The provision and influence of evidence-based policy advice:

A case study of the National Advisory Council on Innovation

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Declaration

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Abstract

Evidence-based policy(-making) (EBP) has been adopted in many countries as knowledge and expertise are increasingly regarded as part of the core capabilities of political administrations in modern democracies. Advisory bodies which produce scientific or evidence-based advice have become an important form of support to and institutionalisation of EBP. However, empirical studies have shown that EBP remains an ideal in the context of the complexities of public policy-making and that advisory bodies seldom have much impact on the policy process.

In South Africa, the National Advisory Council on Innovation (NACI) is a statutory body mandated to provide evidence-based advice to the Minister of Science and Technology. Since its establishment in 1997, there have been widespread perceptions that it is ineffective and uninfluential and therefore unable to realise its full potential and contribution to strengthening science, technology and innovation (STI) policy-making in the country.

The main question this study seeks to address is: how does the nature of NACI's institutional and organisational design, the policy context within which it operates, and the interaction and relationship between these aspects, impact on the outcomes of NACI's advice and its influence on the policy process? Using a qualitative case study design based on documentary analysis and interviews with key informants, the study approaches this question through four empirical lenses: (1) the broader political and policy environment, with a specific focus on institutional and policy developments for the governance of science and technology; (2) NACI as an organisation – the conditions under which it emerged, its institutional design, and how it has interpreted and adjusted to its policy and institutional environments over time; (3) one of NACI's longer-term advisory initiatives as a way of seeing 'NACI in action' and assessing the uptake of its advice; and (4) the factors which have played a role in shaping and constraining the provision of advice and NACI's influence on policy.

The findings reveal that while NACI looks good on paper and has produced a fairly substantial array of advice and supporting research evidence, in reality it has faced various challenges amidst complex dynamics which have limited its real and potential influence. Key among these have been inadequate internal capacity, its lack of independence from the Department of Science and Technology (DST), its low profile in the system, negative perceptions of its credibility and legitimacy, and a policy environment that is uncoordinated and beset with its own capacity challenges. Overall,

the study demonstrates that there are ever-increasing degrees of dilution in the production and movement of NACI's work, leaving the potential for its influence progressively weakened.

The new *White Paper on Science, Technology and Innovation* (2019) proposes an expanded mandate and strengthened role for NACI in support of a new inter-ministerial structure for STI coordination. For NACI's potential and effectiveness in this regard to be fully realised, it is argued that various issues will need to be addressed including NACI's internal capacity; its independence, profile and credibility; role clarification between NACI and the DST; and better institutionalisation of NACI's advisory work within the policy process.

Opsomming

Die praktyk van bewysgebaseerde beleid(-making) (BBM) is deesdae kenmerkend van baie lande omrede kennis en kundigheid toenemend as deel van die kernvermoëns van politieke administrasies in moderne demokrasieë beskou word. 'n Belangrike vorm van ondersteuning vir BBM is adviesliggame wat wetenskaplike of bewysgebaseerde advies lewer; dieselfde adviesliggame is ook belangrik vir die institusionalisering van BBM. Empiriese studies het egter getoon dat BBM slegs 'n ideaal bly in die konteks van die kompleksiteite van openbare beleidmaking en dat adviesliggame selde 'n betekenisvolle impak op die beleidsproses het.

Die Nasionale Adviesraad vir Innovasie (NACI) is 'n voorbeeld van 'n relevante adviesliggaam in Suid-Afrika. NACI is 'n statutêre liggaam wat gemagtig is om bewysgebaseerde advies aan die Minister van Wetenskap en Tegnologie te lewer. Sedert die totstandkoming van NACI in 1997 was daar egter wydverspreide persepsies dat die organisasie ondoeltreffend is en gebrekkige invloed het, en daarom nie die volle potensiaal en bydrae tot die versterking van beleid, wetenskap, tegnologie en innovasie (WTI) in die land kan realiseer nie.

Die belangrikste vraag wat hierdie studie wou beantwoord is: hoe beïnvloed die aard van die institusionele en organisatoriese ontwerp van NACI, die beleidskonteks waarbinne dit werk, asook die wisselwerking en verband tussen die vermelde aspekte op die uitkomste van die advies van NACI en die invloed daarvan op die beleidsproses? Die betrokke vraag is deur vier empiriese lense beskou, waar die empiriese werk 'n kwalitatiewe gevallestudie-ontwerp gebaseer op dokumentêre analise en onderhoude met sleutelinformante behels. Die lense was: (1) die breër politieke en beleidsomgewing, met 'n spesifieke fokus op institusionele en beleidsontwikkelings vir die bestuur van wetenskap en tegnologie; (2) NACI as 'n organisasie – die omstandighede waarbinne NACI ontstaan het, die institusionele ontwerp van die organisasie en hoe dit oor tyd heen geïnterpreteer en aangepas is by die beleid- en institusionele omgewings; (3) 'n spesifieke langer-termyn inisiatief van NACI ten einde 'NACI in aksie' te sien en die gebruik van die organisasie se advies te beoordeel; en (4) die faktore wat 'n rol gespeel het in beide die vorming en beperking van advies gelewer en die invloed van NACI op beleid.

Uit die bevindinge blyk dit dat, hoewel NACI op papier goed lyk en verskeie advies en ondersteunende navorsingsbewyse gelewer het, die organisasie in werklikheid verskillende uitdagings in die gesig staar te midde van 'n ingewikkelde dinamiek wat die organisasie se werklike

en potensiële invloed beperk. Die belangrikste hiervan is onvoldoende interne kapasiteit, sowel as die gebrek aan onafhanklikheid van die Departement van Wetenskap en Tegnologie (DWT), die lae profiel van NACI in die stelsel, die negatiewe persepsies rakende NACI se geloofwaardigheid en legitimiteit, en 'n beleidsomgewing wat nie gekoördineerd is nie en sukkel met die uitdagings van eie kapasiteit. In die geheel toon die studie 'n steeds-toenemende mate van verwatering in die produksie en beweging van NACI se werk, wat die potensiaal vir NACI se werk om enige invloed te hê geleidelik verswak.

Die nuwe *Witskrif oor Wetenskap, Tegnologie en Innovasie* (2019) stel beide 'n uitgebreide mandaat en 'n versterkte rol vir NACI voor ter ondersteuning van 'n nuwe interministeriële struktuur vir die koördinasie van wetenskap, tegnologie en innovasie. Ten einde die potensiaal en doeltreffendheid van NACI in hierdie verband ten volle te verwesenlik, word aangevoer dat verskillende kwessies aangespreek moet word. Die kwessies behels, onder andere, die interne kapasiteit van NACI; die onafhanklikheid, profiel en geloofwaardigheid van die organisasie; die verduideliking en verheldering van NACI en die DWT se onderskeie rolle; en 'n beter institusionalisering van die adviserende werk van NACI binne die beleidsproses.

For my Dad

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Acronyms and abbreviations

ANC	African National Congress
ASSAf	Academy of Science of South Africa
CEO	Chief Executive Officer
CHE	Council on Higher Education
CREST	Centre for Research on Evaluation, Science and Technology
CSIR	Council for Scientific and Industrial Research
DACST	Department of Arts, Culture, Science and Technology
DG	Director-General
DHET	Department of Higher Education and Training
DPME	Department of Performance, Monitoring and Evaluation
DST	Department of Science and Technology
DTI	Department of Trade and Industry
EBP	evidence-based policy(-making)
GEAR	Growth, Employment and Redistribution strategy
HEI	higher education institution
HSRC	Human Sciences Research Council
ICT	information and communication technology
IDRC	International Development Research Centre
M&E	monitoring and evaluation
NACI	National Advisory Council on Innovation
NACOST	National Advisory Council on Science and Technology
NDP	National Development Plan
NRF	National Research Foundation
NSI	national system of innovation
NSTF	National Science and Technology Forum
OECD	Organisation for Economic Development and Cooperation
R&D	research and development
RDP	Reconstruction and Development Programme
S&T	science and technology
SAC	Scientific Advisory Council
SARChI	South African Research Chairs Initiative
SARG	South African Reference Group on Women in Science and Technology
SciSTIP	DST-NRF Centre of Excellence in Scientometrics and Science, Technology and Innovation Policy
SET	science, engineering and technology
SET4W	Science, Engineering and Technology for Women
SETI	science, engineering and technology institution
STI	science, technology and innovation
UCT	University of Cape Town

CHAPTER 1: INTRODUCTION AND ORIENTATION TO THE STUDY

1.1   An autobiographical note

The topic for this study has at its heart the relationship between knowledge and power. Ever since I first heard the phrase 'knowledge is power' as a politicised teenager in the 1980s in South Africa, I have been intrigued by the relationship between the two and vigilant as to how it plays out at both macro (socio-economic, political) and interpersonal levels. I was aware at the time, for instance, of a common discourse among apartheid-supporting white South Africans which held that science backed the notion that the 'black race' was inferior to the 'white race', thereby providing some kind of 'superior justification' for the policies of the apartheid regime which subordinated and oppressed black South Africans. And word was out that our own Human Sciences Research Council (HSRC) – historically a largely government-funded organisation populated by white researchers and managers – was producing similar and other research which supported apartheid policy. I thus viewed the relationship between knowledge and power as essentially political and antagonistic, where scientific knowledge, in the hands of the privileged and powerful few, was used as a tool for maintaining the status quo.

During that time, however, I was also exposed to the power of knowledge. A school friend's mother was employed as a senior researcher at the HSRC in Durban and I had the good fortune of working as her research assistant in the early 1990s. Rooted in the field of early childhood development, her research focused on the impact of parasitic infections on the cognitive development of young children, and she was conducting her studies among black five-year-old children in townships and rural areas in KwaZulu-Natal. Using her findings – which indeed showed a correlation – she advocated with some success for the treatment of parasitic infections in black children, who carried alarming parasite loads and for whom even the most basic healthcare was inadequately available. What really gripped me about this work was not only did it provide evidence that had the potential to shift public health policy and improve the lives of people, but it also represented a challenge to the apartheid government in relation to the distribution of a large proportion of the national resources to the white minority. This struck me as powerful and in fact sparked my interest in social research as a career, through which I believed I could make a tangible contribution to socio-economic development in the country.

Throughout my career as a social researcher I have worked on projects with a development focus, for the most part in relation to higher education and science policy and governance. In every instance, the intention of both the research and the research teams was that the findings and recommendations of the studies would inform the policy and/or practice of the intended beneficiaries and others. In many cases there has been success in this regard, although it is not always possible from the researcher perspective to know how much impact one's work has had. Furthermore, through first-hand experience I have come to understand that this ideal seldom translates into reality in a straightforward manner, and have learnt much about the various strategies that researchers use to get their voices, and those of their research, heard and taken seriously. While I have never lost the faith and continue to pursue what I consider relevant and useful research, I have also continued to grapple with misgivings about the scientific enterprise – particularly its relationship to capital (as manifested, for instance, in the interests of Big Pharma or the military-industrial complex); the social, political and economic dimensions of scientific knowledge production; and the power of its cognitive authority. As a result, my tendency is to be wary, suspicious even, of how scientific knowledge is used when in the hands of politicians or anyone with vested interests.

It was following the completion of my Master's degree in 2001 that I first had the opportunity to get involved in research into the relationship between knowledge and policy when I was appointed as a researcher at the Centre for Research on Evaluation, Science and Technology (CREST) at Stellenbosch University. As part of a study on the utilisation of university research in South Africa, I undertook four in-depth case studies of the use of research for policy in various sectors (Bailey, 2005a). I also co-authored a review of the literature on knowledge utilisation (Bailey & Mouton, 2005). Later, in 2008, while working as researcher on the Phase 1 project of the Higher Education Research and Advocacy Network in Africa (HERANA), I compiled a review of the international and African literature on the use of research in the policy process (Bailey, 2010). From 2011 to 2014, as part of HERANA Phase 2, I undertook a study into the roles and functions of higher education councils and commissions in eight African countries (Bailey, 2014). In this study, policy advice was identified as one of the functions of seven of the eight agencies in the sample – including the South African Council on Higher Education (CHE) – and in some cases the policy advice was required to be underpinned by research-based evidence.

Given my research background in both higher education and science and technology studies, as well as my location as a PhD candidate within the DST-NRF Centre of Excellence on Scientometrics and

Science, Technology and Innovation Policy (SciSTIP), I was interested in pursuing a topic which would focus on the provision of evidence-based policy advice in the national system of innovation in South Africa. The National Advisory Council on Innovation (NACI) is the government-funded statutory body mandated to provide (evidence-based) policy advice to the Minister of Science and Technology on a range of issues at the national policy level. NACI thus presented itself as an interesting case of an advisory body whose policy advice is required to be underpinned by research. At the time there seemed to be a relatively widespread perception within the science and higher education communities that in comparison to its higher education counterpart, the CHE, NACI had not been particularly effective or influential in carrying out its mandate, which made it all the more interesting as an object of investigation.

1.2   Problem statement and research focus

In 1996, the new democratic government published the first science and technology (S&T) policy – the *White Paper on Science and Technology: Preparing for the 21st century* (DACST, 1996a). This document signalled that the government had embraced the idea of the importance of S&T for bringing about socio-economic development in the country. As such, its policy intention was to harness S&T to contribute to addressing the development needs and inequities inherited from the apartheid era, and transitioning the country to a knowledge-based economy and increasing its competitiveness in the global economy. The White Paper also announced the establishment of new institutional arrangements to assist in these endeavours. One of these was NACI which was established in 1997 by the National Advisory Council on Innovation Act (No. 55 of 1997). The Act mandated NACI to provide advice to the minister responsible for S&T on a wide range of matters relating to, among others, coordination of S&T-related policies and governance in the system; the identification of research and development priorities; funding, human resource development and infrastructure; and monitoring and evaluation systems.

However, from the outset, there were concerns about NACI's independence and credibility as an advisory body, particularly as a result of its proximity to and embeddedness in the very government department whose minister it was required to advise and to whom it was accountable. This was exemplified by the fact that NACI was reliant on the Department of Science and Technology (DST) for its budget and administrative infrastructure, and that the Chief Executive Officer of NACI was the Director-General of the Department. These issues were first raised formally in an external review of

NACI conducted in 2002 (Gevers et al., 2002). The Organisation for Economic Development and Cooperation's (OECD) review of South Africa's innovation policy, which was published in 2007, raised another concern about NACI's institutional design, namely that the fact that it was mandated to provide advice to the Minister of S&T constrained 'the Council's ability to address cross-departmental issues' (OECD, 2007: 17), and that, given its ties to the DST, it lacked 'the wider overview needed … to debate and help set national priorities and to coordinate the national effort' (ibid.: 127). Five years later, the report of a ministerial committee appointed by the Minister of S&T to review the science, technology and innovation (STI) landscape in the country raised similar concerns, noting that 'NACI's dependent relationship with the DST … had a number of counterproductive effects, including widespread perceptions of a lack of autonomy, limited capacity to influence national-level strategy and planning for the NSI, a relative lack of resourcing and the low profile of its work' (Ministerial Review Committee, 2012: 75).

This raised interesting questions about how the ways in which NACI has been conceptualised, configured and operationalised as an advisory body related to its real or potential influence on the policy-making of the Minister of S&T (the intended target of its advice), and the role that it played in the system. At the start of the study, the broad aim was to gain a deeper understanding of how NACI went about formulating evidence-based policy advice; to what extent and in what ways NACI and its advice influenced the policy-making of the Minister of S&T; and what factors impacted on the influence of NACI and its advice. Engagement with the literature and the preliminary analysis of the data served to refine these questions and the focus of the study. As such, the study explores how the nature of NACI's institutional and organisational design, the political and policy context within which it operates, and the interaction and relationship between these aspects, impact on the outcomes of NACI's advice, and facilitate or constrain its influence on the policy process. The study asks questions such as: From a legislative point of view, what is NACI mandated to do and how is it expected to function? What are the structural and institutional arrangements for carrying out its advisory work, and how and why have these changed over time? How does it go about formulating advice and what forms do its advisory outputs take? What is the nature of its relationship with and how does it interact with the Minister of S&T, the DST and other key stakeholders in the system? What is the nature of policy-making in the STI policy domain? How has the advice provided by NACI been used in or influenced the decision- and policy-making of the Minister of S&T? What factors have come into play which have impacted on NACI's real or potential influence on the policy-making of the Minister of S&T and, more broadly, STI policy in the country?

1.3   Structure of the thesis

Chapter 2 presents the conceptual framework for the study. In the absence of a 'theory of policy advice', the framework draws on various bodies of empirical and theoretical work which address the many dimensions of the provision and influence of advice on policy-making, often in very different ways. The chapter begins with an overview of the emergence and underlying rationale of evidence-based policy(-making) (EBP) as a practice and approach in modern democracies, and the institutional arrangements that have developed for the provision of scientific or evidence-based advice. Here I focus on the structure and functions of statutory advisory bodies in particular. I then discuss the two lenses that comprise the conceptual framework; namely the nature of policy-making and the ways in which policy advice and advisory bodies enter into and are utilised, and the institutional arrangements and design of advisory bodies and the institutional frameworks within which they operate. The chapter concludes with a delineation of which aspects of the conceptual framework this study specifically addresses.

Chapter 3 outlines the research design and methodology of the study. It describes the qualitative case study design with its institutional and 'mini' case study dimensions, including reasons for their selection, the extent to which limited access to certain data shaped the research design, and the strategies I have employed for optimising the quality of the research. I then describe the various sources of data and their evidentiary value as well as the process and methods of analysis.

Chapters 4 to 7 constitute the empirical chapters of the thesis and build upon one another. In Chapter 4, I consider the broader political and policy context in South Africa within which NACI has operated. I begin with a brief overview of how the South African government is structured in terms of general governance functions, as well as the formal approach to policy-making and the extent to which EBP is given expression at the national level. This is followed by a brief historical sketch of the governance and policy frameworks relating to STI during the apartheid years. I then trace the key institutional and policy developments relating to STI since the election of the first democratic government in 1994, with a specific focus on the ministry responsible for S&T and its associated government department. The chapter concludes with an outline of the policy advice landscape for STI in the country.

Chapter 5 comprises the institutional case study of NACI. It begins with an historical look at the roots and genesis of NACI, based on the assumption that understanding how and why NACI operates as it

does now is, to some degree or another, influenced by where it has come from. The chapter then describes in some detail NACI's institutional design, including its organisational structure, composition and functions; its financing and accountability; and the organisational arrangements and processes for advice formulation. In the latter regard, I explore the general principles underpinning and modalities of advice formulation, how the advice agenda is set, inputs into the advice formulation process, and the communication of the advice to the Minister. The chapter concludes with a brief assessment of outsiders' views on and perceptions of NACI's effectiveness in carrying out its mandate.

Chapter 6 focuses on NACI's advisory initiative on women and science, engineering and technology (SET), and specifically the work undertaken by the dedicated advisory committee which was in place from 2003 to 2012. This 'mini' case study serves as an exemplar of NACI's advisory work and is intended to provide another layer of data through which to explore NACI's provision of advice and its influence on the policy process. The chapter begins by locating the committee's work within the broader framework of the government's gender equality policy intentions and objectives. It then describes the objectives and composition of the committee and the nature of its advice formulation process. The chapter traces the key research and advice outputs produced through and by the committee and, as far as is possible with the data available, explores the extent to which and in what ways the ideas and recommendations from the research and advice found their way into policies, strategies and interventions of the Ministry and the DST.

Chapter 7 focuses on the various factors which appear to have impacted on the influence of NACI – as an advisory body and through its advice. As such, the chapter explores issues to do with the nature of NACI's advice formulation process and outputs and the capacity and skill-sets available to it in carrying out its mandate, as well as (perceptions of) its independence, legitimacy and credibility. Factors relating to the policy and political culture are also highlighted including the Minister/DST's internal capacity, ethos and culture of policy-making, as well as the cross-cutting nature of STI governance and policy.

Finally, in Chapter 8, I take a step back and consider the bigger picture of NACI's work and the constraints on its influence on policy-making in the context of the complex dynamics within which it operates. I do so primarily by looking at the data from the study through an interpretive lens of the 'dilution' of its potential, from the capacities with which it has been endowed through to its interaction and intersection with other actors, institutions, processes and pressures. In light of

recent developments which foresee adjustments to NACI's role and mandate, I raise critical questions that need to be considered going forward. I also consider the contribution of this study and suggest areas for further research.

CHAPTER 2: CONCEPTUAL FRAMEWORK

2.1   Introduction

There is a well-established body of empirical work on knowledge utilisation in general and the relationship between research/science and policy in particular. Research into expert or evidence-based policy advice and science advice, and policy advisors or advisory bodies, has been growing over the past two decades. A large portion of this literature comprises studies focusing on the United States, although more recently there has been an increase in research in the United Kingdom and other European countries. Broadly speaking, empirical studies range across the spectrum of actors and organisations involved in the provision and use of such advice, in different national contexts and policy domains. Some studies focus on the institutional arrangements and organisational structure of policy advice formulation, as well as the political and policy contexts within which they operate, how policy advice is formulated, and how it is utilised or influences the policy process. Others focus on more specific aspects, such as advisory bodies' role in political legitimacy, their transparency and autonomy, the quality of their policy advice, the tension between their policy advice and political control, and the politics of representation in government advisory committees.[1]

Despite this growing body of research, some scholars have noted that there is still much work to do in this field. According to Van Damme et al. (2011: 128), while 'advisory bodies are now a common feature of the policy-making process in many countries, recent knowledge of their organisation and functioning and of their development over time is lacking.' Similarly, Owens (2011: 75) notes that

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[1] Examples from the past 15 years include the Council of Science and Technology Advisors' report on advisory bodies in Canada (CSTA, 2001); Glynn et al.'s (2003) large-scale study of formalised advisory bodies at the national level across Europe as well as in the European Union; Eichhorst and Wintermann (2005) on the institutional pre-conditions and structures for effective policy advice in three European countries; Brown et al. (2005) on three advisory bodies to the German parliament; Brans et al. (2006) on the production of policy advice in Belgium and the Netherlands; Boswell (2008) on the policy advice role of the European Migration Network; Gregory and Lonti (2008) on policy advice in New Zealand government departments; Owens (2011) on the advisory role of the UK Royal Commission on Environmental Pollution; Fleischer's (2012) comparative analysis of policy advice and institutional politics in Germany and Britain, with a specific focus on how the advisory arrangements influence government policy-making; Hustedt (2013) on the constitution of the policy advisory system in climate policy-making in the German federal government; Fobé et al. (2013) on member satisfaction of advice production and use across nine strategic advisory councils in Belgium; Ptackova (2013) on advisory committees of the Czech government; Wilsdon et al. (2014) on science advice to governments across a number of countries internationally and by multinational agencies; and Siefken and Schulz (2015) on executive advisory bodies in Germany and the Netherlands.

the 'impact of individual advisory bodies over extended periods of time has not generally been the subject of in-depth analysis.' Fobé et al. (2013: 225) suggest that studies on advisory councils have 'not provided insights into how [they] are organized, how advice comes to play, and what the influence of advice on public policy might be', and Fleischer (2012: 4) observes that such studies tend to 'neglect their interactions with the ministerial bureaucracy.' Furthermore, authors have noted that while the empirical body of knowledge on policy advice is by now well-established, theories of the influence of policy advice and advisory bodies are neither well-developed nor unified (Fleischer, 2012: 3; Maasen & Weingart, 2005: 8; Oliver et al., 2014: 2; Owens, 2011: 73-74). This is not surprising given that the provision and influence of policy advice take place within a complex web of political and institutional environments, practices and processes, which interact and play out at systemic, sectoral, organisational and individual levels. A review of the literature thus reveals that to the extent that empirical studies incorporate theoretical perspectives (for they are often purely descriptive), they draw on bodies of scholarship that have been developed relatively independently of one another. In part this is the result of the level of analysis in such studies, where some focus on tracing the movement of ideas contained in policy advice into policy decision-making and choice (i.e. the uptake or use of policy advice), and others on the effects of the institutional and organisational design of advisory bodies.

Consequently, reviewing the literature over the course of this study has led me down many different and often divergent pathways, as I have followed the empirical and theoretical trails left by prior work into a complex array of ideas and perspectives. As such, what is presented here does not constitute a theory of policy advice or of the influence of advisory bodies. Rather, it is an outline of historical-contextual, policy-political and institutional-organisational factors which talk to different dimensions and interrelationships in the policy advice universe. These ideas have sharpened the research focus of this study and guided the collection, analysis and interpretation of the data. In other words, the conceptual framework provides various lenses through which to investigate the topic – but, at the same time, it leaves space for other theories or explanations emerging from the data. There is thus an element of grounded theory in this study.

As a prelude to the main discussion then, what follows are a few observations about the scope of the literature relevant to this study by way of contextualising and explaining the selection of ideas and perspectives that make up the conceptual framework. The launching pad for the discussion of the conceptual framework itself is an overview of EBP as an approach, including its underlying rationale and the assumptions it makes about how policy-making happens and how evidence is

expected to be utilised. Included in this overview is an outline of the institutional arrangements for policy advice with a specific focus on the characteristics of statutory advisory bodies which by design appear to reflect the goals of EBP. This is followed by an exploration of the various factors which have been highlighted as playing a potential role in the nature and extent of the use of policy advice and the influence of advisory bodies. The chapter concludes with a distillation of the core elements of the conceptual framework as they pertain to the focus of this study, which has guided the collection and analysis of data.

2.1.1 Observations about the literature drawn upon for this framework

I began the study by seeking out empirical work and theory pertaining to policy advice and advisory bodies (and particularly statutory government bodies), as well as literature relating to evidence-based policy(-making) (EBP) since it underpins the rationale for evidence-based advice and is, arguably in large part, the raison d'être of policy advisory bodies in contemporary times. The first observation in this regard has to do with a distinction. The term I am using – namely, 'evidence-based policy advice', since the case study is of a body which is mandated to provide advice that is underpinned by research-based evidence – is not, as it turns out, a phrase commonly used. The closest one can come is reference to 'expert advice' and 'science advice'. This extends to nomenclature relating to advisory bodies which draw on research-based or scientific evidence to inform their advice, including the most common formulation of 'scientific advisory bodies' which operate at the so-called 'science-policy interface'. These types of advisory bodies provide scientific evidence to inform decision-making on specific issues such as climate change, the use of fossil fuels or the introduction of genetically-modified crops, which may result in laws, regulations and/or standards pertaining to these matters (Neal et al., 2008: 11; Stine, 2009: 3). Referred to as 'science for policy', this type of advice is typically provided by scientists, engineers and so on in the form of data, analysis and knowledge, in order to provide a scientific basis for policy decision-making.[2] Other advisory bodies, such as NACI, produce evidence-based advice relating to the STI system. This is referred to as 'policy for science' or in the more common phraseology 'science policy' or 'science and

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[2] Examples of such advisory bodies in the US include the President's Council of Advisors on Science and Technology, the NASA Advisory Council, the National Science Advisory Board for Biosecurity, and the Nuclear Science Advisory Committee; in the UK the Bovine Tuberculosis Science Advisory Body; and the United Nations Scientific Advisory Board, and the Subsidiary Body for Scientific and Technological Advice of the UN's Framework Convention on Climate Change.

technology policy' or 'innovation policy', among others.[3] This relates to matters such as the size and shape of the institutional landscape, human resources and training, infrastructure, the allocation and distribution of resources, the utilisation or commercialisation of scientific knowledge production, and the coordination of STI policies and activities. The evidence to inform policy in this way is generally produced within the social science disciplines and incorporates policy analysis. While the science-for-policy literature dovetails to some extent with the policy-for-science literature, it also has its own preoccupations such as the 'boundary work' of scientific advisory bodies as 'boundary organisations' in demarcating and coordinating the science-policy interface, especially since the science in question is often contingent, controversial and contested, and beyond the ken of most policy-makers.

The second set of observations has to do with different theoretical treatments in studies of policy advice and advisory bodies. Many empirical studies of EBP and advice locate themselves within the broader knowledge utilisation and research-for-policy literature, most often taking as their conceptual starting points the utilisation studies conducted in the 1970s and 1980s by the likes of Carol Weiss, Nathan Caplan, Karin Knorr and Martin Bulmer.[4] These studies investigated the manner and extent to which social science research was utilised in policy-making, primarily in the US. Two important outcomes of these early utilisation studies were, firstly, that there was little evidence of research being used by policy-makers in the direct, instrumental manner as intended; and secondly, an explication of alternative forms of use including 'conceptual', 'political', 'symbolic' and 'strategic' use. Subsequent studies of the use of research-based evidence in the policy process identified various factors that play a role, some of which have been organised into conceptual frameworks which typically encompass the broader context of the policy environment, organisational characteristics, decision-maker characteristics, and technical factors associated with the evidence itself.[5] Empirical research into policy advice and advisory bodies that follow this tradition have identified a similar range of factors that shape advice provision and use, and draw and build upon the different notions of use, and extend these to include the use of advisory bodies. While much has been written about EBP in recent years given its increasing emphasis in the corridors of government

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[3] Examples of 'policy for science' advisory bodies internationally include the UK government's Chief Scientific Adviser and Trans-departmental Science and Technology Group and the Council for Science and Technology; the Austrian Council for Research and Technology Development; the Science and Technology Policy Council of Finland (now the Research and Innovation Council); the Japanese Council for Science, Technology and Innovation Policy; and the Scottish Science Advisory Council.

[4] See e.g. Bulmer (1982), Caplan et al. (1975), Caplan (1979), Knorr (1977), Weiss (1977a, 1977b, 1979, 1980), and Weiss & Bucuvalas (1980).

[5] See e.g. Court & Young (2006), Lester & Wilds (1990), Oh & Rich (1996), Sabatier (1978), and Shaxson et al. (2016).

policy-making, empirical research has shown that to a large extent it remains an ideal. This is primarily because its rationale is based on faulty assumptions relating to, among others, how policy-making happens and who is involved, and expectations about how evidence is to be utilised, in a way that is very reminiscent of the early utilisation studies.

This left me with questions about the nature of the policy-making process; how evidence and advice enter into and interact with it; and, to the extent that the intention is for evidence and advice to influence policy, what other influences there are on policy thinking, decision-making and change. These questions are addressed directly and indirectly in different schools of thought. Scholarship on public policy and the policy process, which is very long-standing and wide-ranging and found primarily in the domains of public administration and political science, offers a broad take on these issues in the form of a plethora of theories and models of policy-making and policy change. With regard to the nature of policy-making, rational models and those that assume the centrality of government bodies in the process are contrasted with more political and network-based conceptions. These broadened notions help to unpack the complexity within which policy advice is formulated and how and why it is utilised, and also situate advisory bodies as one among a multitude of other actors and inputs into the policy process. As will be seen, these elements constitute a core component of the conceptual framework. Theory relating to policy change – how and why it happens – was also pertinent insofar as policy advice is intended to influence policy outcomes (i.e. contribute to policy change). Major strands of scholarship in this area include, among others, multiple streams analysis, punctuated equilibrium theory and the advocacy coalition framework.[6] This literature served as important background reading; however, the level of theory was too broad to incorporate into the conceptual framework, although some of these perspectives do make an appearance.

Theories relating to the role of ideas (sometimes referred to as 'ideational theories') started gaining attention and traction among scholars in the 1980s and 1990s. The ideational turn, according to Béland (2016: 229), 'is the articulation of causal arguments about the impact of ideas and related factors (culture, discourse, and frames) on political and policy change.' In the strongest formulation, such accounts 'posit a single, overwhelming, and, above all, stable set of ideas as the driving force in politics' in which 'it is the substance of ideas that matters above all in shaping political outcomes' (Lieberman, 2002: 699). While there has been debate among scholars and different schools of thought about the extent to which, and in what possible ways, ideas play a role, there seems to be

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[6] See Cairney & Heikkila (2014) for an overview of these and other major perspectives.

some degree of consensus that 'ideas matter' when attempting to understand or explain policy decision-making and choice, as well as policy stability and change over time (Campbell & Pedersen, 2014: 2). Despite this increased attention on ideas, this is not a theoretically homogenous body of scholarship and in some respects the role of ideas remains under-theorised. Nevertheless, it does represent an attempt to make sense of how policy ideas enter and interact with the policy process, and why some ideas are adopted and others not. However, since the focus of this study is primarily on the institutional features of NACI and the policy environment within which it operates, with only a glance at the specifics of the effects of its advice, the conceptual framework does not engage deeply at this level.

Finally, a number of empirical studies of policy advice and advisory bodies draw on various organisational and institutional theories. The so-called 'new institutionalism' emerged around the time (1940s) that organisations became a recognised field of study, and has since gained considerable attention in political science with regard to, among others, explanations of how institutions are related to political actions and outcomes (Hall & Taylor, 1996: 5; Nutley et al., 2002: 78; Radaelli et al., 2012: 539). Today, there are many variants of new institutionalism, each of which has developed somewhat separately from the others. As such, they are underpinned by different ontological perspectives, conceptualise the political world in different ways, define institutions differently, and identify different factors associated with how behaviour is shaped within or by institutions (see Aspinwall & Schneider, 2000; Hall & Taylor, 1996; Peters, 2000; Radaelli et al., 2012).

The most often-cited versions are rationalist, historical and sociological institutionalism – although as Thelen (1999: 370-371) observes: 'Each of these three schools in fact represents a sprawling literature characterized by tremendous internal diversity, and it is often also difficult to draw hard and fast lines between them.' Generally speaking then, in the rationalist perspective institutions are seen as 'governance and rule systems', 'rationally constructed edifices established by individuals seeking to promote or protect their interests' (Scott, 2001: 35). As Aspinwall and Schneider (2000: 22-23) describe: 'Institutions are like mazes or hurdles – something to be negotiated on the way to a prize which everyone is seeking [and] actors adapt their behavior to these institutions and use them strategically.' Institutions also act as incentives to which individuals respond (Peters, 2000: 3). Furthermore, macro-level phenomena (such as policy-making or the use of policy advice) are understood to be the result of the actions of individuals or the 'aggregated behavior of individuals' (Griggs, 2007: 175).

In historical institutionalism, institutions are defined as historically-constituted formal or informal rules, routines, norms, procedures or organised practices that are embedded in organisations, or in organisational structures or relations, and are understood to influence individual and collective decision-making behaviour (Béland, 2005: 1; Hall & Taylor, 1996: 6-7; March & Olsen, 2008: 3; Scott, 2001: 33). Institutions thus constrain or enable individual action or behaviour, prescribe appropriate conduct, and direct and frame the ideas of those involved in policy-making (Hall & Taylor, 1996: 6; March & Olsen, 2008: 3; Oborn et al., 2011: 326; Scott, 2001: 34). These rules, norms and practices, according to March and Olsen (2008: 3), are 'relatively invariant in the face of turnover of individuals and relatively resilient to the idiosyncratic preferences and expectations of individuals and changing external circumstances.' Institutions thus defined can manifest in the form of organisations, where institutional processes at the macro level play out within single or sets of organisations. Since institutions also transcend organisational boundaries, the notion can also be applied to systems such as policy sectors or advisory systems. Furthermore, historical institutionalism understands institutional development and outcomes (e.g. organisational or policy) in terms of unintended consequences and path dependency (Hall & Taylor, 1996: 7; Scott, 2001: 33). Path dependency refers to the idea that 'political institutions and previously enacted public policies structure the political behaviour of bureaucrats, elected officials and interest groups during the policy-making process' (Béland, 2005: 3); or, as Peters (2000: 3) puts it, 'the policy and structural choices made at the inception of the institution will have a persistent influence over its behavior for the remainder of its existence.'

In its definition of institutions, the sociological tradition goes beyond the norms, rules or procedures described by historical institutionalists to include 'the symbol systems, cognitive scripts, and moral templates that provide the "frames of meaning" guiding human action' (Hall & Taylor, 1996: 14). Together, these constitute the lens through which actors both recognise and respond to the situation (e.g. policy problem) at hand, reworking 'the available institutional templates to devise a course of action' (ibid.: 16). Here, the institutional forms and practices adopted by organisations or bureaucracies are seen as 'culturally specific practices' (ibid.: 14) which become taken-for-granted as the way things are done (Scott, 2001: 57). While historical institutionalism privileges structure over agency, where the prevailing norms and values prescribe certain 'roles' for actors (ibid.: 55), there is a recognition in sociological institutionalism that actors have some agency within their institutional environments. Scott (ibid.: 75), for instance, notes that sociological accounts also consider 'the ways in which individual actors take action to create, maintain, and transform institutions.' Here, in the

spirit of Anthony Giddens' structuration theory, actors are viewed as 'knowledgeable and reflexive, capable of understanding and taking account of everyday situations and of routinely monitoring the results of their own and others' actions' (ibid.: 76). In this sense, according to Hall and Taylor (1996: 15), sociological institutionalism conceives of the relationship between institutions and individual action as 'highly-interactive and mutually-constitutive.'[7]

Advisory bodies, as organisational manifestations of the practice of policy advice and as components of the policy system, operate within an institutional context. Institutional theory has thus been a useful lens for investigating the topic insofar as it suggests that the institutional design of an organisation has a bearing on the role that such a body can play in the policy-making process (cf. March, 1994; March & Olsen, 1984, 2008). By extension, characteristics of an advisory body may have an influence on the nature and extent of the use or influence of policy advice. These would include, for instance, the governance arrangements of the body; its legal and social status, membership composition, and human and financial resources; how the advisory role is conceptualised within the organisation; and the organisational structures, norms and procedures through which policy advice is constructed. Institutional features of the advisory body's principal are also of relevance, such as how it engages in policy-making and draws on evidence and policy in this regard.

In summary, in the development of the conceptual framework it has been necessary to both zoom in to literature specific to policy advice and advisory bodies, and to zoom out and consider these through a wider lens. In so doing, I have had to make a number of choices about which aspects and how much of the literature to incorporate, and then piece together what are essentially somewhat disparate theoretical perspectives and fields of study into a cogent framework. As such, the conceptual framework, as curated, is formulated around what could be considered both policy-related and institutional factors, which talk in different ways to the policy-making context (political and bureaucratic); institutional and organisational characteristics (including processes and outputs) of both policy-making and advisory bodies; characteristics of the actors involved in policy-making and advisory processes; and the relationship between the advisory body, its principal and the broader policy sector. The aim of the conceptual framework is to lay the groundwork for analysing how these factors play out and interact in the specific case of this study, as well as the complexity and dynamics involved.

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[7] There are different views on this. Hay and Wincott (1998: 954), for instance, regard sociological institutionalism as also 'underplaying the role of agency.'

2.2 Rationale and institutional arrangements for evidence-based policy and advice

Drawing on expert knowledge for good governance is as ancient as government itself, as encapsulated in the notion of 'philosopher-kings' in Plato's *Republic* (c380 BCE). More specifically, the doctrine of using reliable, scientific knowledge as the basis for advising decision-making in the political sphere dates back to early modern Europe (Head, 2010: 78), and has its roots in the writings of Francis Bacon, René Descartes, Karl Marx and others, all of whom were advocates of 'a scientifically guided society' (Andrews, 2007: 161). In the early seventeenth century, Bacon coined the term 'knowledge is power' and asserted that 'the most charitable society would be the one ruled by a well-organized community of technocrats who tested their knowledge empirically and acted on the utilitarian principle of procuring the greatest good for the greatest number of people' (García, 2001: 109-110). He devised a new methodological approach for the social sciences that was based on observed fact and empirical data, which, among others, was intended 'to form the basis of social reform and progress' (Mouton, 1993: 2-3). These ideas, advanced by other philosophers, notably Thomas Hobbes and David Hume, laid the foundation for the rise of positivism in the nineteenth century, as developed in the writings of Henri de Saint-Simon and Auguste Comte (ibid.: 3). Saint-Simon and Comte believed that the development of the social sciences towards positive science would run in parallel to the advancement of human reason and could achieve the reconstruction of society (ibid.: 5-6). For the thinkers of the Enlightenment period, bringing positive science to bear on political power and decision-making would counter the historical tendency of governments to rely on superstition, religious values and precedent as the basis of policy-making and government legitimacy (Head, 2008: 9; Young, 2013: 3-4).

Various trends and developments in advanced democracies in the twentieth century saw an increasing focus on the need for scientific or research-based evidence to support government policy-making and, with this, an expansion of policy advice to government in the form of expert policy advisors and advisory bodies of different kinds. In the years following the Second World War, as Crowley and Head (2017: 182) note, 'the over-riding concerns to promote economic growth and productivity in industrialized countries became closely linked to greater investment in science and technology and a larger role for technical expert advice.' In the late 1950s and into the 1960s, science policy advisory bodies were established in the United States and (west) European countries which, according to Brickman and Rip (1979: 168), 'came to enjoy a privileged voice in the higher councils of government.' There was also a significant increase in the contribution of social scientists

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to the formulation, implementation and evaluation of policies and programmes relating to national development (e.g. social welfare, educational reform and urban renewal) (Backer, 1991; Bailey & Mouton, 2005; Gagnon, 1990; Glover, 1993; Head, 2008, 2010; Lindquist, 2001; Weingart, 1999). In the US, this was bolstered by significant injections of funding by the federal government to social science faculties and research institutes (Weiss, 1977a: 531-532), while in the UK the government established the Social Science Research Council to expand the social science research base (Heinrich, 2007: 257). Besides the obvious practical usefulness of social science research, the perceived objectivity of the social science method – as expressed in the positivist tradition – was seen to be the only true antidote to the perceived weaknesses of the policy process, and the 'ignorance' and 'prejudice' of politicians and administrators (Bulmer, 1982: 33). At the same time, in the 1950s Harold Lasswell and his colleagues in the US had been championing the importance of the 'policy sciences' for democratic governance (Head, 2010: 78; Parsons, 2002: 43; Young, 2011: 19). The policy sciences were aimed at, among others, 'systematically transforming policymaking into an evidence-based, genuinely "scientific" endeavour' by providing 'a rigorous and purposeful framework for establishing a public policy development process' that was based on 'scientific decision methods and the behavioral sciences' (Young, 2013: 5).

The optimism about the positive contribution of the social and policy sciences to policy-making was not to last, however, as empirical studies in the 1970s and early 1980s found that there was little evidence of the direct or immediate use of research in the policy process as had been expected. As Albæk (1995: 82) observed: 'Just a few years after evaluation and policy research took the American corridors of power and administration by storm, it became depressingly clear that one could only rarely and with difficulty prove that research had exerted any specific influence or had any beneficial effect on the policy that was implemented.'

Despite these disappointments, since the 1990s there has been a resurgent emphasis on the use of research-based or scientific evidence to inform policy-making in what has been referred to as the 'evidence-based policy movement' (Clarence, 2002; Davies, 2012; Heinrich, 2007; Young 2011, 2013). As Davies (2012: R50) notes, the discourse of EBP 'seems to have percolated into the language of policymaking and governments worldwide.' As such, governments (e.g. in the UK, US, Europe, Australia, Canada and New Zealand), international agencies (e.g. the OECD and World Bank) and non-governmental organisations have expressed commitment to EBP (Court & Young, 2006: 1; Grobbelaar, 2008: 3-4; May, 2003: 1; Porter & Hicks, 1995: 3; Shove & Simmons, 1997: 215; Young, 2013: 5). While such commitments are sometimes only at the level of rhetoric, there are cases

where EBP has become highly institutionalised. Frequent reference is made in the literature in this regard to the stated commitment to EBP by the UK's Blair government in the late 1990s, embodied in various official documents (e.g. the *Modernising Government White Paper*) and operationalised and institutionalised through the establishment of new units, cross-departmental task teams, skills and training initiatives, research programmes, evaluation guides, and so on (Davies, 2012: R50; Head, 2010: 79). Today, there is a wide variety of initiatives, centres, workshops and conferences, guidelines and frameworks, and capacity-building programmes to support the realisation of EBP, especially in developed countries, as well as a plethora of scholarship on EBP and a dedicated journal, *Evidence and Policy*.

The rise of the so-called EBP movement has seen a concomitant increase in and expansion of institutional arrangements for scientific or evidence-based policy advice, and these can be understood within the context of various pressures on modern politico-administrative systems.

The first is the public sector reforms in advanced democracies that began in the 1980s which aimed to modernise government and make it more efficient and effective (Head, 2008: 2; Heinrich, 2007: 256). These reforms are often associated with new public management or distributed public governance (see e.g. Gruening, 2001; Kapucu, 2006; Pollitt, 2007; Van Oosteroom, 2002) and were in part a response to 'revenue pressures and fiscal constraints' (Crowley & Head, 2017: 182). This era of public sector reform, with its emphasis on 'audit, monitoring, performance, strategic planning and quality management systems' (Parsons, 2002: 50), resulted in a shift towards 'strategic steering'. This involves, among others, '"building" government capacity through improving policy capacity and coherence' (Parsons, 2004: 44). Here, knowledge, information and expertise are regarded as part of the core political capabilities of a political order or bureaucracy (Hustedt, 2013: 89), and the way this relationship is organised and institutionalised is considered to be highly salient for the functioning of democracies (cf. March & Olsen, 1995; Trow, 1984). According to Head (2008: 2), EBP holds the promise of addressing some of the key concerns of new public management, such as which options will 'deliver the goods'; how programmes can be improved to get greater 'value for money'; how innovation and competition can be expanded to drive productivity; and how programme managers can achieve specific outcomes for clients and stakeholders. One of the assumptions here is that policy-makers make better-informed decisions and choices, and ultimately better policy that 'works' and is less likely to fail, if they have access to the best available research evidence (Clarence, 2002: 4; Davies, 1999; Gornitzka, 2003: 132; Head, 2008: 1; Howlett & Craft, 2013: 27; Young, 2013: 4). Another assumption is that basing decisions on evidence makes the policy process more rational –

bringing 'order' to the inherent 'messiness' of the process by 'getting experts to establish "what is to be done"' (Clarence, 2002: 1). This approach stands in contrast to opinion-, ideology- or faith-based policy-making, and is seen to legitimate the decisions or choices made as well as the policy process as a whole (Davies, 2004: 3; Engels, 2005: 9; Head, 2010: 77; Pedersen, 2014: 37).

One of the outcomes of the public sector reforms has been the increased emphasis on the establishment of specialised, semi-autonomous (at arm's length) government agencies in a process referred to as 'agencification' (Braun, 1999: 1; Gilardi, 2005: 84-85; Gornitzka & Stensaker, 2014: 2; Groenleer, 2009: 17; Maassen, 2003: 33). The literature suggests that this has been a response to demands on governments for greater efficiency, responsiveness, transparency and accountability; decreased political interference in governance matters; and enhanced technical expertise and the specialisation of functions (Caulfield, 2006; Gornitzka & Stensaker, 2014; Groenleer, 2009; Pollitt et al. 2001: 277). Furthermore, the independence of such bodies is seen to bring greater credibility to governance, given their 'insulation from the electoral cycle, their expertise and their commitment to a problem-solving, rather than a bargaining, style of decision-making' (Majone, 1996: 619-620). I return to the specific institutional form of statutory advisory bodies in section 2.2.1 below.

A second, related pressure on democratic governments is the need for policy legitimacy. According to Brans et al. (2010: 40), there are three principles which must be respected in order for policy to be regarded as legitimate. The first is legality whereby the policy 'has to abide by certain norms and rules'; the second is that the policy must be efficient and effective which includes the principles of acceptability and implementability; and the third is that policy needs to be formulated in a democratic manner: stakeholders must have the opportunity to influence policy and policy-makers must be held accountable. As Brans et al. (ibid.) note: 'In today's world, policy needs to be effective and efficient, but also needs to be developed in a process that is transparent, open, informed and deliberative.' These dual demands of drawing on evidence to inform policy, on the one hand, and attending to the democratic requirements of reconciling and satisfying the interests of diverse groups in the name of the public good, on the other, is reflected in the distinction between the (often competing) discourses of 'professionalisation' and 'interactiveness' which Van Damme et al. (2011: 27) describe as follows:[8]

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[8] In fact, some scholars have argued that EBP is in tension with the democratic ideals of equity and majority rule. For instance, Parsons (2002: 56) argues that EBP effectively attempts to managerialise and de-politicise knowledge production and its utilisation in the policy process. For Howlett and Craft (2013: 28), 'a focus on evidentiary forms of policy advice may serve to exclude some actors from participation in policy advisory or formulation activity, by privileging only those with the requisite resources, expertise, or access to evidentiary forms of policy advice.' Thus, EBP, like the notion of 'technocracy', is seen by some to potentially 'narrow the

> The road towards professionalisation is a movement towards increasingly academic and scientific policy analysis and evaluation. Thus, this route optimises the government's capacity for problem-solving by increasing the scientific knowledge base available for policy decisions. Interactiveness, on the other hand, is based upon the need of democratic governments to garner support for their decisions, to appear to be following the wishes of the people or at least acting in their interests. Policy decisions down this path involve direct consultation and interaction with societal parties, bringing them directly into the policy-making process with the assumption that their support will mean that the policy solutions are not only in the public's interest but are also sustainable.

Drawing on evidence or advice can thus be used as a tool for enhancing the (perceived) legitimacy and credibility of the policy-making body and its decisions by making these appear more authoritative and rational (Boswell, 2008: 471; Cairney, 2016: 24; Oh & Rich, 1996: 6; Pedersen, 2014: 37), as well as by making governments 'appear more open and democratic' and hence garnering greater policy support (Fobé et al., 2013: 226).

Finally, modern governments are faced with significant challenges relating to the increasing complexity and cross-cutting nature of policy issues, such as those relating to social, economic and environmental problems, which span both national and global levels (Crowley & Head, 2017: 182; Stone et al., 2001: 25; Young, 2013: 3). Various authors have noted that because of this complexity, the analytical capacity, expertise and advice of traditional government departments have become insufficient or inadequate (Fleischer, 2012: 9; Fobé et al., 2013: 226). As Fleischer (2012: 9) notes, policy-makers today require 'knowledge on policy facts and government objectives across a wider range of issues that are better provided by advisory arrangements than the permanent bureaucracy with its traditional sectoral orientation.' Thus, the role of expert policy advisors and advisory bodies has become increasingly important – not only to provide the evidence required for policy-making, but also to mediate or make sense of both the complex 'market-place of political ideas and arguments' (Hoppe, 1999: 202), as well as the uncertainty or controversy which can characterise research and scientific endeavour (Halffman & Hoppe, 2005: 135; Van Damme et al., 2011: 126-127).

The 'evidence' implied in the EBP approach refers to evidence that is produced through research or scientific endeavour. In this sense, Davies (2015) describes evidence as information that supports or rejects a conclusion; has standards of validity and reporting; is proven empirically and is theoretically-driven; is almost always probabilistic and rarely self-evident; and can be about what is generalisable or what is particular. Such scientific or research-based evidence is produced in

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sphere of democratic debate' (Moore, 2014: 52). Such concerns have led to an increasing emphasis on the 'democratisation of expertise', which essentially calls for the participation of a greater number and type of groupings in policy deliberations than just experts and decision-makers (Brown et al., 2005: 83; Jasanoff, 1990: 16; Maasen & Weingart, 2005: 2).

universities, public sector science and research institutes and councils, think tanks, non-governmental organisations, international agencies and foundations, as well as by individual contract researchers or research groups. As an output, evidence can take on various forms such as: descriptive statistical and administrative evidence about the nature, size and dynamics of a policy problem; descriptive evidence of people's attitudes, perceptions, experiences and understandings relating to particular issues; economic evidence of the costs and benefits and cost-effectiveness of policies; evaluative evidence of the effectiveness of implementation and delivery of policies and programmes; impact evidence of the effectiveness of social interventions or the impact of policy on outcomes; and analytical evidence on, for instance, how change happens, the complexity and interaction of factors, or causal relationships (Davies, 2004: 11-15; PSPPD, 2011: 2; Shaxson et al. 2016: 17). Typical research designs or methodologies employed include, among others, research synthesis such as systematic reviews, meta-analyses, rapid evidence assessments and consensus studies; surveys; statistical modelling; foresight exercises; cost/benefit analyses; experimental designs; case studies; evaluation studies; and action research (Davies, 2004: 7; Fobé et al., 2013: 227; Head, 2008: 6; PSPPD, 2011: 2). As Head (2008: 2) notes, some approaches tend to be valued over others; for instance, 'the quantitative precision of financial accounting, cost/benefit analysis, risk auditing, and health economics may be more credible than the hermeneutic approaches of history and cultural sociology.' Similarly, systematic reviews, defined as 'methodologically rigorous exercises in assessing the findings of previous cognate research in order to synthesise the results' (Solesbury, 2001: 5), are often cited as preferred methods of generating evidence for policy (Boaz & Pawson, 2005: 175; Davies, 2004: 7).

Policy advice also takes on many forms. For instance, Van Damme et al. (2011: 126) define policy advice as 'an opinion or recommendation offered as a guide for future policy.' They refer to 'reviewing scientific findings; offering instrumental policy advice; introducing public values in the debate; establishing common ground; ensuring a certain degree of policy support; stimulating understanding between actors and/or perspectives', among others (ibid.: 142). Engels (2005: 11-12) describes advice in terms of scientific warning and awareness creation, problem definition, *ex ante* impact assessment of policy options and *ex post* evaluation of policy choices, and the monitoring of implementation. Halffman and Hoppe (2005: 135) define policy advice in terms of providing factual information to policy-makers, determining the effects of past policies and assessing future policy outcomes, providing critical reflection on how policy problems have been defined, identifying potential unanticipated outcomes, and suggesting alternative strategies. Authors have also identified different categories or types of advice. For example, Boston (1994: 3) distinguishes

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between 'strategic' policy advice which involves 'the production of well-researched, in-depth reports' which set out issues and explore options, and 'operational' advice 'which is concerned with the issues of implementation and the administration of government programs.' Prasser (2006: 36) refers to 'cold' (e.g. research-based, independent/neutral and problem-solving, long-term, proactive and strategic) and 'hot' (opinion- or ideology-based, partisan, short-term and reactive) policy advice. Finally, Craft (2011: 15), drawing on Connaughton's (2010) work on the policy advice generated by ministerial advisers in Ireland, draws a distinction between 'substantive' (content-based) and 'procedural' (steering or communication) functions of policy advice.

2.2.1   Statutory advisory bodies

Over the past few decades, the provision of policy advice has been expanded and differentiated significantly, taking place at all political levels and across policy sectors (Heinrichs, 2005: 41), from both inside and outside of government, combining a diversity of technical knowledge and political viewpoints (Craft & Howlett, 2013: 189). Empirical studies have shown that the sourcing, configuration and influence of advisory actors differ from country to country and between policy sectors (Craft & Howlett, 2013: 187-188; Glynn et al., 2003: 11, 89; Wilsdon et al., 2014: 6). The concept of 'policy advisory systems',[9] introduced by Halligan in 1995, gives expression to this phenomenon. Howlett and Craft (2013: 30) define policy advisory systems as 'interlocking sets of actors, with a unique configuration in each sector and jurisdiction, who provide information, knowledge, and recommendations for action to policymakers.' Schulz et al. (2015: 2) describe advisory systems as 'part of the total knowledge infrastructure for policy that comprises all flows of information and knowledge in a country.' Perhaps unsurprisingly, empirical work has shown that policy advisory systems vary in different national systems and policy domains (see e.g. Hustedt, 2013: 90; OECD, 2015: 13). A common conceptualisation of the structure of policy advisory systems is to group advisory actors into three 'sets' or 'communities'; namely, consumers (those with the authority to make policy decisions), suppliers (e.g. knowledge producers in academia or government research institutes), and brokers of policy analysis and advice (Craft & Howlett, 2013: 188; Howlett & Craft, 2013: 30). However, this three-tiered conceptualisation of the structure of advisory systems has been critiqued on the basis of empirical studies, which describe such systems as far more 'fluid, pluralized, and polycentric' with government decision-makers increasingly sitting 'at the centre of a complex web of policy advisors' (Howlett & Craft, 2013: 32-33). As such, policy advisory systems may

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[9] Sometimes the term 'science advisory ecosystems' is employed (see e.g. Diab & Veldsman, 2016).

be populated by individuals such as professional government analysts, ministerial advisors, lobbyists, consultants and scientific or legal experts in universities; permanent, temporary or once-off ad hoc bodies such as statutory advisory councils, advisory committees, commissions of inquiry and foresight units, as well as policy units in government departments and party-political research units; bodies outside of the state apparatus such as policy institutes or think tanks, national academies, professional organisations and disciplinary societies, interest groups, civic and non-governmental organisations, businesses and trade associations, public and individual opinion leaders; and the informal personal networks of policy-makers (Allen, 2014: 6; Brown et al., 2005: 81; Craft & Howlett, 2013: 187; Glynn et al., 2003: 24; Head, 2010: 78; Prasser, 2006: 27-28; Schulz et al., 2015: 2; Stine, 2009: 31-35). According to Wilsdon et al. (2014: 7), governments typically rely on a combination of these advisory sources in order 'to create a broad ecosystem of expertise around policy processes.'

In this mix are statutory advisory bodies which 'can either be fully embedded within the government or have an independent status with a governmental mandate' (OECD, 2015: 14). The focus of this study is on one such statutory advisory body. While the particular make-up of these kinds of bodies varies between and within countries and political traditions, it is possible to identify some key common features and these are outlined below.[10]

Statutory advisory bodies typically function within a framework of laws and/or regulations, as well as terms of reference or guidelines drafted by government. Among others, these set out their advisory mandate, the composition and functioning of the council members, the structure and tasks of the secretariat, the financial[11] and human resources at their disposal, their autonomy and requirements for accountability, their financing, and the norms and procedures for advice formulation. Advisory bodies may provide advice to a single government entity (such as a ministry) although often they provide advice to more than one government principal (e.g. parliament, government ministries, heads of state, attorneys-general and state agencies). As statutory bodies, advisory councils are accountable to one or more principals, such as parliament, the parent ministry and even other departments within the administration. It can be a requirement (e.g. outlined in legislation) that ministries are compelled to consult the relevant advisory council for advice, but in some cases

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[10] The following account is a synthesis of various sources including Bailey (2014), Brans et al. (2010), Brown (2008), Chirwa (2014), EASAC (2012), Fobé et al. (2013), Glynn et al. (2003), Government Office for Science (2011), Jasanoff (1990), Marais (2000), OECD (1998, 2015), Osborne (2004), Ptackova (2013), Schulz et al. (2015), Science & Technology Committee (2006), Sarría-Santamera et al. (2011), Siefken & Schulz (2013, 2015), and Van Damme & Brans (2013).

[11] Statutory advisory councils are usually largely funded by government but some also receive private funding or generate additional income via services offered.

government may choose whether or not to seek advice. It is also possible in some cases for advisory councils to provide advice proactively; that is, without waiting for a request from government. From a legal point of view, the advice given may or may not be binding, and in some countries governments are required to provide feedback on and/or acknowledge or justify the use or non-use of the policy advice given.

The founding legislation or terms of reference for advisory councils may set out on what aspects advice is to be given, as well as explicit procedures to be followed in the formulation of advice. Some advisory councils are required by law to formulate advice on the basis of research-based evidence; in others, they are only required to undertake or commission research where it is deemed necessary. The way in which the formulation process is finalised into a specific advice output (e.g. a report or recommendations) varies. It may be presented as a single position reached via consensus or majority vote, or as a range of options, scenarios or opinions. Usually advice is presented to policy-makers in written form (such as a full or summarised report with recommendations, policy working papers or options papers), but can also be delivered orally (e.g. as a presentation) or in the context of dialogue between the advisory body and policy-makers. In some cases, the advice is published while in others it is kept confidential. Some guidelines call for criteria and procedures for assessing the quality of the advice provided by advisory bodies, as well as the evidence underpinning it through, for instance, peer-review and internal and/or external reviews.

Membership of advisory councils is constituted differently and may include a mix of scientists and experts, public servants, politicians, business leaders and trade unions, individual citizens, and representatives of other stakeholder or interest groups. Some councils may be more stakeholder-representative in composition, while others include a majority of experts. The members and chairpersons of advisory councils are usually appointed by high-ranking officials such as the president, prime minister or a government minister. Other actors such as key stakeholders or interest groups may also be drawn into the process through broader consultation. Advisory bodies typically have a secretariat of salaried staff, headed by a Chief Executive Officer (CEO) or equivalent, which is responsible for the day-to-day functioning of the council, including administrative and logistical support. However, some secretariats also play a role in the advice formulation process, such as providing background information based on the review of available scientific evidence or by commissioning new research; facilitating discussion among council members; communicating with and/or coordinating interaction between the relevant ministers, government departments and other key stakeholders in the policy domain; and writing up the final advice report.

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Despite the predominance of EBP as a discourse and practice in governments around the world, and the increasing emphasis on the importance of policy advice, empirical studies have shown that evidence and advice have been less than influential in the policy process and on policy outcomes (Eichhorst & Wintermann, 2005: 10; Oliver et al., 2014: 6; Young, 2013: 6-7). As Newman et al. (2017: 157) recently reported, 'the evidence-based policy movement has so far shown little progress in transforming the way that public policy is formulated and implemented … Despite the popular rhetoric that policies should be designed to achieve real social objectives, an effective connection with many types of research evidence in policymaking remains elusive.' Similarly, Brans et al. (2010: 29) in their study of education advisory councils in Europe found that '[m]ore often than not, ideas which have been generated in advisory processes do not seem to have any impact on the formal policy processes.' On that note I now turn to an exploration of the factors which are seen to play a role in the use and influence (or otherwise) of advisory bodies and their advice.

2.3 Factors that impact on the use and influence of advisory bodies and their advice

2.3.1 The nature of policy-making and the use of evidence and advice

The focus of this study is on public policy. Public policies are those made by government bodies and officials around issues considered to be of 'national interest'. The term 'policy' is imprecise and as such is defined in different ways with regard to what it is and how it is made. It has, for instance, been described as 'an overall objective', 'a guiding principle' and/or 'a specific action which will be taken to reach the objective' (Wilson, 2006: 153); as 'a course of action adopted by an institution to give effect to its self-perception of its mission and values' (Marais, 2000: 2); and as the outcome of decisions taken by policy-makers regarding actions to be taken in order to address a public concern (Neal et al., 2008: 9; Weible, 2014: 4). The definition of policy that most closely reflects the usage in this study is that offered by Singh (1992: 66):

> [Policy] refers to a framework or plan devised to address some social need, problem or demand. It encompasses, on the one hand, the values and principles underlying political, organisational and

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institutional choices, and on the other, the investigation, research and strategic planning required to operationalise those choices.

Policies also contain 'the commonly understood rules-in-use that structure behavioral situations involving public affairs' (Weible, 2014: 4). While in some cases the objective of policy is to bring about change, in others it is about ensuring continuity (Wilson, 2006: 153). The means towards and goals of policy 'can range in form from procedural to substantive and from symbolic to instrumental' (Weible, 2014: 4-5). The symbolic component of policy is important because it signals government's intent to take action. Thus, as Cairney (2016: 2) cautions, there can be a significant difference between the content of a policy and what actually transpires in reality. The selected course of action is then translated into one or more policy tools or instruments for implementation, such as statutes, laws, regulations, executive decisions or directives, strategies, plans or programmes. Associated with these may be budgets, taxes, financial incentives or penalties, codes of conduct, targets, organisational change, education campaigns, funding for further research, and resources for policy implementation (Cairney, 2016: 3; Page, 1996: 211; Sidney, 2007: 82). The public and other institutions expected to be involved in carrying out the implementation of the policy, and their respective roles, may also be listed (Marais, 2000: 2).

So how are policies made? The EBP approach aligns with the so-called 'linear-rational' model of the policy process and decision-making. One of the earliest descriptions of the linear-rational model – the 'policy stages model' – came from Lasswell. Focussing specifically on the decision-making aspect of the policy process, Lasswell's seven sequential categories included intelligence, recommendation, prescription, invocation, application, appraisal and termination (Lasswell, 1956). Although subsequently there have been a number of refinements made to Lasswell's stages, these still form the basis of many typologies of the policy process. With variations, the policy stages include agenda-setting, problem definition, policy formulation, decision-making, legitimation, policy adoption, implementation, evaluation, and termination or continuation (see e.g. Cairney, 2016: 17-18; Jann & Wegrich, 2007: 43; Sidney, 2007: 84; Weible et al., 2012: 3). Agenda-setting, which is the process of deciding which problems are to be given attention by government (and which not), involves problem recognition, issue selection and problem definition; while the policy formulation and decision-making phases involve identifying the objectives of the policy, considering alternative courses of action, and selecting the course of action that will maximise the attainment of the policy objectives (Béland, 2016: 230; Cairney, 2016: 16-17; Jann & Wegrich, 2007: 45-51; Sidney, 2007: 79; Stone, 2002: 8,233). The notion of a 'policy cycle' extends this linear notion to include a feedback loop to problem identification based on the outcomes of the evaluation phase (Weible, 2014: 7), which

indicates 'the continual perpetuation of the policy process' (Jann & Wegrich, 2007: 44). Normative guidelines on the advice formulation process often depict the policy process as a policy cycle.[12]

In the EBP conception, the policy process is conceived as an essentially rational exercise in which political actors conduct a comprehensive analysis of the problem, taking into account all relevant information as well as the costs and benefits (political, economic, social) associated with the various policy options (Jann & Wegrich, 2007: 44; Sidney, 2007: 79; Stone et al., 2001: 5; Sutton, 1999: 9). These actors then make 'calculated choices between clearly formulated alternatives' (Albæk, 1995: 81). The selection of one course of action over another is understood to be based ultimately on the maximisation of utility (Griggs, 2007: 174), or what Stone (2002: 234) refers to as 'maximum total welfare' – either for the individual or for the organisational entity which the decision-maker represents. This notion is one of the core assertions of rational choice theory in which individuals are viewed as actors with fixed preferences who act in an instrumental, calculated and strategic manner in order to maximise the attainment of their preferences, goals or interests (Aspinwall & Schneider, 2000: 10; Hall & Taylor, 1996: 12).

The rational model of the policy process presupposes a particular use of evidence or advice. Generally speaking, it aligns with the basic premise of positivist social science that there is a clear divide between facts and values or normative statements. As Albæk (1995: 80) observes, in rational policy-making policies are hypotheses 'of how means (i.e., given social programs) will lead to desired ends', and the process essentially 'resembles the classical scientific experiment: hypotheses – intervention – effect.' Here, knowledge is seen as neutral and apolitical and where 'decision-makers will be persuaded by the most accurate or scientifically plausible option' (Stone et al., 2001: 5). Habermas referred to this as the 'scientisation of politics' in which there is a clear divide between the partisan, ideological and value-laden expertise of political leaders and the 'objective', technical knowledge of scientists (Craft & Howlett, 2013: 191). In this conception, the way in which knowledge and advice is drawn upon in the policy process is fundamentally instrumental; that is, it is used directly to solve specific problems or make specific decisions. As Bulmer (1982: 42) described the instrumental use of research-for-policy in general: 'A problem exists; information or understanding is lacking either to generate a solution to the problem or to select among alternative solutions; research provides the missing knowledge; and a solution is reached.' These descriptions depict researchers and policy advisors as neutral actors, merely 'excavating' the facts and putting these into useable form for policy-makers in an objective and disinterested manner (Owens, 2011: 79). The

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[12] See e.g. EASAC (2012: 2), Government Office for Science (2010: 5-6), and Sarría-Santamera et al. (2011: 10).

more traditional notions of 'policy analysis' or 'policy science' reflect this conception. Lasswell, who worked to establish the field of policy sciences in the 1950s, regarded policy science as 'the production and application of knowledge of and in policy' (Hoppe, 1999: 201). Other authors have offered similar formulations. For instance, Dunn (2012: xvii) defines policy analysis as 'as an applied social science discipline that employs multiple methods of inquiry to solve practical problems'; Gill and Saunders (1992: 6-7) as 'a method for structuring information and providing opportunities for the development of alternative choices for the policymaker'; and Howlett et al. (2015: 163) as policy appraisal: 'providing information or advice to policymakers concerning the relative advantages and disadvantages of alternative policy choices.'

However, the traditional linear-rational model of the policy process has long been critiqued. Firstly, empirical research has shown that the policy process seldom happens in the neat, orderly and sequential manner that the linear model implies. For instance, in some cases, stages of the process interact out of step (e.g. implementation can affect agenda-setting and evaluation can be applied to all stages), occur in reverse order or are omitted altogether, while in other cases it is not possible to distinguish the stages at all (Jann & Wegrich, 2007: 53,55; Wilson, 2006: 152). As Jann and Wegrich (2007: 44) observe: 'policies are perpetually reformulated, implemented, evaluated, and adapted' and 'the stages are constantly meshed and entangled in an ongoing process.' In this regard, the so-called 'interactive model', developed by scholars such as Thomas and Grindle (1990), recognises that different actors can exert pressure and make inputs into the policy process at various stages, making the process interactive rather than linear.

Secondly, a number of theorists have questioned the attribution of rationality to decision-makers – what Griggs (2007: 177) refers to as 'overoptimistic heroic qualities' – and instead bring attention to the limits to rationality which, following Simon (1995), is now commonly referred to as 'bounded rationality'. Essentially, bounded rationality recognises both the cognitive limitations of decision-makers as well as the realities of the contexts within which they operate. For instance, it is often noted that it is simply not possible for decision-makers to take into account all relevant and available information or 'to consider all possible alternatives (an infinite number), and evaluate all the possible consequences of each' (Stone, 2002: 233). This is in part because there is seldom sufficient time, and in part because of the inherent complexities of policy problems which decision-makers might have trouble fully understanding (Cairney, 2016: 25; Gains & Stoker, 2011: 487). An obvious consequence of bounded rationality in this sense is that only some problems and solutions are considered while many others are not (Sidney, 2007: 80). Instead, more often than not, decisions are

made which 'satisfy and suffice' (or 'satisfice') even though these decisions might not be the 'best' choice (Albæk, 1995: 83; Griggs, 2007: 178; Stone, 2002: 233). As Stone et al. (2001: 5) put it: 'Decision-makers, accepting the limits of their situation, choose compromise policies that satisfy (rather than maximise) organisational goals, and which are acceptable in the face of competing demands.' Lindblom (1980) also recognised the limitations of rationality, particularly with regard to the tension between taking a fully rational approach to decision-making, on the one hand, and taking into account the costs and benefits in terms of time, energy and money, on the other. Lindblom introduced the notion of 'incrementalism', pointing to the inherent conservatism and pragmatism of policy-makers who, 'when confronted with the need to change policy, attempt to reduce uncertainty, conflict, and complexity by making incremental or marginal changes over time' (Grindle & Thomas, 1991: 28). In so doing, policy-makers are unlikely to turn to new evidence in order to avoid 'costly innovation or departures from routine practice' (Neilson, 2001: 18), or 'limit their search for evidence to politically feasible policy options' (Cairney, 2016: 19).

Other more political conceptions of the policy process have been described in which policy-making is far from rational. For instance, Kingdon's (2011) 'multiple streams' metaphor paints a picture of a somewhat chaotic and opportunistic push-and-pull of ideas and politics in how policy agenda-setting happens. Here, problem streams (which contain problem perceptions looking for solutions), policy streams (in which problem solutions are to be found), and political streams (e.g. changes in public sentiment or government regimes), flow independently of one another in the policy system until a 'policy window' opens where the three streams can intersect (Béland & Howlett, 2016: 222; Goodin et al., 2006: 22; Jann & Wegrich, 2007: 47; Porter & Hicks, 1995). Kingdon (1985: 165) defined a policy window as an 'opportunity for advocates of proposals to push their pet solutions, or to push attention to their special problems.' Policy decision-making has also been characterised by the so-called 'garbage can model' (see Cohen et al., 1972; March & Olsen, 1979). Here, unlike the rational models where calculated, optimum solutions are matched to policy problems, decisions are made 'as if decision-makers reach into a garbage can – drawing a problem with one hand and a solution with the other, and the two are joined together' (Stone et al., 2001: 10). Or, as Albæk (1995: 84) put it, the policy process is 'an anarchic meeting-place which allows actors, problems and solutions to come together, sometimes such that the final decision or end-result is one that was desired by no one.'

One of the critiques of the EBP approach is that it does not take account of the politics of policy-making, based as it is on the assumption of the policy process as rational design and 'what works',

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rather than as partisan and ideological and characterised by negotiation and conflict between competing interests (Parsons, 2002: 54). Policy agenda-setting, for instance, is characterised by (sometimes fierce) competition between political actors – be they in government or external interest groups – to gain policy-makers' attention on their policy problems. As Birkland (2007: 63) puts it, groups must 'fight to earn their issues' places among all the other issues sharing the limited space on the agenda.' Goodin et al. (2006: 23) go as far as to say that the 'largest constraint under which public policy operates … is the sheer selfishness of entrenched interests possessed of sufficient power to promote those interests.' As such, interests also talk to matters of power – its pursuit and maintenance, and its differential distribution. Boswell (2008: 473) thus argues that: 'Any account of how organizations use knowledge will inevitably be premised on a theory of organizations: a set of claims about the sources and nature of organizational interests, and how these translate into organizational action.'

Descriptions of the policy process in terms of 'policy communities' and 'policy network models' also give expression to the observation that policy-making takes place in the context of conflict-bargaining and coalition formation among groups of actors with different interests. These refer to groups of individuals or organisations, from both inside and outside of government, who 'share similar belief systems, codes of conduct and established patterns of behaviour' (Sutton, 1999: 12), and who are 'organized to protect or advance particular interests common to their members' (Grindle & Thomas, 1991: 22-23) with a view to 'shaping the direction and outcome of public policies' (Miller & Demir, 2007: 137).[13] The participants in such communities may include elected officials, bureaucrats, government agencies, interest groups, corporations, industry associations, academics, and researchers in think tanks (Miller & Demir, 2007: 137; Zahariadis, 2014: 33). Such descriptions counter the notion that the power of decision-making is concentrated in the hands of a few individuals, usually in the executive branch of government (Cairney, 2016: 6) and, as Miller and Demir (2007: 137) point out, 'direct attention away from formal institutional structures and toward the relations of power, political action, political conflict, and coalition-building as additional loci of meaningful activity.' Together, these depictions of policy-making draw attention to the role of interests in advice formulation, in relation to how evidence, advice and advisory bodies are drawn upon or deployed in the policy process, as well as in the interactions and dynamics within the institutional environment.

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[13] Various terms are used to describe formations which fall under the policy community umbrella, including policy networks, advocacy coalitions, issue networks and epistemic communities (see e.g. Miller & Demir, 2007; Stone et al., 2001; Weible & Sabatier, 2007).

The EBP approach also makes somewhat narrow assumptions about how scientific evidence enters into and shapes policy-making, and about the centrality and importance of such evidence in the process. In particular, it has been observed that scientific evidence is only one of a number of competing sources of information on which policy-makers in modern bureaucracies draw. Other information sources can include expert knowledge from inside and outside government and the science system; stakeholder consultation; the evaluation of previous policies; information brought to bear by interest groups, activists and other government agencies; as well as experiential and anecdotal evidence (Gornitzka, 2003: 134; Head, 2010: 80; Jann & Wegrich, 2007: 51; Siefken & Schulz, 2013: 3; Young, 2013: 7). As such, 'policy-makers can be confronted with volumes of diverse, competing, and conflicting "evidence"' (Young 2013: 7-8). Not only do policy-makers draw on different types of evidence but there are also other influences on the policy process beyond (if not in contradiction to) the 'best' available scientific evidence. These may include broader societal interests, prevailing ideologies and beliefs, organisational and societal values, political contexts, public opinion and election campaign commitments, the media, bureaucratic culture, the availability of resources, time constraints, and personal and historical experiences and alliances (Davies, 2012: R42; Davies, 2015; Elliott & Popay, 2000; Grindle & Thomas, 1991: 29; Head, 2010: 80; Young, 2011: 21; Young, 2013: 8). Thus, scientific expertise, evidence and advice compete with other legitimate voices in society in the policy process (Brown et al., 2005: 82; Head, 2010: 83). As Gornitzka (2003: 134) observes, 'scientific information in modern bureaucracies enters a crowded place, filled with people, goals, interests, information, and expertise … and there are competing claims to attention from practical experience and common-sense wisdom.' This has led some scholars to use the terms 'evidence-informed', 'evidence-influenced' or 'evidence-aware' policy-making, although the term 'evidence-based policy' is still quite widely employed (Young, 2013: 9).

A range of backgrounded, taken-for-granted ideas – such as those embedded in 'policy paradigms', 'cognitive frameworks' or 'policy discourses' – also enter into the fray and affect whether and how evidence and advice might be utilised. Hall (1990: 59) defines a policy paradigm as 'an overarching framework of ideas that structures policy making in a particular field.' The dominant paradigm defines what problems are to be addressed and which policy instruments are considered appropriate in solving them. Campbell (2002: 22) describes cognitive paradigms as containing 'taken-for-granted descriptions and theoretical analyses that specify cause and effect relationships, that reside in the background of policy debates and that limit the range of alternatives policy makers are likely to perceive as useful', and notes that existing paradigms serve to constrain policy choices even when these no longer provide 'the best policy guidance' and when other better-suited policy ideas

are available to choose from. Policy paradigms are linked to dominant policy discourses. As Andrews (1978, quoted in Hall, 1993: 279) observes, 'the deliberation of public policy takes place within a realm of discourse … policies are made within some system of ideas and standards which is comprehensible and plausible to the actors involved.' Here, language and ideas are considered to inform and influence the policy-making process by, for example, framing and delimiting policy problems and solutions, and emphasising some while marginalising others (Cairney & Heikkila, 2014: 379; Hall, 1993: 289; Stone et al., 2001: 12; Sutton, 1999: 13).

So what does all of this say about the way in which evidence and advice, and advisory bodies themselves, might be used in or influence the policy process, especially in light of the fact that it is seldom in the direct, instrumental manner as intended?

Evidence and advice can, of course, influence policy-makers' thinking. In defining policy problems and formulating policy solutions to address these, policy-makers and other actors engage in a process of meaning- or sense-making. The utilisation studies of the 1970s and 80s identified what they termed the 'conceptual' use of research. This refers to the way in which scientific knowledge can play a role in shifting or shaping how policy-makers think about and understand or conceptualise policy problems and solution alternatives, via the introduction of, for instance, new or adapted concepts, theories, hypotheses and language (Albæk, 1995: 85; Gornitzka, 2003: 139; Landry et al., 2001: 336). Weiss referred to this as the 'enlightenment' function of research, which she elaborated as follows (Weiss, 1982: 621):

> … research provides a background of data, empirical generalizations, and ideas that affect the way that policy makers think about problems. It influences their conceptualization of the issues with which they deal; affects those facets of the issue they consider inevitable and unchangeable and those they perceive as amenable to policy action; widens the range of options that they consider; and challenges some taken-for-granted assumptions about appropriate goals and appropriate activities.

Weiss (1980) used the notions of 'knowledge creep' and 'knowledge percolation' to describe the process through which concepts or findings arising from research filter into policy (and other) discourses. Knowledge creep implies a particular effect of knowledge on policy change whereby the 'consolidated evidence has a cumulative effect on the way policy makers make sense of the problems they face and transforms policy choices incrementally over time' (Daviter, 2015: 499). Some authors have observed that the conceptual influence of evidence and advice is possibly far more significant and lasting in its impact than instrumental use, although it can take very long periods to materialise (Amara et al., 2004: 98; Brans et al., 2010: 31; Cairney, 2016: 7; Glover, 1993: 9; Gornitzka, 2003: 139-140; Weiss, 1977a: 535). Thus, policy advice may translate scientific

evidence into stories or narratives which serve to simplify the science or make it more digestible for policy-makers (Gornitzka, 2003: 139; Sutton, 1999: 13; Weiss, 1991: 39). However, in a more political sense, evidence and advice can play an important and influential role either in giving credence to existing dominant discourses or, as Stone et al. (2001: 12) put it, 'in providing a foundation for "counter-discourses", alternative identities and sites of resistance.' An important aspect of this is framing; that is, the construction of images and narratives about, or ways of interpreting, the what, why and how of a policy problem and its solution (Sidney, 2007: 81). Such framing serves to depict the world in a particular way in attempts to push for one policy alternative over another, or to persuade or justify policy choices, or to make them more acceptable or legitimate (Majone, 1996: 620).

Evidence and advice can also be mobilised by government bodies and policy-makers towards particular ends (and not in the 'what works' sense of EBP) in political, symbolic or strategic ways. Going back to one of the rationales underpinning EBP and advice highlighted in section 2.2 above, drawing on evidence or advice (or at least appearing to) can be used as a tool for enhancing the legitimacy and credibility of the policy-making body and its decisions by making these appear more authoritative and rational (Boswell, 2008: 471; Cairney, 2016: 24; Oh & Rich, 1996: 6). In this regard, based on Weber's account of the ways in which bureaucratic organisations are dependent on expert knowledge, Boswell (2008: 472) points to two symbolic functions: a legitimising function where drawing on expert knowledge can bolster an organisation's 'claim to resources or jurisdiction over particular policy areas', and a substantiating function where expert knowledge lends 'authority to particular policy positions, helping to substantiate organizational preferences in cases of political contestation.'

Use may also function as a kind of rhetorical device in order to persuade others of the merit of particular policy choices; to undermine other perspectives or proposals; or to justify, delay or legitimise particular policy decisions (Brown et al., 2005: 81-82; Engels, 2005: 9; Gornitzka, 2003: 137-138; Heinrichs, 2005: 45; Landry et al., 2001; Majone, 1996: 620-621). In the political sense, Weiss (1979: 429) referred to the use of evidence as 'political ammunition': 'Partisans flourish the evidence in an attempt to neutralize opponents, convince waverers, and bolster supporters' (see also Albæk, 1995: 85; Boswell, 2008: 472; Fobé et al., 2013: 227; Weingart, 1999: 155). Young (2013: 10) also points to ways in which evidence may be used strategically by political actors to deflect blame: 'should the policy fail to achieve its intended goal(s), they will use the evidence to deflect responsibility for the choice of both policy direction and the mechanisms employed to achieve the

related goals – the standard argument being that those choices were directed (if not demanded) by "the evidence".' The political interests of policy-makers and other stakeholders can actually disincentivise the application of evidence, especially when the evidence runs counter to these interests (Weyrauch et al., 2016: 38). In these conceptions, the choice of which evidence to use on the part of policy-makers is itself selective and not neutral. As Brans et al. (2010: 32) observe, 'governments are perfectly capable of picking and choosing [and] "adopting" parts of the advice which are in agreement with their current policy rather than adapting their policy to meet to advice.'

Finally, policy-makers' receptiveness to new ideas in the form of evidence or advice depends on where they are in the policy process, the nature of the policy problem being addressed, and the extent to which the existing policy environment is open to changes in policy direction. For instance, it is easier for advice to influence policy-makers' thinking when they are in the early stages of considering a policy problem and their 'thinking it is still fluid' (Wilson, 2006: 156). Their openness to new ideas can also depend on whether they are dealing with old (familiar) or new (unfamiliar) problems: 'The less agencies have knowledge of and traditions in dealing with a policy area, the more they rely on outside information. In working with a stable and well-understood policy area there are few incentives to use new and external information' (Gornitzka, 2003: 146; see also Oh & Rich, 1996: 10-11). Some policy matters are simply not 'open to rethinking by decision-makers', despite the emergence of compelling new evidence, given that some policy areas 'are tightly defined by government priorities, electoral promises, and ideological preferences' (Head, 2010: 84). As such, the uptake of policy advice can be limited by the extent to which prior or existing policies, and the commitment of resources to existing programmes, influence or 'lock in' current policy choices and options (Cairney & Heikkila, 2014: 378; Jann & Wegrich, 2007: 56; Stone et al., 2001: 11). As Jann and Wegrich (2007:45) put it, 'new policies develop in a dense environment of already existing policies' such that 'other policies act as key obstacles for the adoption and implementation of a particular measure.' This echoes the notion of path dependency in the historical institutionalist sense, or what Spohr (2016: 258) charmingly calls 'institutional stickiness' where, to the extent that particular practices, approaches and ideas are already institutionalised, they become self-reinforcing. In this regard, Baumgartner (2013: 251-252) refers to the 'sticky nature of ideas' and how there is a built-in tendency towards maintaining the status quo.

By way of concluding this section then, it is worth returning to Kingdon's multiple streams framework which suggests that for a paradigm shift to happen, a window of opportunity must present itself. A window of opportunity can appear in the problem stream (i.e. policy issues that

require attention) when, for example, existing policy mechanisms or established institutions are shown to be problematic, or fail altogether; or in the politics stream, following a change of regime or a shift in the national mood on a particular issue (Spohr, 2016: 259). This creates an opening where new policy ideas, 'floating around' in the policy stream, can come into play. This is quite contrary to the notion that a good policy idea will be taken up because of its inherent value or because it is the 'sensible thing to do', as implied in the EBP rationale. Instead, it suggests that a range of conditions need to be present which political or other actors (such as advisory bodies) can exploit at the right time (Kettell & Cairney, 2010: 304; Lieberman, 2002: 709).

I now turn to a consideration of characteristics of the broader policy context which may have a bearing on the potential for advisory bodies to influence the policy process.

2.3.2 Features of the broader policy context

Governments and their ministerial bureaucracies have distinctive cultures and traditions of decision-making which impact on their attitudes towards the use of experts and policy advice, and these may change over time. At the systemic level, the extent to which policy-makers draw on evidence and advice in the policy process depends on the political climate and the government's attitude towards and commitment to EBP. For instance, some political regimes or political leaders may be more populist and anti-intellectual in orientation and therefore disinclined to promote or support EBP (and thus evidence-based policy advice) (Head, 2010: 81). By contrast, where a government has committed to EBP – even if only at the level of rhetoric – this will have the effect of exerting pressure on government bodies to incorporate scientific evidence and advice into their policy- and decision-making processes (Cairney, 2016: 5; Wills et al., 2016: 19).

At both the national and ministerial bureaucracy levels are routinised practices regarding what tasks are to be undertaken in policy formulation and decision-making, and how these tasks should be performed. This would include norms, formal and informal procedural rules, and possibly even incentives, relating to the information use and behaviour of policy-makers (Gornitzka, 2003: 147; Oh & Rich, 1996: 10-11). Such institutional practices and orientations are often historically-constituted and, in this, there is an element of path dependency in terms of the orientation to and capacity for drawing on policy advice of past governments and regimes (Gornitzka, 2003: 147; Lindquist & Tiernan, 2011: 443; Wills et al., 2016: 19). The ways in which, and the sources from which,

government bodies draw upon advice may also be paradigm-driven; in other words, the result of 'collectively shared and subgroup-specific value beliefs and basic orientations' (Heinrichs, 2005: 42), or 'where advisers and decision-makers share values and policy approaches' (Stone, 2001: 21). The same diversity of orientation towards evidence-based policy and advice may also be found in different policy subsystems, each of which 'constitutes unique processes and configurations of historical sociocultural, economic, institutional, and physical conditions' (Weible et al., 2012: 12).

Different modes of decision-making characteristic of different spheres of government are also seen to affect behaviour and practices around the use of evidence and advice. Here, one can distinguish between actors and agencies that operate in 'technical' versus 'political' modes of decision-making, where the former (e.g. government departments) are more likely to be open to the use of scientific information than the latter (e.g. ministries) for whom decision-making often requires negotiation, bargaining and compromise among diverse stakeholders, interests and opinions (Gornitzka, 2003: 147; Oh & Rich, 1996: 11,14; Sidney, 2007: 82). In a similar vein, Boswell (2008: 474) makes a distinction between two 'modes of settlement' in the context of competing policy proposals; namely, 'technocratic', 'when scientific evidence and analysis are accepted as legitimate criteria for adjudicating preferences', and 'democratic', which 'prevail in policy areas in which popular support is considered decisive [and] in which conflict revolves around differences of values or interests, rather than competing knowledge claims.' Boswell (ibid.: 473-474) unpacks this further by distinguishing between 'action organisations' and 'political organisations' – each of which derive their legitimacy in different ways and use expert knowledge or evidence in this regard. Thus, action organisations (e.g. administrative agencies) primarily derive their legitimacy from their outputs and are thus more likely to use knowledge instrumentally in order to 'improve the quality of their output' (ibid.: 474). By contrast, political organisations (e.g. government ministries), which derive their legitimacy through being seen to act on problems requiring action in line with the prevailing norms and values of the political regime, are more likely to use expert knowledge symbolically 'to signal their legitimacy' (ibid.).

Daviter (2015) points to the effects of policy (sub)systems that are characterised by high levels of fragmentation and contested political authority on the possibilities for knowledge use. He refers to the compartmentalisation of policy-making within administrative structures where '[c]omplex problems are factorized into more manageable tasks that are addressed separately in largely independent subsystems' (ibid.: 499). He notes that while this is a 'rational response to the complex and information-rich task environments of modern policy-making systems', it reduces the possibility

of knowledge transfer and organisational learning (ibid.: 499-500). Importantly, he adds, 'fragmented responsibilities and overlapping competences generate an influx of incompatible information and create pressure on existing decision-making structures to accommodate competing knowledge claims' (ibid.: 500).

Finally, there are issues relating to capacity and capabilities at system, organisational and individual levels. Eichbaum and Shaw (2007: 455) distinguish between capacity as 'the structural and organisational endowments within the public sector – both agency level and system wide' and capability as 'the deployment of that capacity in some manifest way.' Thus, with regard to the use of evidence and advice by government bodies responsible for policy-making, there may be a lack of capacity in terms of shortages of staff, as well as capabilities in terms of the requisite skills required to process and absorb policy advice and the evidence behind it, to keep abreast of research in their policy field, or to plan for future research needs (Davies, 2012: R43; Halliwell et al., 1999: 18; Howlett & Craft, 2013: 28; Stone et al., 2001: 22; Young, 2013: 11). As Brans et al. (2010: 34) note, it is often the case in modern bureaucracies that government ministers are appointed to portfolios with little experience or knowledge of the policy field. In this regard, empirical studies have shown that decision-makers' ability (or lack therefore) to process information and evidence is somewhat dependent on their existing stock of explicit and tacit knowledge, as well as their educational background and training (Gornitzka, 2003: 152; Heinrichs, 2005: 45; Newman et al., 2017). Gornitzka (2003: 153) describes this dimension as follows:

> The decision-maker will have an easier time finding, understanding and using knowledge emanating from the scholarly discipline within which he/she has passed years of formal training. The language and way of thinking of the scientific system will be familiar to the bureaucrat. … Second, the common educational background of the civil servants and scientists … not only makes the bureaucrats cognitively capable of using science. It may also be the basis for personal networks that have an impact on flows of information also in connection with bureaucratic decision-making.

2.3.3   Relationship of the advisory body to its government principal(s)

Some authors have approached the influence of policy advice from the perspective of the advisory source's proximity to its government principal(s) and the degree of government control. According to Craft and Howlett (2012: 81), following Halligan (1995), many 'existing conceptual models of policy advice systems associate different levels of influence with the location of advisors either inside or outside government.' Such approaches link back to the idea (section 2.3.1) that evidence-

based policy advice is only one of a number of sources of advice that policy- and decision-makers draw upon, as well as to the conception of the advisory system as comprising a demand side from within the policy process, a supply side (knowledge producers), and knowledge brokers (or advisory actors or bodies) who link the two (section 2.2.1). In so-called 'location models', proximity to the decision-makers is a primary factor for the degree of influence of the advice (Craft & Howlett, 2012: 82). In this conception, the knowledge brokers would be closest to the decision-makers and thus have the greatest influence. To location, Halligan added the component of government control which refers to 'the extent to which decision-makers could expect proffered advice to be more or less congruent with government aims and ambitions' (ibid.). The assumption here is that governments will have greater control over advisory sources within their own structures (e.g. departmental advisors or policy units), or those closely related (e.g. statutory bodies), than over those located outside of government (Howlett & Craft, 2013: 32). Craft and Howlett (2012: 83, original emphasis) add the dimension of 'content' to the locational model, arguing that models 'based only upon proximity measures of influence gloss over the equally important question of "influence over what?", that is, about the *content* of advice provided by different actors, which has become a much more significant element of advice in its own right in recent years as more and different actors have entered into advisory system membership.' In this regard, Howlett and Craft (2013: 35-36) make reference to content-based definitions of policy advice highlighted in section 2.2 above, specifically procedural versus substantive advice, and cold (long-term, proactive) and hot (short-term, crisis-driven) advice.

Related to the locational model is what Van Damme and Brans (2013: 7), in their comparative study of education councils in Europe, refer to as the level of 'embeddedness' of the advisory council within the policy-making process. This may be understood in the formal sense as the legal recognition of the advisory body and the requirement for the government to seek advice from the council, or in an informal sense through its social status. This embeddedness guarantees council participation in the policy process and at least some say over policy proposals. Stone (2002: 30) makes an interesting observation that the more a particular channel or source of information is used, the more the influence of that body is enhanced:

> Channels of influence and political connections … grow by being used. The more people work together and help each other, the more committed they become to each other and to their nominal goal. The more something is done – say, a regulatory agency consults with industry leaders on its proposals, or a school board negotiates with teachers on salaries – the more valuable the personal connections and organizational ties become, and the more people's expectations of 'doing things the way they have always been done' grow.

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This embeddedness or habitual dependence on certain sources of information or advice can lead to what Stone et al. (2001: 24) refer to as 'closed advice circuits', 'closed advisory loops' or 'group think' which occur 'because political leaders tend to rely on advice only from those that are known and trusted [and] develop in governments that have been in office for a long time.' These loops can be broken, for instance, by the instalment of a new government following elections which might draw on different sources of advice, or by 'changes in organisational culture' (ibid.).

While proximity to government may increase an advisory body's access to and influence in the policy sphere, it also has consequences for the independence of the body and its advice. The greater the government control (e.g. in terms of budget and agenda), the more the advisory body becomes a mere extension of the principal government department (Brans et al., 2010: 58) and the less the advisory source and its advice is perceived as independent (Prasser, 2006: 30).

The term 'independence' has two interrelated and overlapping connotations. This first has to do with the advisory body's autonomy which, following Chirwa (2014: 21), refers to the establishment of a council as a legal person, meaning 'it is deemed to have capacity to act, bear rights and duties, enforce its rights and incur liability.' As such, autonomy refers to the legal right for an advisory body to determine, for instance, its method of operations, its budget and utilisation of its funds, and the hiring of personnel (although in practice these may be decided upon in consultation with a principal). Chirwa (ibid.) also notes the importance of autonomy as the foundation for accountability:

> If an agent is not allowed to operate autonomously, it is impossible to hold it accountable because its failure may be directly attributed to its principal. Autonomy makes it possible for an institution to take its functions seriously and deploy its available specialised skills to the fulfilment of its legal mandate, knowing that it cannot pass the bulk of blame to any other entity.

Brans et al. (2010: 51-52) use the term 'discretionary power' in a similar sense as the 'level of discretion a council has to organize its structure and work' by, for example, adding members, changing member profiles, changing work methods, or setting its own agenda. The second aspect of independence refers to the ability of the advisory council to carry out its advisory mandate free from political interference or at arm's length from the political sphere. Proxy indicators of independence in this sense may include how council members and chairpersons are appointed (e.g. by a government principal, peer nomination or election, or advertisement and open application); whether the interests of specific councils members are mitigated by representation from different sectors; the extent to which the advisory council has the freedom to pursue its own policy problem agenda in addition to responding to requests from the minister; and whether the council is free to

disseminate its advice to audiences other than the government principals requesting it (Brans et al., 2010: 21,197; Glynn et al., 2003: 75-77). The founding legislation and/or terms of reference for advisory councils may set out the parameters of autonomy and independence to greater or lesser extents.

At the same time, as various authors have noted, advisory bodies do not, and should not, operate in a vacuum of independence. For instance, Chirwa (2014: 22) observes that the advisory function, which is closely interlinked with and has to take into account political context and policy-making demands and constraints, requires a level of 'cooperation, collaboration and interdependence' with the principal(s), rather than 'mistrust, detachment or antagonism', as might be the case with government agencies that have regulatory or adjudicative functions. Van Damme and Brans (2013) argue that an advisory body's independence from its principal(s) is as important as its dependence, 'because its stability is not derived from isolating itself but by being accountable and responsive to opposing, external authorities.' Advisory bodies are thus faced with finding a balance between '(scholarly and professional) independence on the one hand, and responsiveness to norms and requirements of the political process on the other' (Lentsch & Weingart, 2011: 355), as well as 'independence from the government whilst allowing for the inclusion and participation of government within the council' (Brans et al., 2010: 201). However, as Brans et al. (ibid.: 20) note, councils cannot 'simply be described as independent or not', suggesting that the degree of independence falls on a continuum depending on the particular configuration of the elements involved.

While the institutional framework for independence is important, so too is the *perception* of such independence. As Chirwa (2014: 21) put it: 'It requires not only that the decision-making body does not merely act independently in fact but also that he or she is seen to act as such. There can be no public confidence in an institution that is not seen to be acting independently.' The issue of the real and/or perceived independence of the advisory body is interrelated with another set of factors linked to the influence of the body and its advice, namely its perceived legitimacy and credibility, and these are discussed in the next section.

2.3.4   The (perceived) legitimacy and credibility of the advisory body

Some empirical studies have pointed to the perceived legitimacy and credibility of the advisory body, its advice formulation process and its advice outputs as having a bearing on the potential influence of the body on the policy-making process. As Scott et al. (2000: 237) observe: 'Organizations require more than material resources and technical information if they are to survive and thrive in their social environments. They also need social acceptability and credibility.' Suchman (1995: 574) defines legitimacy as 'a generalized perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs, and definitions.' From an institutional perspective, according to Scott (2001: 59), 'legitimacy is not a commodity to be possessed or exchanged but a condition reflecting perceived consonance with relevant rules and laws, normative support, or alignment with cultural-cognitive frameworks … a symbolic value to be displayed in such a manner such that it is visible to outsiders.' Legitimacy thus has both normative and (subjective) evaluative dimensions (Brans et al., 2010: 47).

The legitimacy and credibility of advisory bodies have been related to institutional features such their legal status, independence and membership, as well as the norms and procedures associated with the advice formulation process. Of course, the credibility of the advisory body is also judged by its outputs and the extent to which these are utilised. Despite this emphasis on legitimacy and credibility, these have not been explored in much depth in the literature and remain largely under-theorised. For instance, Brans et al. (2010), in their study of education advisory councils in Europe, differentiate between the input, throughput and output phases of the advisory process. However, the authors relate these to the contribution of the advisory process to policy legitimacy, and mostly hypothesise these elements rather than theorising about how they are connected. Nevertheless, these distinctions do provide a useful organising framework for investigating the dimensions of the legitimacy and credibility of the advisory process – although I have adapted the 'logic' of the framework to some extent for the purposes of this study.

With regard to the input phase, Brans et al. (ibid.: 49) point to the independence of the advisory body in terms of its discretionary power to administer its own budget and determine its methods of operation, which was discussed in section 2.3.3 above. A second dimension is the degree of administrative support the advisory body has in terms of its human and financial resources; in other words, does it have sufficient resources to carry out its mandate? The authors found that the education councils in their study that had sufficient funding also appeared to be better able to

develop their staff's expertise and institutional memory (ibid.: 194). A third dimension is the advisory body's legal status and the extent of its embeddedness in the policy-making process, which was referred to in section 2.3.3. This would include the extent to which the advisory body is recognised by the government and there is political commitment to the advisory body's work, as well as any 'legal requirements for consultation of the council and/or feedback by the government on the advice the council delivers' (ibid.: 49). Brans et al. (ibid.: 46) suggest that '[m]echanisms of information, coordination, feedback and involvement between the regular policy stream and the advisory stream can increase policy advice take-up.' In a study of nine advisory councils in Belgium, Fobé et al. (2013: 230) found that the reputation and legacy of these bodies played a role in their influence on policy-making; in particular, those with solid reputations and access to resources such as funding and technical assistance were more visible to, taken more seriously by, and accessed more by policy-makers. These authors also point to the length of existence of advisory councils whereby those that are long-established 'can rely on a strong and long standing reputation of providing sound advice for governments', while the more newly-created councils still have 'to establish and profile themselves as advisory bodies within their respective policy domains' (ibid.). This echoes Sabatier's (1978) observations about the importance of the prestige and credibility of the sources of technical information as influences on whether or not policy-makers are likely to use such information, and that these qualities are linked to the perceived legitimacy of the sources. As Sabatier (ibid.: 407) notes: 'Since decision makers cannot be expected to thoroughly understand highly technical issues, there is considerable evidence that they select sources in whom they have confidence because of the sources' perceived credibility and ability to view issues from the decision makers' point of view.'

A fourth aspect of the input phase of the advisory process is the composition of the advisory body membership and this has been picked up by other studies. There are pros and cons to whether the council is expert-based or stakeholder-representative. On the one hand, a more expert-based membership can bring greater credibility to the advice – but only if the credentials of the individual members are respected (Brans et al., 2010: 50) and if the government itself is supportive of or promotes EBP (section 2.2 above). On the other hand, a more stakeholder-representative composition of the advisory council can have positive effects on the ultimate uptake of advice, the argument being that inputs from multiple backgrounds, perspectives and experience make for the formulation of better advice (Brown et al., 2005: 84; Siefken & Schulz, 2015: 16; Van Damme & Brans, 2013). Furthermore, broader representation might give the advice greater credibility and weight – and thus acceptance and utilisation – since it is more likely to be perceived as being responsive to the needs and interests of the relevant societal groups (Brown et al. 2005: 84-85; Fobé

et al. 2013: 230; Siefken & Schulz 2015: 16; Van Damme & Brans 2013). In this regard, Siefken and Schulz (2015: 16) describe advisory bodies as serving as 'a forum for (pre-) negotiation among political actors, much like an incubator to sort out similarities and differences of positions and maybe even to reconcile them partially.' Brans et al. (2010: 196) found that councils with high membership diversity based on a representative structure had greater levels of social embedding and therefore it was 'more difficult for government to undermine without threatening core interest groups.' However, a representative-based council membership might slow down the process of advice formulation owing to the need to consult their respective organisations and constituencies, which may have an adverse effect in terms of the timing of advice provision (Van Damme & Brans, 2013: 6). Either way, arguably, an advisory body is likely to be more effective if its members can bring both analytic and local knowledge of the policy subsystem to which they refer, as well as to other related subsystems and the macro system within which they operate (cf. Weible et al., 2012: 12).

The throughput phase refers to the advice formulation process itself. Once again, the independence of the advisory body is important, specifically the extent to which the advice is formulated at arm's length from political interference. Another aspect that Brans et al. highlight has to do with the nature and intensity of the interactions internally between council members, as well as the extent to which the advice formulation process involves engagement with or participation by relevant government principals and key external stakeholders. They hypothesise that the intensity and inclusiveness of interactions can lead to advice that is considered to be more robust and legitimate, and hence is more easily accepted (ibid.: 48). Brans et al. also point to the way in which the decision-making around the advice is undertaken, focusing particularly on whether it is based on consensus and/or includes minority opinions. They hypothesise that consensus-based decision-making could either give the advice more weight (especially when the composition of the council is more representative-based) or dilute it since it has to take all perspectives and opinions into account – although their findings suggested that the inclusion of minority opinions could also weaken the advice, 'making it possibly easier for decision-makers to ignore it' (ibid.: 201).

A key aspect of the advice formulation process which some studies have picked up on, and which is emphasised in various government and agency guidelines on advice formulation, is the transparency of the process. In this regard, the guidelines of the European Academies Science Advisory Council distinguish between 'openness' and 'transparency' (EASAC, 2012: 7):

> Openness means that the advisory process has actively taken account of all the relevant evidence and has been seen to do so. This might entail, for example, an open and public call for evidence and a

willingness to listen to a wide range of different views on a particular topic. Transparency means that the working practices of preparing advice for dialogue are clear and that any private interests of the participants are declared.

Bal et al. (2004: 1340) distinguish between 'procedural' and 'substantive' transparency. Procedural transparency refers to the general procedures of the advisory body's work, which includes 'the organisation of the advisory process and the membership of advisory committees.' Substantive transparency allows outsiders to see how the advisory body reached its conclusions (e.g. by making visible how the scientific evidence was evaluated and how the evidence-based argument was constructed) as well as who was involved (ibid.; see also EASAC, 2012: 7).

In light of the above, guidelines point to the need for making the advisory reports, minutes of meetings, the evidence used to inform the advice and accounts of the non-use of advice available in the public domain (e.g. on their websites) and/or disseminated to specific target or interest groups and even the media (Bal et al., 2004: 1339; Government Office for Science, 2011: 27-28; Sarría-Santamera et al., 2011: 20). More specifically, guidelines may require considerable transparency in terms of how the advice was formulated. For instance, the guidelines for the UK's scientific advisory committees state that the final advice 'should explain the reasoning on which the advice is based; make clear what principles, if any, of risk management are being applied, include assumptions underlying the advice and identify the nature and extent of any uncertainty' (Government Office for Science, 2011: 26). Similarly, the guidelines for policy advice in the European health policy context require that advice outputs specify the data and sources of data used; record and explain 'all assumptions made and methods used in interpreting and synthesizing the data'; and indicate where and how expert judgement was applied (Sarría-Santamera et al., 2011: 15-16). The guidelines of the Australian National Audit Office (ANAO, 2001: 3) require that advisory councils report on 'the impact of limitations on information to ensure that decision-makers can accurately assess the risks associated with making a decision on the level of information provided', and that they identify the sources of information drawn upon in formulating their advice – for the general information of the ministers but also so that others can contest the information and its use. In addition to making its reports public, the Health Council of the Netherlands may also be 'asked to disclose information on the committee members as well as on the committee process' (Bal et al., 2004: 1339). In this regard, Bal et al. (ibid.) note: 'In reaction to this requirement, the council has developed various measures to maintain a sharp distinction between what is displayed to the public and what is kept concealed – for example, by having summaries of minutes for public display while keeping the full minutes out of public scrutiny.' They also note that the deliberations that take place within the council are not transparent because the council needs to be seen to 'speak with one voice' and also to 'minimise the

politicisation of the council's work' (ibid.: 1340). In this regard, the authors (ibid.) make the argument that: 'Limiting procedural transparency enables the council to provide substantive transparency. Concealing information from public scrutiny is thus not contradictory to the democratic function of the council but rather a necessary condition.'

In summary, from the point of view of accountability (legal, public and evidentiary), there can be demands for transparency and openness of the advice formulation process, the sources of evidence drawn upon and the substance of the advice given. At the same time, the formulation and provision of advice takes place in a political context in which deliberations and decision-making are not always made visible to outsiders.

For the output phase of the advisory process, Brans et al. (2010: 53-54) hypothesise that variables would include to whom the advice outputs are disseminated (e.g. government, media or parliament); whether they are tailored or customised for the target audience; whether the information is made available in the public domain (transparency); the quality of the advice (innovativeness, whether it is watered down, the evidence base); and the extent of the uptake or utilisation of the advice. Various authors have identified factors that impact on the potential for the uptake of policy advice that have to do with the nature of the policy advice itself. These include technical factors such as: the timeliness of advice provision – especially given that while policy-makers are often pressured into making decisions within a period of weeks or months, research can take months if not years to complete; the feasibility (e.g. in terms of resources available to implement or political support) of the policy options or recommendations presented by the advice; the extent to which the policy advice output is clearly expressed and easy for policy-makers to understand; and the degree of consensus or conflict among experts about the evidence underpinning the advice and perceptions of its quality, as well as the extent of the support for the content of the advice – by other experts and more broadly among other key stakeholders (Davies, 2012; Fobé et al., 2013; Jann & Wegrich, 2007; Mulgan, 2013; Oliver et al., 2014; Sabatier, 1978: 407; Wilson, 2006). Interestingly, Spohr (2016: 258) notes that what are generally taken to be policy-related factors may also have institutional dimensions. He gives as examples technical feasibility, which 'involves compatibility with existing structures' for a policy alternative to be implementable, and value acceptability, which is interpreted by policy-makers through a shared (institutionally-shaped) understanding of equity. Brans et al. refer to the 'innovativeness' of the advice as a criteria for assessing its quality. They ask questions such as: 'Have specific problem perceptions been brought to the fore that would otherwise have been overlooked? Has a new, more integrated

problem definition been developed? Has a new direction for possible solution been explored? Have flaws in proposed policy been identified?' (Brans et al., 2010: 30). However, they note that advice also needs to be 'within the scope of the intended policy and of those actors responsible for setting up the policy', and thus that advice 'has to be creative as well as useful in order to have policy impact' (ibid.).

Finally, an indicator of an advisory body's legitimacy and credibility is the extent of the utilisation of its advice. Different types of use have been highlighted in earlier sections, including instrumental, conceptual, political, strategic and symbolic use. While this study does explore the extent of uptake of advice in the mini case study of one of NACI's advisory initiatives (Chapter 6), identifying or measuring uptake is a notoriously difficult undertaking and some of the methodological challenges in this regard are highlighted in Chapter 3.

2.4   Conclusion

The literature reviewed has pointed to a range of factors associated with the influence of advisory bodies and their advice, ranging from how policy-making happens and the ways in which evidence and advice enter into and may be utilised, to features of the broader policy context, the relationship between the advisory body and its government principal(s), and the perceived legitimacy and credibility of the advisory body, its advisory process and advice outputs. Broadly speaking, these can be grouped into policy-related and institutional factors, although in many ways these are interrelated. While all of these broad dimensions are of relevance to this study, it is not possible or indeed necessary to include all of the aspects covered. Thus, by way of concluding this chapter, I distil from the discussion specific features that constitute the 'conceptual framework' for my analyses (see Table 2.1 below) which, in turn, create a bridge to the next chapter in which I outline the research design and methodology of my empirical work.

Table 2.1: Core elements of the conceptual framework for this study

The broader context within which NACI operates

- Historical antecedents to the establishment of NACI with a specific focus on the governance and policy advice arrangements for STI during the apartheid era, and how these have shaped the current context
- The STI policy sector (NSI) post-1994:
  - Governance arrangements; policies and policy imperatives; actors, institutions and networks involved in policy development and implementation
  - Degree of complexity of the policy issues and the governance and institutional arrangements; linkages and coordination
  - Degree of politicisation of STI policy and the interests at stake in the NSI
  - Institutional arrangements for and sources of policy advice in the STI system
- The nature and culture of policy-making at the central government and STI policy sector levels, and specifically within the Ministry and Department of S&T:
  - New public management practices (e.g. performance monitoring and evaluation, strategic planning)
  - Practice of EBP and drawing on policy advice; consultative process involving external stakeholders
  - Norms, formal and informal procedural rules, incentives and practices relating to the ways in which evidence and advice are incorporated into the policy process
  - Vertical and horizontal interactions and linkages in government and the sector

The institutional and organisational design of NACI

- Why and how NACI was established (motivations, intentions); extent to which NACI's institutional design was a departure from or a reflection of previous institutional arrangements for policy advice
- Legal status and institutional framework (e.g. advisory mandate; council membership appointment, composition and tasks; resourcing and administrative support; accountability and autonomy)
- Organisational and advisory structure, financial resources, administrative infrastructure, capacity and expertise
- Formal and informal norms and procedures relating to the formulation of advice (e.g. evidence-based, consultative, finalisation and communication of advice, transparency of operations and outputs)
- How NACI has interpreted its official mandate and political and institutional environments; why and how it has made adjustments in this regard; disjunctures between the legal/formal institutional framework and what actually happens in practice

The relationship and interaction between NACI, its parent body and the STI policy sphere

- Mechanisms for interaction and feedback between the policy and advisory streams
- Proximity of NACI to the Minister and DST, and degree of control over NACI (e.g. discretionary powers with regard to budget, operations and agenda; accountability; arm's length from political interference)
- Embeddedness of NACI in the policy-making process; how institutionalised NACI is in the policy process of the Minister and DST (e.g. legal recognition, nature and degree of interaction)
- Nature and extent of NACI's interaction with other key actors in the STI policy sphere
- Effects and unintended consequences of NACI's institutional design and the interaction of this with its broader context – perceptions of NACI's independence, legitimacy, credibility and effectiveness
- Nature and extent of the uptake of NACI's advice

CHAPTER 3: RESEARCH DESIGN AND METHODOLOGY

3.1   Introduction

The aim of this study was to gain a deeper understanding of how the nature of NACI's institutional and organisational design, the political and policy context within which it operates, and the interaction between them, impact on the outcomes of its advice and facilitate or constrain its influence on the policy process. The study asks questions such as: From a legislative point of view, what is NACI mandated to do and how is it expected to function? What are the structural and institutional arrangements for carrying out its advisory work, and how and why have these changed over time? How does it go about formulating advice and what forms do its advisory outputs take? What is the nature of its relationship with and how does it interact with the Minister of S&T, the DST and other key stakeholders in the system? What is the nature of policy-making in the STI policy domain? How has the advice provided by NACI been used in or influenced the decision- and policy-making of the Minister of S&T? What factors have come into play which have impacted on NACI's real or potential influence on the policy-making of the Minister of S&T and, more broadly, STI policy in the country?

In this chapter I outline how I set out to address these questions and the rationale underpinning the particular approach adopted. As such, the chapter describes the qualitative case study design, including its embedded nature and different levels of analysis; the delimiting of the cases; how the difficulties encountered in accessing certain data sources affected the original research design; and the strategies I have employed to optimise the quality of the research. I then outline the methods and sources of data collection and consider the evidentiary value of each. The chapter concludes with a description of the analysis, interpretation and final reporting of the data. It should be noted that the collection, organisation, analysis and writing up of the data for this study was an ongoing and iterative process throughout the course of the study, and were interwoven with the development and refinement of the conceptual framework. Thus, while these dimensions of the research process are discussed in separate sections below, in reality they proceeded in a much messier manner than is described here.

3.2   The qualitative case study design

Over the past decade, there has been a surge of empirical studies focusing on statutory advisory bodies. By way of providing examples of the types of research design and methods employed in such studies, I provide a brief overview of four recent studies which have a similar purview to the current one.

Firstly, Brans et al. (2010) conducted a study of semi-permanent education advisory councils in Europe via desk research, questionnaires, and in-depth case studies of five of these (in the Netherlands, Portugal, Greece, Belgium and Estonia). Primarily a descriptive study with some explanatory elements, the researchers explored the political contexts within which the councils were operating, their institutional design (e.g. legal basis, council membership, internal organisation, autonomy and funding), and the influence of the institutional arrangements on the advice outputs and the utilisation of the advice. They also considered which principals were the recipients of the councils' advice as well as the ways in which these bodies functioned as boundary organisations. Secondly, Fleischer's (2012) study focused on a comparative analysis of policy advice and institutional politics in Germany and Britain, with a specific focus on how the advisory arrangements influence government policy-making. The study relied primarily on in-depth case studies, incorporating the specific method of process-tracing, and included extensive desk research on the organisational structure of the advisory bodies (specifically their durability, internal affiliation, size, fragmentation and expertness), as well as interviews based on semi-structured questionnaires with members of the advisory councils and representatives from their government principals. Thirdly, Fobé et al. (2013) investigated member satisfaction of advice production and use across nine strategic advisory councils in Flanders, Belgium. Using a combination of documentary analysis and a survey, the study investigated the following aspects of the advisory councils: the defining characteristics on the input side of the councils including legal frameworks, tasks, age of the organisations, membership characteristics and legacy; the input and process-related aspects including the time for and timeliness of the advice, the transparency and facilitation of and the involvement of council members in the advisory process; and an assessment of the extent to which the advice provided was used in the policy-making process. Finally, Ptackova (2013) undertook a study of the Czech government's advisory councils and committees. She based her investigation on the legal frameworks and formal rules and procedures relating to these bodies, interwoven with institutional and discursive analyses relating to the form of governance, the policy process and the relationships between the government, the bureaucracy and the public.

As can be seen from the sample of studies above, which reflect the general approach to studies of this kind in the broader empirical literature, much of the research into the functions of advisory bodies and the uses of policy advice is often descriptive in nature, based on in-depth single or comparative case studies and, in some cases, surveys. In their recent review of the literature on EBP and advice, Oliver et al. (2014: 4) found that only a limited number of studies have used other methods such as ethnographic approaches or participant observation.

This study adopts a qualitative case study design. Yin (2003: 13) defines a case study, in its broadest sense, as 'an empirical inquiry that investigates a contemporary phenomenon within its real-life context.' Case studies are in-depth investigations of particular cases or phenomena which seek to provide 'an analysis of the context and processes involved in the phenomenon under study' (Meyer, 2001: 329) and which intend 'to capture the complexity of the object of study' (Hyett et al., 2014). As Stake (1994: 238) notes: 'Case researchers seek out both what is common and what is particular about the case, but the end result regularly presents something unique.' In exploring how the case is unique, one can consider the nature of the case, its historical background, the physical setting, other contexts (e.g. economic, political), and 'those informants through whom the case can be known' (ibid.).

I elected to employ a qualitative case study approach for two main reasons. The first is because case studies are, in my view, best-equipped to deal with the study of phenomena that are characterised by complexity in terms of a multiplicity of actors, institutional arrangements and processes, and where context matters. The terrain in which policy advice is formulated and expected to be utilised, as described in Chapter 2, reflects complexity of this kind. Stake (1994: 239) articulates the motivation for choosing a holistic, qualitative approach to deal with complexity as follows:

> With its own unique history, the case is a complex entity operating within a number of contexts, including the physical, economic, ethical, and aesthetic. The case is singular, but it has subsections … a concatenation of domains – many so complex that at best they can only be sampled. Holistic case study calls for the examination of these complexities. … much qualitative research is based on a holistic view that social phenomena, human dilemmas, and the nature of cases are situational and influenced by happenings of many kinds. … Most [qualitative researchers] find the search for cause of little use, dramatizing, rather, the coincidence of events, seeing some events purposive, some situational, many of them interrelated. They favor inquiry designs seeking data describing diverse operations of the case.

The second reason for choosing a case study approach – as with any type of research design – is based on the nature of the research questions being asked. Conventionally, case studies are best used when answering exploratory or descriptive questions (what is happening or has happened?) or

explanatory question (how or why did something happen?) (Meyer, 2001: 330; Yin, 2012: 5). The main research questions of this study are essentially 'how' and 'why' questions: How does NACI formulate its advice? How does this advice, and NACI as an advisory body, influence the policy process? Why is the advice used or not used? What explanations might there be for NACI's influence (or not) on the policy process overseen by the Minister for S&T?

3.2.1 The institutional case and its embedded subcase

A case is usually a 'bounded entity' such as a group, organisation, event, process, role or other social phenomenon, and forms the unit of analysis for a study (Babbie & Mouton, 2001: 281; Yin, 2012: 6). Identifying the case as a unit of analysis presents a number of challenges – not least because of the blurring of boundaries between, for instance, the contextual and organisational features on the one hand, and the nature of the phenomenon under investigation on the other (Yin, 2003: 13). Stake (1994) distinguishes between 'intrinsic' and 'instrumental' case studies in an attempt to make sense of and delineate the shifting sands between the case and its context and interrelationships. An intrinsic study 'is undertaken because one wants better understanding of this particular case' and not because it necessarily represents other such cases (ibid.: 237); in other words, it is of interest in and of itself. By contrast, instrumental case studies aim 'to provide insight into an issue or refinement of theory' and the selected case therefore 'plays a supportive role, facilitating our understanding of something else' (ibid.). In this study, the focus is on the phenomenon of the provision and influence of advice in the policy process. This is investigated through the lens of a particular organisation (NACI), comprising actors, structures and practices, within a particular context (the STI policy sector in post-apartheid South Africa). To this extent, my study contains an intrinsic element insofar as there is interest in the specific case (NACI), but it is also instrumental because it is using a specific case in order to understand a particular phenomenon (the provision and influence of advice).

The primary case study is of NACI. The reason for selecting NACI as the case was threefold. Firstly, it was one of only a few statutory advisory bodies in South Africa at the time the study began (2015). Secondly, STI is the primary focus of the centre of excellence (SciSTIP) at Stellenbosch University at which my PhD was registered. Thirdly, the focus on the research- and science-policy interface and evidence-based policy in various policy sectors within the South African context has been gaining

attention over the past two decades.[14] But, while empirical work on policy advice and advisory bodies has been growing internationally, it is only an emergent field in the South African context. There have been a few descriptive overviews of scientific or evidence-based advice in the country (see Grobbelaar, 2008; Netshiluvhi, 2015; Pistorius, 2008). The case study of the CHE I conducted as part of HERANA Phase 2 (mentioned in Chapter 1) focused on its roles and functions but not on the influence of its advice or as an advisory body *per se*. At the time of writing, a PhD candidate at SciSTIP was investigating African academies of science as health science advisers and one of the cases was the Academy of Science of South Africa (ASSAf). However, aside from internal and external reviews of NACI itself, as well as broader reviews of STI in South Africa, I was not aware of any academic study that had been undertaken on NACI. Thus, in addition to an intrinsic interest in NACI as a case, this study aims to fill the gap in knowledge of the workings of advisory bodies in the country.

At the centre of the institutional case study is a focus on the main institutional features of NACI – its official legislative mandate, its organisational design (structure, composition, resourcing, functions and operations), and how it goes about formulating and communicating advice. The institutional case study is put in historical context in terms of antecedents and changes over time. It is also located within aspects of the broader political and policy environment, with a specific focus on the Minister of S&T and the DST. Although NACI was established in 1997, the timeframe of the study extends a bit further back in time to the apartheid years as I have explored the genesis and origins of NACI's establishment, as well as the policy and institutional arrangements and developments that preceded it. Originally, I had set the cut-off point for the institutional case study as 2014 since this is when the term of the third NACI Council came to an end, thus coinciding with the start of my study. Council terms are a useful criterion for a cut-off point since there appears to be a kind of 'boundedness' to the work of NACI in terms of new projects and directions being initiated and others ended with each change of council. However, as will be seen, the data and discussions in the thesis flow beyond 2014, primarily because the study itself spanned almost five years during which time there were certain developments that I felt were too pertinent not to mention.

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[14] For example, in the health policy sector (Dilger, 2001; Gilson & McIntyre, 2008; Moynihan, 2004; Naude et al., 2015); in economic policy and poverty alleviation (Ayuk & Marouani, 2007; Bailey, 2005b; Du Toit, 2012; Marais & Matebesi, 2013); in agriculture (Sukume & Hungwe, 2001); in arts and culture (Deacon, 2009); in education (Jansen, 2003; Kulati, 2005); in the environmental sphere (Funke et al., 2009; Shaxson et al., 2016; Von der Heyden et al., 2016); relating to skills planning (Ranchod, 2016); and at the national government level (Choge et al., 2014; Dayal, 2016; Paine Cronin & Sadan, 2015).

In order to gain deeper insights into how NACI's institutional design manifests in practice, I elected to look at specific advisory initiatives. My original intention had been to undertake two such 'mini' case studies for the purposes of comparison (e.g. in terms of different policy issues, histories, roleplayers, processes and outcomes). However, owing to challenges in accessing the necessary documents and interviews (see section 3.2.2 below), I ultimately focused on only one advisory initiative – namely, that relating to women and SET – for which sufficient data were available. In terms of design, I have thus followed what Yin (2012: 7) refers to as an 'embedded subcase'; that is, the mini case study is 'nested' within the institutional case. In the mini case study, I also wanted to explore the nature and extent of advice use or uptake. I did not have great ambitions about this component owing to the now well-documented challenges with empirically investigating the use of evidence or advice in the policy process. These include, among others, disentangling the advice from other forms and sources of input (not least because policy-makers themselves would find it difficult to identify which sources of advice and information played what role in their decision-making process), and the fact that accounts by policy-makers about the manner and extent of use are not the same as evidence of actual use or impact on policy (Gornitzka, 2003: 134; John, 2003: 487; Oliver et al., 2014: 6; Van Damme & Brans, 2013). Furthermore, in trying to identify the effects of policy advice, Owens (2011: 82) observes that 'there is a risk, on the one hand, of false positives – crediting advisers with changes that might well have happened anyway – and, on the other, of overlooking significant impacts because the line of influence has been indirect or obscure.' Another challenge is that the policy decision-making process itself is not completely (if at all) transparent. During the time I was preparing my PhD proposal, I had a conversation with a former CEO of the CHE who warned me that attempting to discover how policy-makers used advice would be virtually impossible because of the 'black box of decision-making', and that it was highly unlikely that anyone involved in the decision-making would be willing to talk to me about the choices and decisions taken because (and I paraphrase) of the potential political backlash. The way I approached the analysis of this component of the mini case study is described in section 3.4 below.

The selection of the advisory initiative for the mini case study was informed by both documentary sources as well as on the basis of suggestions made by key informants. There was a high degree of consensus among sources consulted that the work undertaken by the South African Reference Group on Women in Science and Technology (SARG), which later became the Science, Engineering and Technology for Women (SET4W) committee, had been one of the most successful of NACI's

advisory initiatives (the other was the work of the National Biotechnology Advisory Committee).[15] I believed it important to select a case perceived as 'successful' on the assumption that it would be more likely to generate sufficient data (compared to a less successful or failed initiative). Furthermore, SET4W had a finite existence (2003-2012) and could thus be studied as a 'complete(d)' entity, and allow time to identify influence (or otherwise) beyond the life of the initiative itself. Thus, in terms of seeking out evidence of uptake of the advice, the mini case study extends to the time of writing.

It should be noted with regard to the mini case study that during my time as a senior researcher at CREST (2002-2004), I was involved in a few studies commissioned by the DST and NACI that would inform the work of the SET4W committee. I was appointed as project manager of the DST-commissioned project on women's participation in SET and, with the Director of CREST, interacted directly with the DST-appointed official overseeing the project and the SET4W committee. The advantage of this involvement is that I have first-hand experience of and some insight into how the research was produced and the involvement of the DST and the SET4W committee in this regard, as well as how the DST in particular interacted with the research. A potential disadvantage is my own biases, especially since I had a few negative experiences, especially in relation to dealing with the DST and their involvement in how we constructed the narrative of the evidence.

Both the institutional and mini case studies are located within a broader political and policy context, and all of these are viewed over time. Pettigrew (1985: 64) refers to this as vertical (multi-level) analysis and horizontal (processual) analysis:

> The vertical level refers to the interdependencies between higher or lower levels of analysis upon phenomenon to be explained at some further level, for example, the impact of a changing socio-economic context on features of intraorganizational context and interest group behavior. The horizontal level refers to the sequential interconnectedness between phenomena in historical, present, and future time.

Pettigrew (ibid.) goes on to say that in this approach to analysis, 'the contextual variables and categories in the vertical analysis are linked to the processes under observation in the horizontal

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[15] For instance, a key informant commented: 'I think probably the most successful group of studies you might consider looking at is perhaps the work done by the SET4W group. I think they were really an active and a stimulating reference group and they did nice work.' In addition, a former head of the NACI Secretariat, during a visit to NACI in 2016, consulted on my behalf with other NACI staff members to garner their opinions on which the most successful of the advisory initiatives had been and they too recommended SET4W. In terms of documentary sources, the 2008 external review of NACI reported that while NACI and its work were largely invisible in the broader system, this view had 'its counterpoint in the very positive attitude to the SET4W work, which was characterised by early publication and the resultant lively debate around it' (Havenstein et al., 2008: 5).

analysis.' The case study design is encapsulated in Figure 3.1 below. The cross-cutting and substantive focus of each of the three levels – context, institutional case study and mini case study – are outlined in the empirical framework in the conclusion to Chapter 2 (section 2.4).

Figure 3.1: Dimensions of the embedded case study design
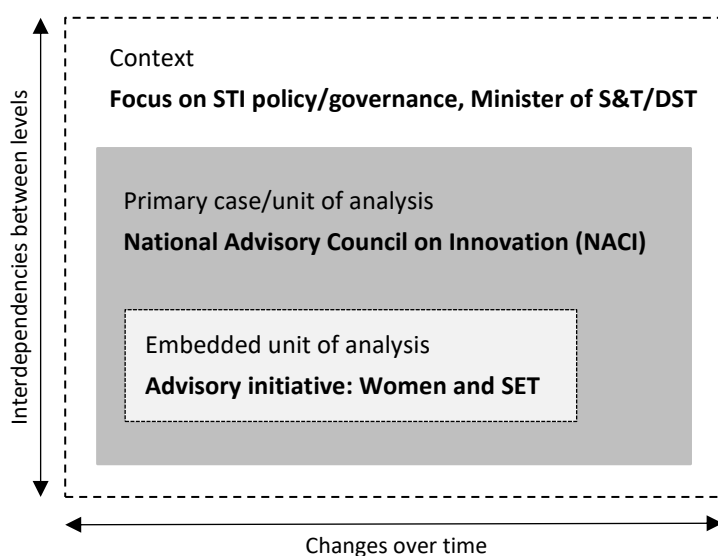
3.2.2   The effects of a lack of access to certain data sources

The data for this study was drawn from documentary sources and interviews with key informants (see section 3.3 below). As alluded to above, I confronted obstacles to gaining access to certain documents and people that I deemed important to include. My first port of call for sourcing the documents I required was the NACI website where I was able to download the full set of NACI annual reports and the corporate business plans (up until 2011). I also went through the publications section of the website looking for the various research reports and advice outputs mentioned in the annual reports relating to the two advisory initiatives. I discovered that the archive of publications was very incomplete – only a portion of the documents mentioned in the annual reports were listed under publications on the website; even fewer were attached as pdfs (none for the biotechnology advisory initiative); and some links to pdfs linked to the wrong reports. I emailed a NACI Secretariat staff member to request the outstanding documents but the individual was only able to find one report. At this point, it seemed that the main issue was a lack of capacity and some disorganisation within NACI in terms of maintaining a document repository. I thus conducted a general internet search which yielded some results, and approached the researchers behind the research reports I

still could not access to see if they could send me a copy.[16] I also put in a formal request to the NACI Acting CEO and NACI Chair for access to documents and permission to interview (current) NACI Council members and the Acting CEO. I was informed that my request had been discussed at an Executive Committee meeting and that a decision had been reached that I needed to approach the DST in this regard. I thus drafted a letter to the DG in which I provided an overview of the study and the research questions, requesting assistance from someone in NACI to access outstanding documents, and permission to interview NACI and DST officials and the DG himself. I received no reply to this email, nor to the follow-up email I sent a few weeks later. The following year I sent a second email request to the DG and was again met with a wall of silence.

These challenges of incomplete document archives and the obstacles presented by gatekeepers are not uncommon. In this specific case, the lack of access narrowed the scope of the study in two important ways. Firstly, the fact that I was unable to interview DST officials – and especially the DG – means that this perspective is largely absent in the analysis. I was much less concerned about not being able to interview current NACI staff since I had been able to conduct interviews with former NACI Chairs (the last leaving this position at the end of 2018), the first Head of the Secretariat, and some former Council members. I did, however, manage to secure an interview with a senior DST official who had recently left his post. Secondly, the lack of access to documents – and particularly the research reports and advice outputs associated with the advisory initiatives I wished to investigate – resulted in my doing only one of the intended mini case studies,[17] and limiting the analysis of the remaining advisory initiative to some extent. Fortunately, based on the data I *did* have, there was a core thread of research and advice that was sufficiently visible for me to demonstrate the movement of (at least overarching) ideas from research to advice, and to look for any evidence of uptake in the policies, strategies and initiatives of the DST.

Importantly, aside from the limiting effects on the scope of the study, it became apparent over time that the challenges I faced in gaining access, and the dynamics around this, was *data in and of itself*. In particular, it talks to key issues relating to the factors that impact on the influence of NACI and its advice, such as NACI's organisational capacity, its lack of independence and autonomy vis-à-vis the

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[16] My request to one researcher, and the subsequent email interaction, revealed some interesting insights into NACI/DST's policy on intellectual property and copyright, prohibiting some research reports from being made publicly available (see Chapter 7).

[17] I decided to drop the biotechnology mini case study. Aside from there being virtually no reports available in the public domain, I surmised that if there were research reports and advice outputs that NACI/DST would not give permission to be accessed relating to women and SET, it was highly unlikely that I would have any luck accessing documents relating to a much more sensitive and political policy domain like biotechnology.

DST, and the lack of transparency of NACI's processes and outputs, and these are discussed in Chapter 7.

3.2.3 Strategies to optimise the quality of the research

The case study approach as a research design is employed widely in the social sciences. However, it has not been without its critics. For instance, case study research has been criticised for being unsystematic in its procedures; creating opportunities for biased views and other inputs to influence the findings; falling prey to the biases or prejudices of the researcher in the selection and interpretation of the data; as well as questions around the possibility or desirability of the findings of case study research to be generalised (Yin, 2003: 10; Yin, 2012: 6). These kinds of critiques echo those made of qualitative research in general, which reflect broader ontological and epistemological debates (e.g. positivist vs. constructivist) in the so-called 'paradigm wars' between quantitative and qualitative perspectives.

The real thorn in the side of qualitative research has been criteria against which the quality, rigour and integrity of a research study are determined. Using Guba's (1981) language, the quality of social research can be assessed against the criteria of 'truth value', applicability, consistency and neutrality. Within the quantitative paradigm, I understand these, respectively, to answer the basic questions: Do the research findings represent a 'truthful' representation of 'reality'? Can the research findings be generalised to a broader population? Do the measures and instruments measure what they are designed to measure? Do the research methods mitigate researcher bias? These questions are addressed via adherence to the now well-established and explicated criteria of internal and external validity, generalisability, reliability and objectivity. Scholars working within the qualitative paradigm have, generally speaking, taken issue with the ontological and epistemological assumptions which underpin quantitative approaches, and hence the appropriateness or relevance of these criteria. Furthermore, within the qualitative tradition there has been a need to address the critiques of qualitative research's methodological substance. Thus, over the years, a variety of other criteria or standards by which the quality and rigour of qualitative research may be pursued and assessed have been suggested and developed.

Many researchers working in the qualitative tradition follow the approach of Guba and Lincoln (Guba, 1981; Lincoln & Guba, 1985, 1988), who assert that 'the issues at stake in qualitative research

are fundamentally different from those in quantitative research and require alternative terminology to describe different concepts' (Rolfe, 2006: 305). The authors' key concept is that of 'trustworthiness' (they sometimes use 'authenticity') which is taken to be analogous to the term 'rigour' (Lincoln & Guba, 1988: 6). Essentially, trustworthiness responds to the question: How do we judge the process and products of qualitative inquiry? Drawing on conceptualisations found in ethnographic studies, Guba (1981: 79-80) translates the language of the quantitative tradition into new terms for the purposes of assessing the trustworthiness of qualitative research (or what he refers to as 'naturalistic inquiry'). Thus, internal validity becomes 'credibility', external validity and generalisation become 'transferability', reliability becomes 'dependability', and objectivity is re-described as 'confirmability'.

Guba (1981: 84) sets up the premise for credibility as follows: 'Whereas rationalists are concerned with guarding against masking or competing factors (sources of error) that are said to confound the inquiry, naturalists wish to take account of the bewildering array of interlocking factor patterns that confront them and pose formidable problems of interpretation.' Thus, rather than attempting to isolate variables for investigation typical of quantitative research, the qualitative approach seeks credibility by investigating the phenomenon holistically, from multiple perspectives, and in all its complexity. Credibility in this sense has been described as responding to questions such as: 'How congruent are the findings with reality?' (Shenton, 2004: 64), and 'Does it "ring true"? Is there compatibility between the constructed realities that exist in the minds of the respondents and those that are attributed to them?' (Babbie & Mouton, 2001: 277).

Transferability is based on the fundamental assumption that 'virtually all social/behavioural phenomena are context-bound' (Guba, 1981: 86). Thus, rather than attempting to generalise findings to a broader population, qualitative research aims at applicability 'to other contexts and settings or with other groups' (Krefting, 1991: 216). As Shenton (2004: 69) observes, while the case under study is contextually unique, 'it is also an example within a broader group.' In this conception, the onus of transferability is on those who read the study (the 'receiving context') rather than on the case study researcher ('sending context') (Babbie & Mouton, 2001: 277; Shenton, 2004: 70). As Shenton (2004: 70) puts it: 'After perusing the description within the research report of the context in which the work was undertaken, readers must determine how far they can be confident in transferring to other situations the results and conclusions presented.' Furthermore, while the specific findings of a case study may not be generalisable, the case study design itself could be considered a 'prototype model' for other researchers to draw on in the future (ibid.: 71).

In the quantitative paradigm, consistency is seen as an outcome of replicability, where any variations in results are assumed to be errors in the measure or instrument. For qualitative researchers, usually based on the assumption of multiple constructed realities, variations or inconsistencies are to be expected given the nature of the inquiry – which is holistic, exploring multiple perspectives, unique features, changes over time, and atypical or contradictory findings (Krefting, 1991: 216; Shenton, 2004: 71). Variations also arise as a result of shifts in the thinking, increasing insights or human error on the part of the researcher, who is the research instrument (Guba, 1981: 81; Krefting, 1991: 216).

Finally, scholars working within the qualitative paradigm generally reject the positivist/rationalist notion of objectivity – both how it is meant to be achieved and whether it is possible or desirable at all. Rather, qualitative researchers, as the main research instrument, recognise 'the role that their own predispositions can play' (Guba, 1981: 81) and, as a result, employ very different strategies to address the criterion of neutrality. In fact, as Krefting (1991: 217, my emphasis) notes, qualitative researchers 'try to increase the worth of the findings by *decreasing* the distance between the researcher and the informants.' Instead of objectivity, Guba and Lincoln refer to confirmability. The burden of neutrality is thus shifted from the investigator to the data, 'requiring evidence not of the certifiability of the investigator or his or her methods but of the confirmability of the data produced' (Guba, 1981: 81-82).

Guba and Lincoln outline a range of methodological strategies to be employed by researchers both during and after a study in order to attempt to meet, and be able to assess, the four dimensions of trustworthiness. Commonly cited strategies in this tradition include prolonged engagement, persistent observation, peer-debriefing, triangulation, member checks, reflexivity, thick description, theoretical or purposive sampling, and audit trails (Babbie & Mouton, 2001: 277-278; Guba, 1981: 84-88). These kinds of strategies have become standard fare in qualitative research and, over the years, scholars have refined or added to these. Unsurprisingly, however, not everyone agrees with this typology of strategies or even the criteria themselves, to the extent that there is no real consensus across different qualitative traditions. In part this is because there is diversity within the so-called qualitative paradigm in terms of ontological, epistemological and methodological assumptions and perspectives; in part, at a pragmatic level, not all strategies will be appropriate or

relevant to every project.[18] Even when the criteria for trustworthiness are accepted, there is debate over whether the proposed strategies actually achieve their targets or, worse, constitute a threat to some of the criteria for quality. Rolfe (2006: 305), for instance, argues that strategies such as member checks or peer-debriefing can, in fact, undermine the credibility of an account insofar as they create 'a forced or artificial consensus and conformity in the analysis of the data, which is usually at the expense of the validity or meaningfulness of the findings.'

Other scholars have developed new strategies altogether. Morse et al. (2002: 14), for instance, propose five 'verification' strategies which are to be applied during the research process and which 'can act as a self-correcting mechanism to ensure the quality of the project.' These include methodological coherence (i.e. congruence and iteration between research questions, methods, data and analysis); appropriate sampling ('participants who best represent or have knowledge of the research topic'); collecting and analysing data concurrently; thinking theoretically; and theory development (ibid.: 18-19). In contrast to strategies such as audit trails which place the onus of judgement of quality on the reader, these strategies shift the responsibility of rigour to the researcher (Rolfe, 2006: 305).

The specific strategies I have employed in this study to optimise the trustworthiness and credibility of my results include triangulation, thick description, leaving a data trail, and researcher reflexivity. These are described in brief below. Two other strategies are discussed in subsequent sections; namely, considering the evidentiary value of different sources (section 3.3) and purposive sampling (section 3.3.2).

Triangulation

The triangulation of data sources and methods of data collection is a common strategy for improving the truth value, credibility and confirmability of a study and, in my view, adds considerable value in and of itself. Firstly, triangulation enables one to gather information from multiple perspectives, which is critical when investigating a complex phenomenon. As Baxter and Jack (2008: 544-545) observe, the use of multiple methods 'ensures that the issue is not explored through one lens, but rather a variety of lenses which allows for multiple facets of the phenomenon to be revealed and understood.' This makes for richer data. Secondly, the use of different types of data helps to

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[18] For example, strategies employed in ethnographic studies, such as prolonged engagement in the field and persistent observation, might not be relevant to a particular case study research design, or peer-debriefing in the context of a one-person study such as a PhD.

mitigate the inherent biases and limitations in each; for example, as Tansey (2007: 767) notes, 'interviews can compensate for the distortions that exist in written sources.' Thirdly, data triangulation serves to clarify meaning (Stake, 1994: 241) (e.g. using interviews to dig deeper into the information contained in official documents). It can also be a tool for confirming findings (Baxter & Jack, 2008: 556) through corroboratory evidence, or what Yin (2003: 98) refers to as 'converging lines of inquiry'. However, one needs to keep a vigilant and critical eye on the information and perspectives provided by different data sources and not take them at face value. As Yin (2012: 13) notes, what might appear to be corroborating evidence provided by members of an organisation could simply be the repetition of 'the same institutional "mantra," developed over time for speaking with outsiders (such as researchers or media representatives)' which 'may not necessarily coincide with the organization's actual practices.' Finally, over and above corroboratory evidence, triangulation also enables one to uncover contradictory depictions, interpretations and explanations. Identifying alternative themes, divergent patterns and rival explanations (what other ways are there to see or explain the phenomenon?) are also ways to enhance the credibility of the research findings.

Thick description and a data trail

The two main strategies I have employed to make the internal workings of my study more visible to readers – and therefore more assessable – are thick description and maintaining a chain of evidence. The notion of thick description is rooted in ethnographic studies but is now utilised in qualitative research across the social science spectrum (Ponterotto, 2006: 546). The first use of the term is credited to the anthropologist Clifford Geertz (cf. Geertz, 1973) for whom anthropological writing was essentially the researcher's constructions of the constructions of the research subjects. As such, 'for a reader of anthropological work to gauge for herself or himself the credibility of the author's interpretations, the context under which these interpretations were made must be richly and thickly described' (Ponterotto, 2006: 539). For the purposes of case study research, thick description involves detailed descriptions of the phenomenon under study pertaining to, among others, the context(s) within which it occurs, its history and development, and the intentions and meanings of the actors involved (Babbie & Mouton, 2001: 272; Denzen, 2001: 53; Ponterotto, 2006: 541). Such detail has a few effects. The first is the more detail I provide, the more the reader will come to know the case – as Hyett et al. (2014: 7) put it, enabling the reader to have a 'vicarious experience and a sense of being there with the researcher in their interaction with the case.' The second is that thick description, presented as a text, enables both the researcher and the reader to engage in interpretation. A third effect is that it makes the text voluminous! Thick description in this study

does not only refer to the substantive content, however, but to the description of the research process itself (as contained in this chapter) – which is primarily indicated throughout the text by the use of the first-person pronoun, or the researcher-narrator's voice.

The second strategy relates primarily to making the data sources, as well as the decisions and selections made by the researcher in the research process, visible or transparent for the reader. In the same way as a quantitative study usually culminates in a report in which the presentation and analysis of data occurs at varying levels of aggregation – from tables and graphs of selected and organised data and written summaries, to appendices of detailed figures and a database of the raw data underpinning the work – qualitative research designs include what are variously referred to as 'confirmability audits', 'decision trails' or 'data trails'. The idea here is that readers can track, verify and come to their own conclusions about the decisions made and the procedures and data used during the research process, in order to make their own determination about whether the interpretations, conclusions and recommendations are, in fact, supported by the inquiry (Babbie & Mouton, 2001: 278; Rolfe, 2006: 305; Shenton, 2004: 72; Yin, 2003: 105). Decision or data trails are underpinned by the presentation of a 'chain of evidence'. The extent to which such trails actually contribute towards achieving, or enable, confirmability is however questionable. Babbie and Mouton (2001: 276) state that audit trails 'do little to identify the quality of those decisions, the rationale behind those decisions, or the responsiveness and sensitivity of the investigator to data' and thus to identify 'actual shortcomings that have impaired reliability and validity.' I would argue that the use of thick description and research reflexivity (see below) mitigate such critiques of the value of the data trail strategy. Furthermore, the data trail as described in textbooks is an unreachable ideal: what to include in the chain of evidence is inevitably selective and partial. Nevertheless, both the practice and presentation of a chain of evidence has been of value in the analysis and writing of the study, and should provide readers of the research with adequate detail in order to be able to follow my line of thinking and to make a determination about the rigour applied in data collection and analysis.

The data trail for this study is set out in a few ways. Firstly, direct quotations from documentary sources, as well as compiled, collated, summarised and/or synthesised information, are provided in tables, 'data boxes' and appendices. Classifications are also included in these formats, and diagrams are used as visual summaries of the interrelationships between actors or the nature of certain processes. Secondly, as is standard practice, all documentary sources are cited. Thirdly, cross-references are made throughout the text to information or data provided in other sections or

chapters. Finally, for the purposes of maintaining anonymity, the transcripts of interviews with key informants are not included. However, direct quotations from these interviews or email correspondence are included in the text, as are some of the comments or questions I posed in order to contextualise key informants' comments.

Researcher reflexivity

An important strategy for achieving trustworthy research is researcher reflexivity. Reflexivity is based on the assumption that the researcher plays a central role in how and what knowledge is constructed. It acknowledges the subjectivity of the researcher and how his or her worldview, interests, personal experiences, biases, preconceived ideas, assumptions, social and academic background, and ontological and epistemological beliefs influence and shape the research process every step of the way, as well as the interpretation of the findings and the conclusions (Berger, 2015; Mauthner & Doucet, 2003; Palaganas et al., 2017). The idea is that the researcher must be subject to the same critical scrutiny as the phenomenon under study. Palaganas et al. (2017: 427) describe reflexivity as both a concept – 'a certain level of consciousness' and self-awareness about our role as researcher and that we are 'part of the social world that we study' – and as a 'continuous process of reflection'. Berger (2015: 220) refers to reflexivity as 'the process of a continual internal dialogue and critical self-evaluation of the researcher's positionality as well as active acknowledgement and explicit recognition that this position may affect the research process and outcome.' Such predispositions can include 'beliefs underpinning decisions made and methods adopted', 'the reasons for favouring one approach when others could have been taken', and the 'weaknesses in the techniques actually employed' (Shenton, 2004: 72). However, it is more than this. The entire research process has been a series of judgements and selections on my part – what methodology to adopt, what information to look for, who to interview, what questions to ask, what to include and exclude in the final write-up. It is thus also the telling of the story in and of itself. Stake (1994: 240) articulates my experience of this quite eloquently:

> … it is the researcher who decides what is the case's own story, or at least what of the case's own story he or she will report. More will be pursued than was volunteered. Less will be reported than was learned. … It may be the case's own story, but it is the researcher's dressing of the case's own story. This is not to dismiss the aim of finding the story that best represents the case, but to remind that the criteria of representation ultimately are decided by the researcher. Many a researcher would like to tell the whole story but of course cannot; the whole story exceeds anyone's knowing, anyone's telling. … These are subjective choices not unlike those all researchers make in choosing what to study. Some are made while designing the case study, but some continue to be made through the final hours.

3.3　Data sources

The study employs two methods of data collection, namely the collation of information from a wide range of documentary sources, and in-depth interviews (and in some cases email correspondence) with key informants. The data sources are described in greater detail below. The discussion also considers the evidentiary value of the different sources and types of information and data. This latter aspect is important since, as highlighted earlier, all sources of data have their own inherent biases. For instance, the annual reports of organisations, while generally comprehensive in their coverage of activities and financial status, tend to highlight what went well over that period. Often, only superficial reference is made to failures to deliver or challenges encountered. Furthermore, as Yin (2003: 87, original emphasis) notes, documents are not always accurate and are inherently biased insofar as they are 'written for some specific purpose and some specific audience *other than* those of the case study being done.' In this regard, Tansey (2007: 767) suggests asking questions of the sources such as: Who is speaking? To whom are they speaking? For what purpose are they speaking? And, under what circumstances? Tansey (ibid.) also points to what documents advertently or inadvertently conceal:

> … documents can often be incomplete and present a misleading account. By presenting the official version of events, documents often conceal the informal processes and considerations that preceded decision making … They may also imply consensus and agreement with a decision, when in reality disagreements may have been widespread and that other, undocumented, decisions may have been considered extensively.

There are also challenges with interviews with key informants in terms of the reliability of their accounts and input. As Yin (2003: 92) notes, interviews 'are subject to the common problems of bias, poor recall, and poor or inaccurate articulation.' The types of information one can glean from key informants may be affected by their position within an organisation or in relation to the topic of study. For instance, in previous research projects I have found that senior leadership, such as the vice-chancellors of universities or the CEOs of statutory bodies, can be less critical of their organisation's activities and instead offer up rhetoric (or the institutional 'mantra' referred to earlier) – I assume in order to keep the organisation's reputation intact or even to keep its secrets. By contrast, former staff members (especially disgruntled ones) and external stakeholders may be quite critical of the organisation. In short, both documentary sources and interviews cannot be taken at face value. Thus, included in the discussion below is my own assessment of the key data sources in terms of their evidentiary value and limitations.

3.3.1   Documentary sources

The desk research component of this study drew on multiple and different types of documentary sources. The most central of these was a range of official documents relating to NACI, including its founding Act of Parliament, annual reports and corporate business plans, internal and external review reports, research reports and advice outputs. My first foray into the empirical work for this study began with these documents which I revisited throughout the research process as the need for additional information came to light. I began by trawling through NACI and DST annual reports, business/strategic plans and websites for a variety of basic, factual information as well as 'official' discourse about NACI's mandate and operations. I then consulted internal and external review reports which introduced assessments and critiques of NACI into my thinking, and which shed light on factors that had triggered small or large shifts in focus, structure and operations. The external reviews of NACI, in particular, provided a critical counterpoint to the 'insider' perspective. NACI research reports and advice outputs were key documentary sources for the mini case study relating to women and SET. Additional information pertaining to NACI and the DST was gleaned from general internet searches which generated other types of sources such as media releases and articles, and notes from Parliament's Portfolio Committee on Science and Technology as available online. Finally, a range of other documents were consulted as part of developing a picture of the broader policy context – some of which have informed the advice agendas and/or operations of NACI over the years. These included reviews of the South African STI landscape and policy; government White Papers relating to S&T; national strategies and plans relating to STI and development more broadly; published commentaries by outside observers; and the founding Acts of Parliament for related bodies such as the CHE and ASSAf. While the documents provided relevant information for the analysis, in some cases they were the subject of analysis themselves. Table 3.1 outlines the main documentary sources used in the study, including the kinds of information provided by each source, how I have used these sources in my analysis, and reflections on their evidentiary value. The way in which I worked with the documentary sources in terms of organisation and analysis is described in section 3.4 below.

Table 3.1: Main documentary sources, their use in analysis and their evidentiary value

Founding Act of Parliament (National Advisory Council on Innovation Act No. 55 of 1997) and subsequent amendments	
Type of information	Legislative framework which establishes NACI. Sets out the requirements regarding NACI's functions (including what aspects it is to advise on and to whom); the composition of the Council and criteria for membership; its organisational structure; expenditure of NACI and remuneration of Council members; accountability measures; tenure of Council members and Council meetings.
Use in analysis	Provided a critical reference point for the analysis and assessment of NACI's actual operations and activities and how it interpreted its institutional framework. Amendments to the Act pointed to official institutional changes which resulted in changes in NACI's functioning. To the extent that the Act is explicit, vague or silent in relation to specific matters, it became part of the interpretation of the findings.
NACI annual reports (2000/01 to 2017/18)	
Type of information	In general: messages from the Minister of S&T, CEO and NACI Chair; list of Council, Executive Committee and advisory committee members; information about the Secretariat staff; iterations of the aims and objectives of NACI; foci of advice agenda; reports on or lists of activities during the year under review (e.g. research commissioned, reports published, advice given to the Minister, hosting of or attendance at workshops, seminars and conferences); financial reports; changes in organisational structure; performance appraisals; international liaison; overviews of selected aspects of the NSI; and future plans.
Use in analysis	Information gleaned from these annual reports formed the backbone of the desk research undertaken for this study – especially in terms of compiling basic factual information pertaining to Council members(hip), staff capacity, changes in organisational and advisory structures, changes in focus of advice, financial expenditure, activities and events, requests from the Minister for advice, and lists of research studies/reports and advice outputs. The latter provided the building blocks for tracing the formulation and use (or non-use) of the SET4W policy advice. Basis for the construction of a timeline of institutional development and change. Provided examples of the 'official' discourse about NACI and the extent to which it fulfils its mandate, as well as responses to external reviews. To the extent that the information provided in the annual reports was contradictory between reports and against other sources of information, this became data in and of itself.
Evidentiary value	• Inconsistency and incomplete coverage of advice outputs (i.e. sometimes advice outputs and associated studies are reported on in some detail, while in other cases advice outputs are only listed by title) • Contradictory information, especially in terms of descriptions of what was done, when and why (i.e. uncertain about accuracy) • Tend to highlight achievements and underplay failures, are generally superficial, and are only at times moderately self-critical
NACI corporate business plans (2003-2011)	
Type of information	Some overlap in content with the annual reports (e.g. lists of Council and committee members, research and advice activities, reviews of past outcomes), but with a main focus on planning for the coming year in terms of resources (human resources, finances, infrastructure), the portfolio of activities, corporate goals and timeframes, performance monitoring and evaluation, and plans to improve the effectiveness of NACI.
Use in analysis	Cross-checking facts and mining for additional information.

Evidentiary value	Given that these documents are both intended for internal purposes and open to public scrutiny, assume that they are fairly reliable in terms of accuracy of content. They also provide an insider perspective.
NACI website (2015-2019)	
Type of information	Basic information about NACI's mandate, structure, programmes and activities; and access to the NACI annual reports and corporate business plans, research reports and advice outputs.
Use in analysis	The nature and limited scope of the website became data in and of itself.
Evidentiary value	The website appeared to be poorly maintained and, from what I could tell, was not kept up-to-date nor was it comprehensive in making its outputs available. During the course of the study, the website was redesigned and the new website had even less information in it than the previous one (e.g. there was no longer information about the specific advisory committees or project teams). It is also noted that the NACI website is maintained by the DST.
External reviews of NACI (2002 and 2008)	
Type of information	Overviews and critical analyses of NACI's design, activities and outputs; its place within and relationship with other key stakeholders in the NSI; the effects of its work; and recommendations for change.
Use in analysis	Aside from highlighting key issues about NACI and its work which I could follow up on, the analyses and recommendations became data for my study insofar as I could see if and how NACI responded to these which, in turn, shed light on NACI's perspective and ability to adjust, and offered interpretations which I could set up against those of key informants and my own.
Evidentiary value	These reviews were valuable inputs into the study primarily because they were undertaken by high-level local and international experts with considerable knowledge and experience of the broader political and policy context within which NACI operates; they were based on the analysis of a wide range of documents and interviews with numerous stakeholders; and the reports appear to have been written with a no holds barred approach. While the reviews were obviously geared towards the terms of reference given, they addressed many of the core issues of my study.
DST annual reports	
Use in analysis	General information about the DST itself including the purview of its functions, changes in organisational structure and responsibility for public sector SETIs and facilities, as well as reportage on the broader NSI and developments in the policy environment. All references to NACI and SET4W were captured in order to glean additional factual information, verify (where possible) what was reported in NACI annual reports, and to get a sense of how the DST 'talks' about NACI. In this regard, the fact that NACI and SET4W were not mentioned at all in certain DST reports became data in and of itself.
Evidentiary value	As with the NACI annual reports, cannot be certain about the comprehensiveness or accuracy of the reporting; tend to highlight achievements rather than failures and are moderately self-critical.

NACI research reports relating to women and SET	
Type of information	Information pertaining to the commissioning of the research project (background context, by whom, terms of reference); the research group; the research timeframe; aims and objectives of the study; methodology(ies); findings and recommendations.
Use in analysis	Used to generate a narrative of the work of the SET4W committee over time and how each project fitted into or responded to the ongoing work and direction of the committee. Also provided the key elements (especially findings and recommendations) for tracing the movement of ideas from research through to advice and policy.
Evidentiary value	Research reports were written for a specific audience and purpose – first and foremost the SET4W committee – and thus did not always contain the information I was looking for (e.g. information pertaining to the commissioning of the project).
NACI advice outputs relating to women and SET	
Use in analysis	Identifying the key focus of the advice in order to ascertain how these reflect the key findings of the research that informed the advice, and as the basis for linking the advice to any evidence of uptake by the Minister/DST in their policies, strategies and initiatives. Also, two versions of the same document provided data as comparison over time which enabled me to see that there had been a shift in tone, which in turn gave me insight for interpretation.
Evidentiary value	Of the few advisory outputs accessed, all were the final output and therefore only provided a superficial view; that is, they do not contain details of discussions, meetings or deliberations. To some extent they highlight how the research and advice are connected.
Reviews of the landscape of public sector STI policy and institutions (especially the IDRC review 1995, OECD review 2007, Ministerial review 2012)	
Use in analysis	Taken together, the external reviews of the broader STI landscape provided a critical overview of developments, challenges and dynamics over time at policy and institutional levels, which informed much of the background context to the study. Within this, specific reference to the DST and NACI in terms of their functions, positioning and effectiveness, as well as recommendations for change, were noted and used as part of the analysis of what had happened and why. It was also possible to then trace the extent to which, and in what ways NACI in particular, and the DST more generally, had responded to the recommendations.
Evidentiary value	The reviews were valuable in their scope and the critical, outsider perspective and analysis provided.

3.3.2   Interviews with key informants

The selection of key informants to interview was purposive in the sense implied by the notions of 'elite' or 'expert' interviewing. Here, Yin (2012: 12) notes that the insights gained from informants is that much greater if they are key people in their relevant organisations – and to this I would add have extensive working knowledge and experience of the relevant policy sector(s). I thought it critical to select individuals who would have in-depth insider knowledge of either NACI, the DST and/or the broader political and policy environment, and of historical perspectives on developments over time. In addition, the selection aimed at obtaining the inputs of individuals with differing relationships to NACI and the DST, as 'insiders' and 'outsiders' – although most had experience of both – as well as different backgrounds and perspectives. Interview data for the women and SET mini case study came from the two SET4W committee chairs and a former NACI Chair, who were able to assist in reconstructing the sequence of events, the processes involved, and the outcomes in terms of influence on policy.[19] In total, nine in-depth interviews were conducted and the list of key informants is provided in Table 3.2 below. In all cases the interviewees have extensive knowledge and experience of various domains relating to STI and collectively offered a rich array of perspectives and insights. Their curricula vitae are extensive and they sit on the boards of many government agencies and other bodies in the sector. The table thus provides only snippets of background information about each interviewee highlighting experience that is relevant to the focus of the study.

The interviews were conducted at strategic points in the research process between 2016 and 2019. I began my interviews once quite a substantial amount of desk research on NACI, the DST and the STI policy sector had been completed and first drafts written up. This was an intentional strategy as I wanted to have a thorough background knowledge in order to use the interviews in a focused way. As such, the aim of the interviews was to fill in gaps or clarify information; to corroborate or note contradictory evidence in relation to official accounts; to explore historical, contextual and political dimensions; to garner different perspectives; to gain insight into the inner workings of especially NACI and the DST; to unearth information about why certain decisions or actions were taken; to provide a sounding board for my preliminary observations and interpretations at the time; and to raise questions and issues that I had not yet thought about. In the process of writing the first drafts of the chapters, I made in-text notes highlighting queries for follow-up in the interviews.

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[19] Two other individuals – including the DST official who was involved in the SARG/SET4W work – did not respond to my requests for interviews.

Requests for interviews were accompanied by an overview of the study as well as the list of questions and thematic areas that I wished to discuss. The aim of this was to give informants the opportunity to reflect on the issues prior to the interview and to not waste the interview time with asking questions about basic information (except where this was necessary in the absence of access to certain documentation). The interview schedules were tailored for each interview respondent. In every case, informants were keen to participate and conveyed, in most instances, the view that the study was an important one. Interviews lasted between one and two-and-a-half hours, and follow-up questions or requests were posed to informants via email.

Given the timeframe of this study which covers developments since the early 1990s, a challenge to collecting data of this kind is people's memories. This was certainly the case with most, if not all, key informants interviewed for this study, many of whom prefixed their statements with phrases such as 'as far as I can recall' or 'if I remember correctly'. Some key informants were in possession of various records (such as minutes of meetings) which they used to jog their memories of events, decisions and so on. Respondents did most of the talking and all-in-all the interviews were fascinating. Some of the narratives could be published as is – not only for their eloquence and depth of knowledge and insight, but also because I believe very little of this history has been documented.

All the interviews – whether telephonic, face-to-face or via Skype – were recorded. In each case, I requested permission to record the interview and invited interviewees, wherever desired, to indicate whether something they said should be 'off the record', which is taken to mean that it is not quoted directly or attributed to the speaker. I also made the commitment to all respondents that their remarks would be anonymised in the text. The audio recordings were transcribed by myself and a second transcriber. In the latter case, I went through the draft transcriptions while listening to the recording, with a view to filling in gaps, correcting words or spelling. In all the transcriptions I paid close attention to punctuation in order to reflect, as far as I was able from my own 'hearing', the speakers' intended meaning. (This is an example of the insertion of the researcher into the research process – here as interpretation during data collection.) Finally, in order to comply with good practice and ethics, the thesis was sent to each of the interview respondents, accompanied by a request for them to review the quotations extracted from their interview transcripts. In particular, they were asked to assess how I had represented their views in the context of the discussion, and whether they were adequately anonymised. Changes requested by interview informants were then effected in the finalisation of the thesis.

Table 3.2: List of key informants and their affiliations

Name and date of interview	Relationship(s) to NACI	Other selected affiliations
Dr Bok Marais August 2016	• Head of the NACI Secretariat (2001-2007)	• Previously Vice-President of Research Development and Deputy President of the HSRC; Professor in the Graduate School of Technology Management at the University of Pretoria; Research Associate at the Institute for Economic Research on Innovation (2015-2017)
Prof David Kaplan February 2017	• Member of the 1st NACI Council (1998-2004) • External stakeholder	• Professor at the University of Cape Town (UCT) since 2004 (Economics, Business Government Relations, Graduate School of Business); previously Chief Economist at the Department of Trade and Industry (2000-2003), and Director of the Science and Technology Research Centre and the Development Policy Research Unit at UCT (1995-2000) • Involved in the IDRC review of innovation policy in South Africa in the early 1990s; coordinator of the task team that produced the Green Paper on S&T (1996); involved in the development of the White Paper on S&T (1996); member of the Ministerial Review Committee on the Science, Technology and Innovation Landscape in South Africa (2012)
Prof Rasigan Maharajh April 2017	• External stakeholder	• Since 2004, Chief Director of the Institute for Economic Research on Innovation at the Tshwane University of Technology and, since 2014, Node Head of SciSTIP; previously at the CSIR, Head: CSIR Policy Group (2002-2004) and Manager of the Manufacturing Policy Centre (1999-2002) • National Coordinator of the Science and Technology Policy Transition Project of the mass democratic movement (1995-1997) involved in drafting S&T policy and legislation for DACST
Prof Calie Pistorius May 2017	• Member of the 1st NACI Council (1998-2004) • Chair of the NACI Council (2004-2008)	• Founder and Director of the Institute for Technology Innovation at the University of Pretoria (1990s); Vice-Chancellor and Principal, University of Pretoria (2001-2009) and Vice-Chancellor of the University of Hull (2009-2017) • Consultant to industry and government on innovation and technology strategy, management and policy
Dr Steve Lennon May 2017	• Member of the 1st NACI Council (1998-2004) • Chair of the NACI Council (2008-2014)	• Worked at Eskom from 1983-2015; in Executive capacity since 2000 overseeing portfolios of Resources and Strategy, Corporate Services, and Sustainability • Consults locally and internationally in the fields of innovation, S&T and energy, among others

Name and date of interview	Relationship(s) to NACI	Other selected affiliations
Prof Cheryl de la Rey November 2018	• Executive Committee of the 2nd and 3rd NACI Councils • Chair of the NACI Council (2014-2018) • Member and Chair of the SET4W advisory committee (2007-2011)	• Vice-Chancellor and Principal: University of Pretoria (2009-2018); CEO: CHE (2008-2009); Deputy Vice-Chancellor at UCT (2002-2008); Executive Director: Research Promotion at the National Research Foundation (NRF) (2000-2002)
Dr Lucienne Abrahams April/May 2019	• Executive Committee member of the 1st and 2nd NACI Councils • Member and Chair of the SET4W advisory committee (2003-2006)	• Director: LINK (Learning, Information, Networking, Knowledge) Centre, University of the Witwatersrand; specialises in digital innovation and transformation in African economies and societies • Inputs into policies and strategies of provincial governments • Member of the Ministerial Review Panel on the Science Technology and Innovation Institutional Landscape (2017)
Dr Thomas Auf der Heyde April 2019	• Department of Science and Technology	• Deputy Director-General of the DST (2007-2018) with portfolios of International Cooperation and Resources, Human Capital and Knowledge Systems, and Research and Development Support • Previously Professor and Executive Director for Research and Innovation at the University of Johannesburg, and Extraordinary Professor at CREST (2009-2014)
Prof Michael Kahn April 2019	• External stakeholder	• Extraordinary Professor in the School of Government at the University of the Western Cape, and at CREST at Stellenbosch University; previously Executive Director: Knowledge Systems, HSRC (2002-2008) • Led the science and mathematics section of the National Education Policy Initiative (early 1990s); co-authored the ANC Policy on Science and Technology; involved in the development of the Green and White Papers on S&T (1996); co-authored the 2012 Ministerial Review Committee on the Science, Technology and Innovation Landscape in South Africa report

Source: Compiled via internet searches, NACI annual reports, and information provided by key informants

3.4   Analysis and writing

As Yin (2012: 15) observes, there is no 'cookbook for analyzing case study evidence.' The general principles that have guided my analysis, which are common in qualitative research,[20] include organising and synthesising data into categories linked to the conceptual framework as well as those emerging from the data, and grouping these into themes; seeking out patterns within and across the data in order to develop the issues; triangulating observations; identifying contrasting and contradictory interpretations or explanations; developing assertions and explanations about the case; and linking the data to the theoretical propositions or themes in the conceptual framework and the research questions. Although guided by prior experience and the methodological literature, much of the analysis for this study has been a process of trial and error, thinking and rethinking, involving a fair dose of creativity, experimentation, flexibility and intuition. What follows is a description of the approach I have taken to data organisation and analysis. I begin with an overview of the analysis of the institutional case study as whole; that is, incorporating NACI itself, its broader policy context, and the mini case study on women and SET. The analysis in this regard proceeded in two main stages. I then outline how the analysis of the formulation and use (or otherwise) of the advice produced by the SARG/SET4W committees was undertaken.

The first level of the organisation and preliminary analysis of the documentary data entailed collating and compiling basic, descriptive information about NACI and the women and SET advisory initiative, primarily from NACI annual reports and supplemented by other sources (see section 3.3 above). The information was captured in Excel spreadsheets with separate sheets for each financial year, and into the following categories: NACI Council members and terms, financing, the Secretariat, the advisory structures, research studies, and advice outputs. Other information (including direct quotations) pertaining to key developments within NACI in particular, and the DST and the system more broadly, was collated into a Word document. Also structured chronologically, I used a colour-coding system to categorise the information contained in this document. Categories included, among others, remarks made by the Minister of S&T and the NACI CEO and Chair; developments in the system which impacted on NACI and/or to which NACI responded; articulations of NACI's functions and its role/position in the NSI; and descriptive details of research reports, advice outputs and other activities (and especially those of the SARG/SET4W committees). Together, the information contained in the Excel spreadsheets and Word document was used to develop the first drafts of the empirical chapters into descriptive narratives and summaries. As interview data

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[20] See e.g. Baxter & Jack (2008: 554) and Stake (1994: 244).

became available, the basic information derived from documentary sources was supplemented with the information provided by key informants. This included filling in gaps, clarifying and nuancing.

With regard to the analysis of the interview transcripts, while I am aware of the availability of computer software to assist with qualitative data analysis (and have used it in a couple of projects), I opted not to go this route. In my view, such software is invaluable in working with significant amounts of textual data generated through open-ended questions in a questionnaire or in structured interviews. However, the nature of my interviews I believe demanded a different approach – one which would not cut informants' inputs into chunks of coded and categorised text, but which would do justice to the nuanced, historically- and contextually-situated and often theoretically-informed insights they offered. I also wanted to analyse each interview transcript holistically; in other words, developing a sense of each person's orientation, assumptions and narratives – even though ultimately extracts from transcriptions were stitched together in the construction of the case study narrative. As such, my approach to analysing the interview data involved the reading and re-reading of the transcripts at various points in the study. In the process, I used colour-coding to mark sections of text according to categories – those relating to the factual information outlined above and those emerging from the conceptual framework, as well as notions introduced by key informants themselves. I also made hand-written notes in the margins, essentially summarising the key points being made. These actually served as first articulations of my own thinking and made their way into the draft chapters. I then cut and paste direct quotations into the draft chapters as they were currently constituted.

The second layer of the overall analysis took place once the draft chapters were written up. This involved taking a step back and first looking at each chapter as a whole and then across the chapters towards further analysis. The within-chapter analysis involved reading different sources of information together in order to identify patterns, themes, relationships, contradictions, and developments and changes over time. Given that the empirical chapters focused on different dimensions of the overarching research questions, and as written are intended to build upon one another, the cross-chapter analysis sought to deepen the analysis by exploring, for instance, the linkages and dynamics between features of the broader policy context and NACI's operations, or between the factors highlighted as impacting on NACI's influence on policy and specific examples identified in the women and SET mini case study. Roughly speaking, this within-chapter/across-chapter approach echoes Pettigrew's (1985) notions of vertical and horizontal analyses (see section 3.2.1 above), where the within-chapter analysis enables analysis of developments and changes over

time, and the across-chapter analysis seeks out the interdependencies between the different levels of analysis – in this case, the policy context, NACI and its advisory initiative. Chapter 7, which explores the factors associated with the influence of NACI's advice and as an advisory body, required a slightly different type of analysis, specifically the development of themes based largely on interview data.

The concluding chapter represents the final analysis insofar as it brings together the empirical analysis and the themes arising from the conceptual framework in the development of the conclusions of the study. As highlighted in Chapter 2, the conceptual framework for the study initially served as a starting point in terms of the collection and analysis of data. The concluding chapter thus revisits the main themes of the conceptual framework in light of the data and empirical analysis, highlighting which factors and interrelationships in the conceptual framework are most pertinent in the case study. There is also an element of grounded theory whereby insights emerging from the empirical analysis as well as the theories, concepts and discourses introduced by key informants are also brought to the surface, and intermingle in my interpretation of the findings.

The writing process was an integral part of – and essentially facilitated – the process of analysis. The first drafts of the empirical chapters were structured heading-wise according to the basic categories linked to research questions and the conceptual framework. This descriptive writing, which contained the summaries and syntheses of data sources, was my first real glimpse of the data and enabled me to begin to identify key issues, possible story lines, contradictions and so on. The introduction of new data along the way resulted in the introduction of new headings or sections and the restructuring of the chapters. Between the desk research and in-depth interviews, I amassed a significant amount of data, not all of which made it into the final draft of this thesis – in part, because as the conceptual framework evolved, so the need for certain data fell away. As Maxwell (2005: 49) has observed: 'no theory will accommodate all data equally well; a theory that neatly organizes some data will leave other data dishevelled and lying on the floor, with no place to put them.'

Finally, the mini case study on NACI's advisory initiative relating to women and SET includes a dimension of investigating the use (or not) of specific advice outputs. The challenges associated with empirically investigating use (section 3.2.1) together with the lack of access to documents and key informants, meant that at best I would be able to trace in broad brushstrokes the movement of ideas from the advice agenda, to the research commissioned, into the advice output and out into the

policy sphere. Over the past few decades, the process-tracing method[21] increasingly has been seen as a valuable tool in the qualitative research toolkit, and has been applied to various phenomena including, for example, research into decision-making and decision support systems (see e.g. Ford et al., 1989; Todd & Benbasat, 1987). However, I opted not to go this route. Firstly, most of the definitions and examples of process-tracing I encountered in the literature speak the more positive-empiricist language of causality, dependent and independent variables, hypotheses and so on. This version of process-tracing is popular among scholars who wish to bring about greater systemisation and standardisation of qualitative methods in order to bring them more into line with the types of tools for causal inference employed by quantitative researchers (Collier, 2011: 823; Ropo et al., 1997: 332). Secondly, I simply did not have the data to undertake such a fine-grained analysis as the process-tracing method requires. So, I designed a method of my own which at most, I believe, achieves a wide-angle lens and a somewhat impressionistic view of specific instances of advice formulation and use. The idea of the method is simple: look for core substantive themes or ideas in the policy sphere and how these emerge or are reflected in the advice agenda, the research commissioned and the advice outputs, and then see if there is any evidence of these themes or ideas – and specifically as they appear in the research or advice – reflected in the policies, strategies or initiatives of the DST. The process is elaborated upon further in Chapter 6.

3.5   Conclusion

In this chapter I have described the qualitative case study design encompassing the institutional case study of NACI and the embedded mini case study of the women and SET advisory initiative. I have noted difficulties encountered in accessing certain data sources and how these shaped the research design, and highlighted the strategies I have employed to optimise the quality of the research. I have detailed the methods and sources of data collection, and described the procedures followed for data analysis.

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[21] In the field of organisational research, the term 'processual research' is used (Ropo et al., 1997).

CHAPTER 4: POLICY AND ADVISORY LANDSCAPE IN THE SOUTH AFRICAN NATIONAL SYSTEM OF INNOVATION

4.1   Introduction

The conceptual framework for this study as outlined in Chapter 2 points to the relevance of the broader political and policy environments within which advisory bodies operate to the nature, formulation and uptake of policy advice and the overall influence (or otherwise) of the advisory body within the system. The importance of these broader contexts also became increasingly evident during the analysis of data for this study. As such, the aim of this chapter is to set the backdrop to the case study of NACI (Chapter 5), the mini case study of the specific advisory initiative on women and SET (Chapter 6), as well as to the discussion of factors impacting on the influence of NACI in Chapter 7.

As a point of departure, I begin with a brief overview of the South African government structure and formal approach to policy-making, as well as a consideration of the extent to which the rhetoric and practice of EBP has been present. I then outline the institutional arrangements for the governance of the NSI in South Africa and key developments in STI policy-making since 1994. The discussion is prefixed by an overview of the science system inherited by the new government, and some key debates and discussions that took place during the interregnum between the unbanning of the African National Congress (ANC) and the release of Nelson Mandela in 1990 and the first democratic elections in 1994. As will be seen, the debates around and proposals for the transformation of South Africa's STI system involved the need for the establishment of statutory bodies with advisory functions. And, as Chapter 5 will highlight, over the period of its existence, NACI's operations, outputs and influence (real and potential) have been shaped by these governance and policy developments. The chapter concludes with an exploration of the policy advice landscape as it pertains to the NSI.

4.2   Overview of government structure and policy-making in South Africa

South Africa is a constitutional democracy with a three-tier system of government (national, provincial and local) and an independent judiciary. At the national level, legislative authority resides in Parliament and its national assembly, whose members are elected through a system of proportional representation. In addition to its legislative function, Parliament oversees the work of the executive branch of government. The executive branch is led by the Cabinet comprising the President, Deputy President and government ministers appointed by the President. The President has the power to 'remove ministers from office or … re-allocate functions to ministers' (DPSA, 2003: 15). While the President and Cabinet are accountable to Parliament for the execution of their duties and for government policy in general, individual ministers can also be held accountable by Parliament 'for the way in which a particular policy for which he/she is responsible, has been carried out' (ibid.: 16). Each minister is assigned a portfolio in a specific area of governance, and the work associated with each ministry is undertaken by a department headed by a Director-General (DG) and Deputy DG and staffed by civil servants. Ministers are responsible for policy formulation and final decision-making, and their departments for the execution of associated tasks including 'initiating the draft of legislation on request of the minister, drafting regulations, and giving effect to acts in its portfolio' (Marais, 2000: 27). A key informant explained the division of labour between ministers and departments (i.e. the political-administrative interface) as follows:

> Technically, the minister is what is called the executive authority of the department and the DG is what is called the accounting authority. … The minister is responsible for providing political leadership and ensuring political leadership. The DG and the rest of the department are responsible for ensuring that all investments are made in accordance with the political framework that has been constructed in consultation with the minister; [in other words] ensuring that all financial activities take place within that framework so that the department doesn't pursue strategies and policies that have not been signed off and agreed by the executive authority; ensuring that all spending is in accordance with the political imperatives that the executive authority authorises. (Key informant)

This respondent also noted, however, that the demarcation between a minister and his/her department is not clear cut: 'that doesn't mean that there is a clear demarcation between a political authority and an administrative authority. That doesn't exist. These things infuse into each other like day into night. So in every system there is an increasing level of administrative responsibility as you go down, and an increasing level of political responsibility as you go up.' By way of example, DGs and Deputy DGs are frequently called to Parliament to account for their activities.

Within the national assembly, a portfolio committee consisting of members of Parliament is established for each government department. According to a government document (DPSA, 2003:

43), the system of parliamentary committees 'is one of the most important mechanisms for ensuring efficient, transparent government and allowing public input in the law-making process.' These committees 'monitor their departments and may investigate and make recommendations relating to legislation, budget, structure, functioning and anything else' (ibid.: 105).

Policy coordination, planning and evaluation at the national level have taken various forms over the years. During the time of President Thabo Mbeki, a Policy Coordination and Advisory Services unit was located within the Presidency which 'engaged in scenario planning, vetted policy proposals, and tried to encourage their mutual compatibility' as well as 'episodic monitoring of the implementation of policy within clusters, with a special concentration on hard and "transversal" issues that cut across departments and tiers of governments' (Butler, 2013: 7). In 2010 (coinciding with the start of the Jacob Zuma presidency), the unit was replaced with two new planning and monitoring institutions: the National Planning Commission which produced the country's *National Development Plan 2030* (NPC, 2012), or NDP, and the Department of Performance, Monitoring and Evaluation (DPME). The DPME is responsible for 'the evaluation of government's priorities, the development of performance indicators, and the assessment of the quality of management practices across the public service' as well as the development of 'a government-wide monitoring and information system' (Butler, 2013: 7). At the level of ministers, the ministerial portfolios are incorporated into a number of government clusters, the aim of which is to improve government planning, decision-making and service delivery. As such, the primary functions of the clusters are 'to ensure the alignment of government wide priorities, facilitate and monitor the implementation of priority programmes and to provide a consultative platform on cross-cutting priorities and matters being taken to Cabinet' (GCIS, 2015: 203). There is also a Forum for Directors-General located within the Cabinet Office which meets on a monthly basis.

With regard to policy-making in the South African context, laws and public policies 'stipulate ways in which executive actions should be performed by government institutions or individuals – either authorising or prohibiting particular actions' (DPSA, 2003: 39). The initiation of new policies may result from an identified need, or from proposals from interest groups, government officials or members of the executive (ibid.). Formally, the policy process begins with consultations with key stakeholders and the establishment of a task team within the relevant government department to develop a Green Paper which represents government's definition of the problem and its solution (DPSA, 2003: 39; Marais, 2000: 4). This is often followed by a White Paper which represents the government's policy and includes the consolidated inputs of stakeholders. Drafts of both Green and

White Papers are subject to inputs by key stakeholders and the public (where appropriate) (DPSA, 2003: 40). According to Marais (2000: 4), research, consultation and other activities might form part of the initiation of the White Paper process, 'depending on aspects such as the culture in the department and government, nature of the subject, and the time available.' Then, where necessary, aspects of the policy are legally formalised in Acts of Parliament.

Broadly speaking, the policy-making process in South Africa is structured around the overall planning framework of the government which determines the planning cycles of individual government departments and links these to electoral, parliamentary and budgetary cycles (DPSA, 2003: 34). The planning framework includes a sequence of activities that culminate each year in the Medium Term Strategic Framework – 'a limited but focused set of medium-term strategic objectives that are shared by all spheres of government and inform the Medium Term Expenditure Framework' (ibid.). In addition to this wider annual planning cycle, government departments are required to develop three-year plans which are informed by the election mandate, the President's State of the Nation Address, key policy priorities of Cabinet and clusters (ibid.: 45-46). These plans must 'explicitly indicate where coordination with other agencies will occur' and identify 'partnerships with other spheres of government' (ibid.: 47).

A review of documents and websites at the time of writing revealed the emergence of an EBP discourse over the past decade or so. As Wills et al. (2016: 11) recently observed: 'There is an increasing understanding of what evidence-informed policy-making means in South Africa, which reflects both international debates about evidence and South Africa's unique history and current challenges.' Commitment to and institutionalisation of EBP at the central government level is primarily given expression in the government-wide evaluation of policies and programmes across departments at both national and provincial levels, under the auspices of the DPME, whose explicit mandate is 'to strengthen the use of M&E [monitoring and evaluation] evidence in government' (Paine Cronin & Sadan, 2015: 1), 'using both programme-focused and administrative (department-focused) data, including programme evaluations' (Shaxson et al., 2016: 18). According to Goldman (2016), the DPME plays the role of an 'evidence broker' which involves helping to 'create the supply of rigorous evidence, but also make sure it is available in the right form, in the right place, at the right time, and that appropriate preparation is done and relationships built to help ensure that the evidence is used.' In order to encourage senior managers within government departments of the importance of (evaluation) evidence, the DPME has run courses for DGs and Deputy DGs which seek 'to develop a common purpose around evidence and the key role that M&E (and research) plays in

this' (ibid.). In September 2016, the DPME, in conjunction with the University of Johannesburg's Build Capacity to Use Research Evidence (UJ-BCURE) programme, launched its 'evidence mapping tool' which is described as follows:[22]

> Evidence maps are an evidence synthesis tool that allows decision-makers to rapidly access a body of evidence relevant to their policy questions. This evidence is then mapped against a policy framework and visualised on an interactive evidence interface to allow public servants to interrogate and engage with the evidence. … The maps are most helpful when a department is engaging in the formulation of new policies or is proposing a review and potential shift of existing policies.

In two recent documents, it is stated that the DPME and the DST are playing a critical role in advancing EBP across government. Shaxson et al. (2016: 18) state that these two departments 'both lead the debate around evidence within government together with the Department for Public Service Administration.' According to Wills et al. (2016: 11):

> DPME and DST are at the forefront of work to improve the use of all types of evidence throughout the South African government at national, provincial and local levels. DST oversees the government's approach to research and innovation via universities, research councils and various partnerships between research, industry and government. DPME, which sits in the Office of the President, oversees the planning, collection and reporting of different forms of evidence on government performance.

A key informant provided clarity on the role of the DST at this national level:

> The Department has been very strong in promoting this concept [EBP] … because the Department is nominally responsible for supporting a large proportion of South Africa's intellectual sector that produces this evidence in the form of the universities and the science councils. So inasmuch as the universities and science councils play a key role – at least in principle – in providing data and evidence and information for evidence-based policy, and the Department is responsible for supporting the research and intellectual activities in those institutions that produce such knowledge, the Department is therefore pretty much at the centre of this debate and views itself as that in that context … because the Department needs to translate the expectation of evidence-based policy into research policy and research management approaches that promote the production of knowledge that can be used for evidence-based policy-making. … So the Department is close to this, has thought a lot about it, and it is a key imperative for the Department. (Key informant)

This informant also highlighted the fact that the implementation of EBP in other government departments can only be encouraged (not enforced in any way) by the DST and DPME:

> Now the difficulty for the Department, of course, is that while it might be responsible for promoting the activities that produce knowledge for evidence-based policy, it is in almost all instances not responsible for those areas of application where that evidence-based policy is developed – housing, water, health, sanitation, environment. The Department has no remit over those areas at all. So in a sense the Department can only encourage those things which serve as input into evidence-based policy-making, but it has very little influence over the uptake of such knowledge and evidence. And that is a bit of a dichotomy for the Department and a source of frustration and difficulty. … The DPME is probably caught in a very similar dilemma because their responsibility really is just to oversee the processes around planning and evaluation that happen in the departments. They are not responsible for

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[22] South African government website: http://www.gov.za/speeches/evidence-mapping-tool-19-sep-2016-0000, accessed December 2016.

> developing the policies of those departments. So inasmuch as evidence is needed in environment, in health, in water, in sanitation, in agriculture, in forestry etc., the DPME is not really responsible for directing how that evidence and knowledge are used in order to formulate policy. They are really only there to oversee the system whereby this *ought* to happen and whether it happens. (Key informant)

The extent to which the DST itself adopts an EBP approach is discussed in Chapter 7.

A second institutional mechanism within the Presidency for EBP support has been the Programme to Support Pro-Poor Policy Development (PSPPD) which falls under the National Planning Commission. Phase I of the PSPPD (2007-2012) aimed at developing 'a cadre of researchers and policy-makers with a deeper understanding of household dynamics and poverty to enable more informed evidence-based policy-making.'[23] Among others, Phase II (2012-2017) continued to provide support to the DPME and the National Planning Commission with regard to evaluation policy and systems and the use of evaluation to improve policy implementation. The three anticipated outcomes of Phase II were to make new and existing research and other evidence available, and to support and finance the generation of new knowledge; to improve the awareness and skills of policy-makers and researchers in generating, analysing and using research evidence; and to work with key stakeholders to identify institutional mechanisms to improve the use of evidence to inform policy-making and implementation.[24]

There is some evidence that government departments have been drawing upon evidence to guide policy choices.[25] As far back as 2001, the Department of Health's *Health Research Policy in South Africa* made reference to the need for EBP. In the foreword to the policy document, then Minister of Health, Manto Tshabalala-Msimang, wrote: 'We are yet to see research that effectively contributes to the development of appropriate solutions and evidence that leads to sound policy formulation' (DoH, 2001). The policy document addresses this issue directly by including a strategy to develop a culture of EBP among civil servants and policy-makers via increasing the number of decision-makers with research backgrounds, providing regular research seminars, and providing appropriate research results for policy formulation and evaluation (ibid.: section 6.3.5). However, a recent study into the use of evidence in health policy-making in South Africa found that health research in South Africa 'is not considered as the major driver of policy decisions' (Naude et al., 2015: 8). In recent years, the Department of Environmental Affairs appears to have been particularly active in attempting to institutionalise EBP practices. In 2012, the Department published the *Environment Sector Research,*

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[23] For example, basic education, social development, health and the national treasury (PSPPD website: http://www.psppd.org.za/pebble.asp?relid=4797, accessed August 2015).

[24] The Presidency website: http://www.thepresidency.gov.za/pebble.asp?relid=7078, accessed August 2015.

[25] PSPPD website: http://psppd.org/research/phase-i-research/psppd-i-policy-briefs/#, accessed August 2015.

Development and Evidence Framework: An approach to enhance sector science-policy interface and evidence-based policy making. In the Preface to the document, the purpose of the Framework is outlined as follows (DEA, 2012: 1):

> This document addresses the need for a common framework for the collection of solid evidence that can be used in support of environment sector policy decisions and for the achievement of sector priorities. In response to the pressing environmental issues of our times the framework is seeking to develop a more rigorous approach that gathers, critically appraises and uses high quality research evidence to inform policy-making and professional practice.

One of the ways in which the framework proposes operationalising EBP is the development of a central knowledge management system 'to facilitate interactions among key stakeholders from the science and the policy domains' (ibid.). Another is the establishment of various forums (coordinating, intergovernmental, theme-specific and multi-stakeholder) to facilitate interaction between actors at the science-policy interface. In 2015, the Department published its *National Biodiversity Research and Evidence Strategy (2015-2025)* which is accompanied by an annual implementation plan that 'details what evidence is needed in the short to medium term to inform policy decision-making, and the medium to long-term evidence that provides the foundational knowledge for the sector' (DEA, 2015: 3). A key informant reported that the Department had some years ago established a small fund (about R1 million) in the Council for Scientific and Industrial Research (CSIR) which they could draw down on as and when they needed short-term research, advice and support.

According to Wilsdon et al. (2014: 40), the practice of seeking evidence-based advice has 'acquired greater weight' since the establishment of the National Planning Commission and the DPME, 'both of which have contracted in the advice of scientists and engineers.' In their case study of advisory processes in South Africa, these authors made a number of observations about how the process works. For instance, they noted that while there are formal routes for requests for advice from individuals or entities on specific matters as well as for inputs into the drafting or amendment of legislation, in other cases 'entities may generate comment on matters in a proactive or ad hoc manner and then present these for consideration' to specific government ministers (ibid.: 39). Furthermore, such inputs may be made available for public scrutiny but that this is not always the case (ibid.):

> In general, except where state security is invoked, policy making in government is performed in an open and consultative manner. The process of soliciting engagement thus takes many forms: a Call for Public Comment regarding a draft bill, new regulations, draft White Papers, intended proclamations in terms of regulations, amendments; Open Calls for Proposals involving tender; closed tenders; public inquiries; Ministerial Committees, Judicial or Ministerial Commissions of Inquiry. … The relevant scientific or professional bodies and entities are specifically and individually invited to participate in and comment on various stages of policy making while these are in progress.

What might be referred to as a support infrastructure for EBP is also emerging in South Africa, with examples in recent years of locally- and internationally-funded initiatives (often in partnership) undertaking capacity-building and intermediary or coordination functions for EBP development and practice. An example of a capacity-building initiative is the Development Research Uptake in Sub-Saharan Africa programme[26] which, working in 22 research-intensive universities in 14 sub-Saharan Africa countries including South Africa, aims to 'improve the accessibility, uptake and utilisation of locally contextualised development research evidence on climate change and environment, health, information, education, governance, food security, and livelihoods to inform sub-Saharan and global development policy and practice.'[27] As part of this programme, MPhil and PhD degrees in Science and Technology Studies, with a specialisation in research uptake and utilisation, were offered by CREST at Stellenbosch University. Short courses are also on offer by various bodies, including local and foreign universities, and government departments,[28] as well as a number of EBP-related workshops and symposia in recent years.[29]

The few examples of the institutionalisation of EBP within government aside, much of the commitment to EBP appears to remain largely at the level of rhetoric. For instance, the PSPPD Policy Brief of July 2011[30] noted that while there is much talk about EBP within government, 'it is not sufficiently recognised by policy makers and in some cases evidence building is not effectively linked to real policy engagement.' More recently, Paine Cronin and Sadan (2015: 2) noted that South Africa 'does not have explicit requirements for the use of evidence in policy making or an explicit set of criteria, norms or guidelines or standardised policy cycle that could be used as a basis for describing and analysing practice.' In 2011, the PSPPD commissioned a study in which 54 senior government officials were interviewed in order to ascertain their attitudes towards and use of evidence in policy-making (Paine Cronin & Sadan, 2015). Generally speaking, there was widespread agreement among

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[26] A joint initiative between the Association of Commonwealth Universities in London and two South African bodies – CREST at Stellenbosch University and Organisation Systems Design.

[27] DRUSSA website: http://www.drussa.net, accessed August 2015.

[28] Two examples include: short courses for senior civil servants provided in partnership by the Centre for the Analysis of South African Social Policy at Oxford University and the Institute of Social and Economic Research at Rhodes University in South Africa; and UCT's Graduate School of Development Policy and Practice which, in partnership with the DPME in the Presidency, offered an introductory course (from 2014 to 2016) on 'Evidence-Based Policy-Making and Implementation' to senior executives at national and provincial levels.

[29] Examples include: the 'Double Symposium on Evidence-Based Advice' in 2006 and a pan-African workshop entitled 'Science Advice for African Scientists: Enhancing capacities in providing science advice to governments' in 2016, hosted/co-hosted by the Academy of Science of South Africa (ASSAf); and in 2008, the CSIR organised a 'Collaborative Workshop on Evidence-Based Policy-Making in South Africa' with specific reference to environmental issues.

[30] PSPPD website: http://psppd.org/research/phase-i-research/psppd-i-policy-briefs/#, accessed August 2015.

interviewees about the value of EBP. The authors note, however, that there was a 'wary response' to EBP and disagreement about what it is in practice and how it can be achieved, as well as 'significant variation in understanding and use of key concepts, norms applied and assumptions regarding the reasons for current problems' (ibid.: 2,4). Key informants generally concurred that while government might have adopted the discourse of EBP, there is limited implementation. One respondent put this down to the challenges of implementing EBP: 'The government as a whole has bought into it. Most departments are paying at least lip service to it, but I think many of them are trying to implement it but are struggling with that.' Another respondent was more sceptical, suggesting that to the extent that government espoused the rhetoric of EBP, this was for political and symbolic purposes:

> You know, the buzz around evidence-based policy-making, it comes to us out of the UK – very much the period of the Blair government … and like so many aspects of what one of our system reviewers called policy tourism, this makes its way to our shores and it acquires a particular cachet, the extent of which it actually means: anything is open to its own evidence. … When the Department of Planning, Monitoring and Evaluation is instituted and enters into the Presidency, one almost gets the feeling that this is there for the benefit of the international community of donors and multi-lateral agencies who will be impressed that we are actually running things according to the most modern approaches, whereas the reality is that the thieves are right there in the pantry and the bank and it's really a joke. … So I have actually come up with my own phrase: not evidence-based policy-making but politically-biased evidence-making; the other way around. Whatever is happening on the ground, you now find noise to justify it. It's the reverse. (Key informant)

4.3 Governance and policy for the South African national system of innovation

Authors such as Dawson et al. (2009) and Van der Meulen and Rip (1998) have described the structures and institutional arrangements of an NSI in terms of different levels or tiers within which role players are organised, including the government or policy level, a strategic level of intermediary bodies, and the operational level of research and development (R&D) performance. Marais (2000: 17) adds to this the international policy and system level and the programme level. The South African NSI incorporates various public sector bodies which operate at different levels including: government ministries and departments; high-level statutory advisory bodies mandated to advise government on innovation-related functions (see section 4.3.4 below); research and innovation agencies (e.g. the National Research Foundation [NRF] and the Technology Innovation Agency); research-performers such as universities, science councils, research laboratories and providers of scientific and technical services; and some state-owned enterprises.

The focus of this study is on the functions associated with 'system-level governance' of the NSI which involves primarily government and intermediary bodies, but also other actors (see below). System-level governance is taken to refer to the institutional arrangements (frameworks, structures, resources, processes and activities) that are involved in the direction, planning, management and coordination of NSI sectors, organisations and actors (public and private), as well as to participation, representation, consultation and negotiation among key stakeholders (CHE, 2004: 173-174; De Boer & File, 2009: 10; Fielden, 2008: 2; Marais, 2000: 8; Ozoliņa et al., 2009: 8-9; Palmberg & Lemola, 2012: 469). System governance involves the 'steering' of NSI sectors, organisations and actors towards particular STI (and national development) goals, through mechanisms such as regulatory frameworks, national policies and strategic plans, targets and priorities, resource allocation and distribution, incentives and sanctions, and M&E[31] (Bailey, 2014: 5-6; Dawson et al., 2009; De Boer & File, 2009: 9; Fielden, 2008: 16; Hjelt et al., 2008: 1; Ozoliņa et al., 2009; Palmberg & Lemola, 2012; Rip, 1998: 27). Effective steering requires agreement (a pact) between key stakeholders about the role(s) and vision for the NSI (cf. Cloete et al., 2011). It also requires the coordination and alignment of knowledge policies, governance instruments and STI activities – across government departments and agencies, and among other key role players in the NSI and sectors of the economy (Bailey, 2014: 6; Dawson et al., 2009: 22; Palmberg & Lemola, 2012). Drawing on case studies of Finland, South Korea and South Africa, Palmberg and Lemola (2012: 471) offer a useful depiction of the vertical and horizontal dimensions of the governance of the NSI, with a specific focus on key public (or semi-public) organisations. Their figure (reproduced as Figure 4.1 below) indicates the 'typical decision-making levels' and 'key governance capabilities within the institutional and organizational framework' required for vertical governance (ibid.). The authors describe horizontal governance (or coordination) as crossing 'the boundaries of distinct policy domains and sectors' (ibid.: 475):

> The development of a horizontal innovation policy involves placing a broader strategic approach above departmental goals by integrating priorities and objectives across various policy sectors. Horizontal governance of innovation policy requires the integration of innovation-oriented thinking into other policy domains and greater attention to interfaces with policy sectors that use and apply science and technology.

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[31] M&E in this context refers to the collection, tracking and analysis of system- and institution-level data and trends, and the development of performance indicators, in order to assess the inputs, activities, outputs and impacts of R&D and innovation (Bailey, 2014: 6; Palmberg & Lemola, 2012: 476).

Figure 4.1: Typical governance structure of a national system of innovation
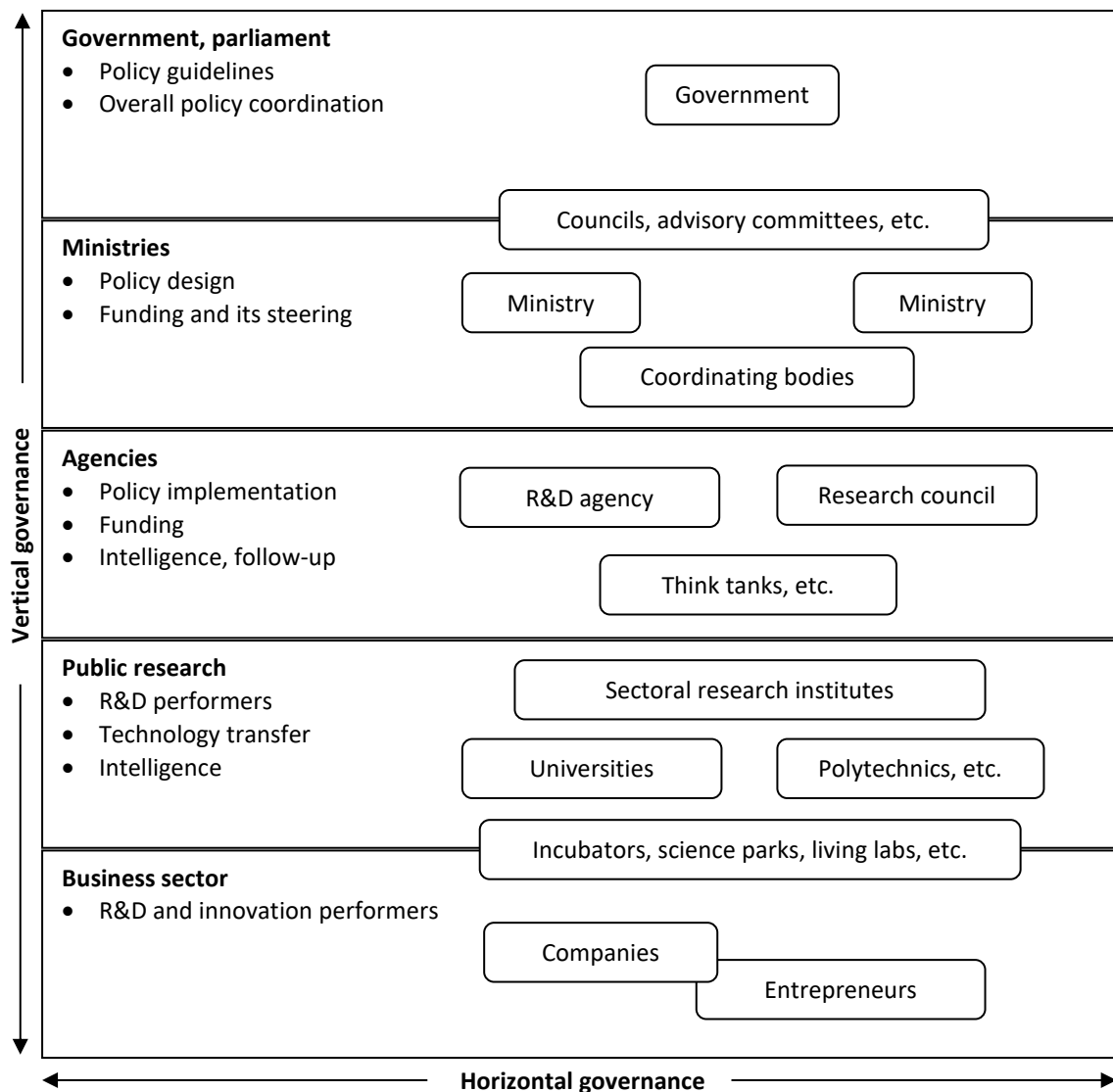
Source: Palmberg and Lemola (2012: 472)

Increasingly, key tasks are delegated to government agencies and other intermediary bodies which undertake a wide variety of functions within an NSI. Such functions include the allocation of government funding and the coordination of competitive funding mechanisms; the regulation of sectors, institutions and programmes; undertaking foresight exercises or evaluations; conducting or commissioning research; policy advice and implementation; identifying priorities; representing NSI 'communities' or interest groups; and acting as a bridge between government, R&D performers and other stakeholders, or between the realm of STI and the business sector (Bailey, 2014; Dawson et al., 2009; Djamal, 2011; Fielden, 2008; Galli & Teubal, 1997; Palmberg & Lemola, 2012). Outside the purview of governance, other functions required for the development and maintenance of an NSI

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are shared by government and other key NSI actors and organisations in both the public and private spheres. Such functions include human resource development and capacity-building; the provision of funding and infrastructure for STI activities; R&D performance; data, policy research and evidence-based advice; the supply of scientific and technical services[32] to the public administration and business; and the diffusion of information, knowledge and technology (see e.g. APCTT, 2011; Djamal, 2011; Dawson et al., 2009; Galli & Teubal, 1997; OECD, 1997; Ozoliņa et al., 2009).

The literature on policy relating to STI is replete with various definitions of what such policy refers to and includes.[33] The key elements – science, technology and innovation – are either described or formulated separately or in some combination, giving rise to various terms that are frequently used interchangeably, such as 'science policy', 'technology policy', 'S&T policy', 'innovation policy' or 'STI policy'. Indeed, the abbreviations S&T and STI are used interchangeably in official DST and NACI documents. S&T policy generally refers to matters relating to support for, and stimulation and structuring of, the science system itself and tends to emphasise the following three interrelated components: the production, acquisition and application of scientific knowledge; the interrelationships between the key roleplayers and institutions in these endeavours; and the resources (e.g. funding and skills) and infrastructure required – all with a view to contributing to national socio-economic development (see e.g. Arvanitis, 2009; Edquist, 2001; Ha-Joon, 2002; IDRC, 1993; Marais, 2000; Neal et al., 2008; Perry & May, 2007; Stine, 2009). As such, national S&T policy may include an explication of the government's vision for S&T and its role in this regard, as well as a focus on the public funding and promotion of basic R&D; the development and provision of the necessary human resources (specifically in SET and mathematics); prioritisation within and management of the science system; the development of S&T infrastructure; and the introduction of regulations, standards, guidelines and performance audit mechanisms relating to scientific practices and institutions. S&T policy may also address the 'interactive processes and procedures – both inside and outside government' (Neal et al., 2008: 9) which are pertinent to the realisation of the objectives of the policy, as well as the relationships between key S&T institutions and the coordination of S&T across relevant government sectors (Marais, 2000: 12).

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[32] The *Frascati Manual* defines science and technological services as including, among others, 'S&T activities of libraries and museums, translation and editing of S&T literature, surveying and prospecting, data collection on socio-economic phenomena, testing, standardisation and quality control, client counselling and advisory services, patent and licensing activities by public bodies' (OECD, 2002: 18).

[33] For more detailed discussions of STI policy, its history and definitions see, for example, Boekholt (2010), Edquist (2001), Lundvall & Borrás (2004), UNCTAD (2011), and World Bank (2010).

Owing to the complexity of the innovation process and the web of interactions and roleplayers involved (both inside and outside of S&T fields), innovation policy is usually regarded as broader than and as incorporating S&T policy, and is thus sometimes referred to as STI policy. Furthermore, STI policy either includes, is related to or informed by policies in other domains such as R&D, trade and industry, STI infrastructure development, technological support services, technology transfer, intellectual property and education (Arvanitis, 2009: 5-6; Edquist, 2001: 46; UNCTAD, 2011: 8; World Bank, 2010: 54). As such, STI policy goes beyond knowledge production, the scientific community and the public sector to include 'management of the "demand side" (the use that firms, farms and public sector entities make of knowledge and technology in the production of goods and services)' (UNCTAD, 2011: 8). STI policies usually also address coordination instruments. For instance, echoing Palmberg and Lemola's (2012) notions of vertical and horizontal governance above, an UNCTAD report highlights the need to 'combine horizontal policies (education and training, access to finance or knowledge dissemination) and vertical ones (to support specific sectors and/or technologies)' (UNCTAD, 2011: 8). Arvanitis (2009: 6, original emphasis) points specifically to coordination in terms of the use of information, data and knowledge:

> This *co-ordination* work has become crucial in areas such as the management of scientific information databases and of useful data, the definition of quality and security norms, the establishment of sound design principles in technological and scientific matters, and more generally the normative and regulatory action of authorities with regard to knowledge and its use.

Policy relating to STI in South Africa is diverse and is created and implemented across a range of government departments and agencies. This is discussed in greater detail in sections 4.3.2 and 4.3.3 below. First, however, I consider the nature of the S&T system inherited by the new democratic government in 1994, as well as discussions and developments in this regard leading up to the elections.

4.3.1   The apartheid legacy and preparation for a new democratic government

In 1994, the new democratic government inherited a peculiarly South African STI system, shaped as it was by apartheid policies of racial segregation and by the country's growing isolation from the world from the 1960s onwards. As such, the system has been characterised as skewed and distorted along the lines of race and gender (STI was largely the preserve of white males), and in terms of the

narrow focus on a handful of strategic areas of STI;[34] as fragmented, inefficient, poorly coordinated and lacking in accountability; as having inadequate knowledge and technology flows from science into industry, low levels of investment in R&D and innovative capacity, and limited networks in the regional and global contexts; as well as by a policy process that was selective, lacking in transparency and legitimacy, and did not allow for public participation (Amuah & Makgoba, 1995; DACST, 1996a; IDRC, 1993, 1995; Kaplan, 1995a; Mouton, 2006; NACI, 2006a; OECD, 2007). As trade unionist Jayendra Naidoo is quoted in the White Paper on S&T as having remarked during the pre-1994 interregnum:[35] 'Science and technology policy was used to underpin the state's oppressive apparatus and bolster apartheid' (DACST, 1996a: 46).

Under the apartheid government, the management of S&T was divided between different ministries, with science the responsibility of the Department of Education and technology the responsibility of the Department of Trade and Industry (DTI) (Kaplan, 1996: 112). Furthermore, government initiatives for the stimulation of a South African NSI were poorly coordinated across government structures and were 'frequently overlooked in policy debates' (DACST, 1996a: 19). It is worth noting here the dominance of the CSIR during the apartheid era – both in terms of scientific knowledge production and funding, but also in terms of its coordination role in the science system. The CSIR was established by an Act of Parliament in 1945 and, according to Mouton et al. (2001: 23), 'was given the task of coordinating all the country's research, public or subsidized.' As such it had the dual task of initiating new research and acting as a funding agency. Reporting directly to the Prime Minister, the CSIR was the de facto scientific advisor to the Prime Minister, although it lost its inter-ministerial status when it was placed under the control of the Ministry of Economics in 1952 (ibid.: 26-27). By way of emphasising the centrality of the CSIR in the system, a key informant reported that during the 1980s, when South Africa was essentially a militarised state, it was the State Security Council that made major decisions about the science system – especially given the predominance of defence-related R&D at the time – and that the head of policy at the CSIR sat on the State Security Council 'basically representing the entire science system.'

There was also an absence of an S&T policy during the apartheid years. According to Grobicki (1992: 172), the publicly-funded Foundation for Research Development, which was established in 1984 and

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[34] The STI agenda was driven by the larger national objectives of self-sufficiency and state security. This resulted in significant government support for R&D in strategic areas such as military defence, food security, liquid fuels and energy (CHE, 2004: 108; NACI, 2004: 4; NACI, 2006a: 19).

[35] The interregnum refers to the period between the unbanning of the ANC and the release of Nelson Mandela in 1990 and the 1994 democratic elections.

distributed public funds to research-performing institutions, 'shifted to funding in terms of individual excellence rather than funding on the basis of research areas and research priorities.' This lack of a national strategy for S&T and the linking of scientific research activities with national development goals was only deepened with the apartheid government's adoption in 1998 of the system of 'framework autonomy' for the management of science councils. As Mouton et al. (2001: 32) describe, this saw a shift from the 'excessive micro-management of the affairs of the councils and introduced a system where the councils could act more autonomously with regard to issues of governance, the setting of research priorities and overall management.' Importantly, it also meant that the government subsidy would be fixed 'in order that the science councils would have to secure additional funding from the market i.e. clients in the public or private sectors' (Kaplan, 1995a: 8). A negative consequence of this was that 'the increased drive towards contract research' meant that 'the research portfolio of most science councils became increasingly market-driven', with the effect that 'less attention was given to socio-economic and development goals' (Mouton et al., 2001: 34).

Following the release of Nelson Mandela and the unbanning of the ANC in 1990, debates and discussions about South Africa's future STI policies and governance arrangements came into focus among members of the mass democratic movement (which included the ANC, the United Democratic Front and other liberation organisations, trade unions and struggle activists, among others) as well as representatives of existing research organisations (e.g. science councils) and universities, in anticipation of the transition to a democratic government. According to Grobicki (1992: 172), the focus on S&T policy within the liberation movement had only started gaining attention from 1990 when the ANC formed the Interim Science and Technology Group.[36] This group, in consultation with other stakeholders in the S&T system at a conference in November 1990, produced a draft position paper on S&T policy, *Towards a Technology Policy for South Africa* (ANC, 1990). Among other recommendations emerging from these processes was the call by the ANC Interim Science and Technology Group 'for the creation of a broadly based national council for S&T' which would comprise 'representatives from industry, the trade unions, agriculture, the technikons and universities, funding bodies [and] the Academy of Science' (Kaplan, 1995b: 70), as well as, at the national level, a Ministry of Research and Technology and a 'politically independent' Office of Technology Assessment (Grobicki, 1994: 217). At the ANC conference in 1992, the now Science and Technology Group put forward various S&T-related policy guidelines which, according to Grobicki (ibid.) were 'rather more guarded concerning future structures' than the 1990 proposals had been, emphasising greater consultation and participation of relevant organisations and stakeholders.

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[36] Renamed the Science and Technology Group in 1991 (Mouton et al., 2001: 37).

Between 1991 and 1995, the Canadian International Development Research Centre (IDRC) – on the request of the ANC, and in partnership with the ANC, the Congress of South African Trade Unions, and the South African National Civic Organisation – conducted a series of missions to South Africa to assist in the transition to democracy. A key activity undertaken by the IDRC was a review of the existing S&T policy in the country. The main outputs of this review were a report entitled *Towards a Science and Technology Policy for a Democratic South Africa* (IDRC, 1993), followed in 1995 by Volume 3 of the series, *Building a New South Africa* (IDRC, 1995).[37] The comprehensive terms of reference of the mission included a review of the organisation of the research system; the arrangements for the formulation of S&T policy within government; linkages between producers and users of research; arrangements for the training of researchers; international linkages; the financing and prioritisation of research; and the current performance of the system against the goals identified for it (IDRC, 1995: 6). A further focus was on assessment of 'the extent to which the current research system meets the needs of the disadvantaged majority of the population, and to indicate where changes – in policy direction, structure or financing – will be needed to address those needs' (ibid.). Finally, the review was to propose the main elements of an S&T policy and institutional arrangements.

The mission's main observations and recommendations related to: the need for a national government-level framework for future S&T policies; a consultative and transparent process of resource allocations; the rearrangement of priorities, especially to move away from the interests of (white) capital to those of the disadvantaged majority; the crisis in education at both school and tertiary levels; transformation of the governance of S&T institutions; the replacement of the Scientific Advisory Council with a more appropriate structure; improving capacity in the country for S&T policy research; and the identification of technology missions that align with national social and economic objectives. According to Kaplan (1995b: 71), the IDRC mission provided 'an initial public forum for dissenting voices from within the S&T system' which was 'later given further expression with the establishment of the Science and Technology Initiative.' The Science and Technology Initiative 'brought together a very wide grouping of persons and organisations concerned with S&T including the S&T performers such as the science councils and universities, but also the professional associations, business and labour' (Kaplan, 1995a: 7). Its purpose would be 'to discuss both issues of immediate concern, relating to transition and those with longer term implications, and to concern

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[37] The other three volumes focussed on economic policy, urban policy, and environment, reconstruction and development.

itself with both policy and system' (Kaplan, 1995b: 74). The working group for the Initiative, which included representatives from the existing S&T system as well as the democratic movement, identified six priority issues that provided a framework for the work of the Initiative. These included the need for information on the existing S&T system; transparency and influence of the existing decision-making and advice-formulating processes; a future S&T system and its decision-making processes; enabling research establishments to respond to major issues; human resources development; and governance (ibid.: 75-76). As will be seen, the areas highlighted by both the IDRC review and the Science and Technology Initiative became core foci of the future work of the new democratic government.

4.3.2   Governance and institutional arrangements post-1994

In order to address the problem of the fragmented and poorly coordinated S&T system and to ensure that the promotion of the NSI remained 'prominent among the list of governmental priorities' (DACST, 1996a: 19), in 1994 the government established the Ministry of Arts, Culture, Science and Technology and its associated Department of Arts, Culture, Science and Technology (DACST) (which included separate 'branches' for arts and culture, and science and technology). The formation of this new ministry marked an important shift in the place of S&T on the national agenda since it was the first time in South African history that there was a ministry dedicated to S&T (albeit linked to arts and culture), effectively raising S&T to Cabinet level (Amuah & Makgoba, 1995: 69; Kaplan, 1996: 122; Mouton et al., 2001: 49). The terms of reference ascribed to DACST in the White Paper on S&T are outlined in Box 4.1 below.

Box 4.1: DACST's terms of reference with regard to S&T

- To promote coherence and consistency in the government's approach to stimulating South Africa's national system of innovation in general, and in its commitment to the support of science, engineering and technology development in particular.
- To promote and co-ordinate interdepartmental and government-wide initiatives relating to the support of innovation and technology diffusion.
- To direct the preparation of a government-wide science budget, in order to permit ministers to assess relative spending priorities, on a multi-year basis, across the full spectrum of government's activities in support of innovation.
- To design and present to ministers a comprehensive system for the management of government science, engineering and technology institutions, in order to ensure that their roles within the national system of innovation are clearly defined, that they have clearly defined and understood objectives, and that they undertake their mandate with efficiency, economy and effectiveness.
- To ensure that the management system referred to above includes adequate arrangements for evaluation of performance against international best practice, and that output measures are in place to indicate the nature of the contribution being made by government science, engineering and technology

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institutions to South Africa's development.

- To manage the process of evaluation and review created within the management system described above and to recommend to ministers any actions necessary as a result of assessments carried out.
- To represent the government in formal international, intergovernmental negotiations dealing with science, engineering and technology and with the promotion of innovation.
- To provide a link between government and the activities of the National Advisory Council on Innovation.
- To commission or conduct any policy research necessary to the fulfilment of the responsibilities set out above.

Source: DACST (1996a: 19)

A Cabinet-level Ministers Committee for Science and Technology was also established in 1994 which comprised ministers whose portfolios encompassed a significant S&T component and was 'the principal policy co-ordinating and information disseminating body for science and technology matters across Government' (DACST, 1996a: 19). At the time of its inception, the Committee included the ministries for trade and industry, health, minerals and energy, agriculture, transport and defence (Mouton et al., 2001: 51).

In August 2002, the Ministry of Arts, Culture, Science and Technology was split and a new Ministry of S&T and its associated Department of Science and Technology (DST) were formed.[38] This development further emphasised the symbolic importance of S&T at the national government level. It is worth noting, however, that the first two ministers were from minority parties in South Africa and not the ANC (Ben Ngubane from the Inkatha Freedom Party and Mosibudi Mangena from the Azanian People's Organisation). It was only in 2009, following the inauguration of the fourth ANC government, when an ANC member (Naledi Pandor) was appointed as the Minister of S&T. According to Marais and Pienaar (2010: 90), it was 'generally anticipated that this … would increase the potential impact of the ministry.' The Ministry and the DST have, since their inception, held the primary functions of policy-making and oversight and coordination of the NSI, as were ascribed to their previous organisational iterations. As such, among the functions assigned to the DST have been oversight of the resourcing and management of public institutions; coordination of STI across government departments and at the system level (e.g. governance framework, priority-setting, and monitoring of performance and finance systems); and direct line management responsibility for S&T[39] (Marais & Pienaar, 2010: 90; NACI, 2006a: 22-24).

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[38] This institutional arrangement was in place until 2019 when, following the general election in May, a new Ministry of Higher Education, Science and Technology was formed.

[39] In 2015, the public entities for which the DST was responsible were the CSIR, the NRF, the Human Sciences Research Council (HSRC), NACI, ASSAf, the South African National Space Agency, the Technology Innovation Agency, and the South African Council for Natural Scientific Professions (DST, 2015).

While Parliament has political oversight of the NSI, the actual work associated with such oversight is undertaken by the parliamentary Portfolio Committee on S&T and includes 'oversight of the work of the DST and its associated institutions' (NACI, 2006a: 23). Other tasks assigned to the Portfolio Committee include consideration of draft legislation and involvement in policy formulation, all of which is underpinned by broad consultation with the public (e.g. through public hearings and submissions) as well as other key stakeholders in the NSI (Marais, 2000: 25; Mouton et al., 2001: 60-61).

Governance tasks also fall under the purview of other ministries that have STI-related responsibilities (e.g. those related to trade and industry, agriculture, health and defence) (Dawson et al., 2009: 21; Fielden, 2008: 7). Such government departments fund and/or perform R&D and/or are responsible for specific institutions in other STI-related sectors. Key examples in this regard include the DTI which supports research and innovation at industry level, as well as the Departments of Agriculture for the Agricultural Research Council, Minerals and Energy for Mintek and the Council for Geoscience, and Health for the Medical Research Council.

Finally, there are consultative forums which provide platforms for 'addressing challenges common to the institutions in [the NSI] and the formulation and communication of a common position to government' (NACI, 2006a: 35). The Science and Technology Initiative was dissolved in 1994 and reconstituted as the National Science and Technology Forum (NSTF) in 1995 'for the purposes of consultation on science and technology issues between the ministry and the broad S&T community' (Kaplan, 1995b: 76). The NSTF is a non-profit, multi-stakeholder umbrella body for more than 100 public and private sector organisations with an interest in STI (e.g. science councils, higher education institutions [HEIs], government departments, state corporations and utilities, civil society and labour organisations, non-governmental research organisations, and the business sector). It describes itself as a 'consultative forum and watchdog for influencing the formulation and delivery of [SET] and innovation public policy in South Africa.'[40] Other examples of consultative bodies include the Committee of Heads of Organisations of Research and Technology (science councils and other public research institutions), and Universities South Africa which represents the interests of the university subsector.

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[40] NSTF website: http://www.nstf.org.za/about/what-we-do/, accessed September 2016.

4.3.3   Key STI policy and strategy developments post-1994

Given that the focus of this study is on NACI and its principal the Minister of S&T and, by association, the DST, the discussion of key policy developments relating to STI post-1994 that follows is confined almost exclusively to the work undertaken by this body.

One of the first tasks of the new Ministry of Arts, Culture, Science and Technology was the development of a consolidated policy on S&T which, following a consultative Green Paper process, resulted in the *White Paper on Science and Technology: Preparing for the 21st Century* (DACST, 1996a).[41] The White Paper on S&T placed considerable emphasis on the importance of S&T for South Africa's development and contextualised the new S&T policy in terms of two national imperatives: to address the development needs and inequities inherited from the apartheid era, and to transition the country to a knowledge-based economy and increase its competitiveness in the global economy (ibid.: 5-6). The White Paper was thus formulated within the broader macro framework for economic development in the country which, at the time, was the Growth and Development Strategy.

According to Palmberg and Lemola (2012: 473), these goals, together with the fragmented, inequitable and inefficient apartheid legacy, 'prompted the South African government to adopt a broader and more holistic innovation system approach to policy that could better direct activities toward common socioeconomic goals.' As such, the White Paper on S&T adopted the notion of a 'national system of innovation' as the guiding framework for policy development and coordination. The White Paper defined an NSI as 'the means through which a country seeks to create, acquire, diffuse and put into practice new knowledge that will help that country and its people achieve their individual and collective goals', and was seen to comprise an interactive 'set of functioning institutions, organisations and policies' (DACST, 1996a: 10-11). The White Paper's conceptualisation of an NSI incorporated the emphasis on innovation and not simply the production of knowledge. Innovation was seen to contribute to improving the lives of all South Africans by 'progressively increasing economic growth and enhanced participation in the economy' and 'by innovative and pervasive personal and social development of the nation's people' (Ministerial Review Committee, 2012: 9). The key policy proposals in the White Paper on S&T with regard to the development of an NSI focused on capacity-building, human resource development and inequity redress; promoting innovation; re-allocating government spending according to new priorities; and introducing a longer-term perspective in planning and budgeting, as well as institutional changes and new management

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[41] Hereafter referred to as the White Paper on S&T.

approaches (DACST, 1996a: 46). The White Paper also announced the creation of a National Advisory Council on Innovation which was established in 1997 (see Chapter 5).

The next major development was Cabinet approval of *South Africa's National Research and Development Strategy* (DST, 2002)[42] as the guiding framework for the development of the NSI. The R&D Strategy built on the policy groundwork laid by the White Paper on S&T and was the newly-formed DST's response to the need for strategic direction for the publicly-funded S&T system and 'for creating an enabling environment' for the NSI as a whole (ibid.: 9). The strategy identified key weaknesses in the system including those relating to funding mechanisms, human resources, R&D in the private sector, intellectual property, and the fragmentation within government relating to governance of the NSI. The strategy elaborated details for implementation in certain areas such as enhancing innovation, promoting new national S&T missions, diversifying and transforming human resources for S&T, and creating an effective government S&T system. With regard to the latter, the strategy noted that while the DST had made significant strides at the level of individual institutions, there was still considerable fragmentation at the systemic level. In this regard, the R&D Strategy stated that to 'a significant extent this [had] been as a result of unwillingness to confront contradictions in and between departmental mandates established in a different political era' (ibid.: 61). As will be seen in Chapter 5, the identification of new S&T missions (biotechnology, information technology, technology for advanced manufacturing, technology for and from natural resource sectors, and technology for poverty reduction), and the emphasis on human capital development, would become central focus areas of NACI's work for many years. The DST was marked as the central body responsible for giving effect to the R&D Strategy.

In 2007, the DST published its *Ten-Year Innovation Plan 2008-2018* (see DST, 2008).[43] A key informant explained that this was essentially a strategic plan for the DST only, although there are references to its role in respect to interfacing with other government departments: 'The central role of implementing the plan was the DST's. The White Paper is different; the central role of implementing the White Paper is that of Cabinet through the agency of DST as a coordinator.' The Plan built on the foundations laid by the R&D Strategy but focused more specifically on the continued development of the NSI 'in support of the transformation to a knowledge-based economy' (ibid.: 4). According to the Plan, progress towards a knowledge-based economy would be driven primarily by human capital development, knowledge generation and exploitation (R&D),

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[42] Hereinafter referred to as the R&D Strategy.
[43] Hereinafter referred to as the Ten-Year Plan.

knowledge infrastructure, and 'enablers to address the "innovation chasm" between research results and socio-economic outcomes' (ibid.: 6). The Plan emphasised innovation as the 'key to scientific and technological progress', but stressed that the aim was not 'innovation for its own sake' but rather that 'innovation revolution must help solve our society's deep and pressing socio-economic challenges' (ibid.: 1). It presented a set of 'grand challenges' for S&T based on the DST's projections for 2018.

In 2012, the National Planning Commission published the NDP (see NPC, 2012), the primary aim of which is to eliminate poverty and reduce inequality by 2030. In the Plan, science, technology and innovation are frequently referred to as important mechanisms for achieving these goals. For instance, the NDP states that S&T 'are key to equitable economic growth, because technological and scientific revolutions underpin economic advances, improvements in health systems, education and infrastructure', and that innovation 'is the primary driver of technological growth and drives higher living standards' (ibid.: 93). As an ASSAf review of the STI system in South Africa notes, the NDP takes the coordination of STI across government and the NSI to the next level through 'novel thinking about innovation' (ASSAf, 2013: 43):

> [The NDP] gives greater prominence to STI than any of the preceding policy documents and, importantly, adopts and advocates a system-wide view of STI in relation to broader society. It takes the concept out of the sole domain of the DST and considers it to be relevant across government. Any recommendations to reenergise the NSI cannot be seen in isolation from the NDP, and innovation actually becomes a key enabler for many of its elements.

In 2016, the DST published its *Human Capital Development Strategy for Research, Innovation and Scholarship* which then Minister Naledi Pandor, in the foreword to the Strategy, described as 'a framework that systematises and codifies the Department's human capital development interventions within a strategic context' (DST, 2016: 3).

Since the publication of the White Paper on S&T, a number of subsector-specific policies, strategies and frameworks relating to the NSI have been developed by the DST, including the *National Biotechnology Strategy* (2001), the *Advanced Manufacturing Technology Strategy* (2002), the *Indigenous Knowledge Systems Policy* (2005), the *Youth Into Science Strategy* (2006), the *Nanotechnology Strategy* (2006), the *ICT Research and Development and Innovation Strategy* (2007), the *Bio-Economy Strategy* (2013), the *National Strategy for Multi-Wavelength Astronomy* (2015), the *South African Additive Manufacturing Strategy* (2016), and the *Basic Sciences Development Support Framework* (2016).

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In terms of policy imperatives, at the highest level government 'sets its key policy priorities based on the mandate it receives from the electorate' while government departments 'need to develop their programs based on the policy priorities of Cabinet' (DPSA, 2003: 45). The Minister of S&T and the DST derive their policy imperatives from various key national sources including the NDP and Cabinet, as well as the various iterations of macro-economic policy, and these need to be reflected in the Department's annual strategic plans. A key informant explained that the priorities for the DST are not very different from those of the Department's priorities for the system as a whole (e.g. human capital development): 'There are some of course that are unique to the operations of the Department … like being more efficient and effective in its operations, reducing costs, those sorts of things.'

Finally, there was general consensus among key informants that STI is not a politicised domain insofar as there is agreement across the board about its importance and thus, for instance, no contestation among political parties for the need for investment in S&T. The policy domain was also described as relatively stable from a politico-administrative point of view, and as not having been susceptible to the corruption as has occurred in other government departments.

> Politics is always critical, there's no question. But I don't think at a monitoring and evaluation level. Certainly it plays a big role in the role that science and technology has a kind of Cinderella role – government has so many other priorities, allocations that are quite limited … But it's a double-edged sword. It's been the one system that has had real consistency, like the DGs, consistency at the top – quite outstanding in that way, I think we've only had three DGs since 1994. And our Ministers have largely been good Ministers. So we've had reasonable political leadership and at the individual institutional level … But the system as a whole, I don't think that has been a problem. I don't think politics with a small 'p' has been a problem. I mean it's not like people say: we don't want to get evaluated because it might show us in a bad light. (Key informant)

> The importance of science, technology and innovation to the policies that other government departments ought to be pursuing, or to be developing, does not make science and technology a politicised portfolio or responsibility. And that's true I think in all countries of the world. It's not contested. It's intellectually accepted as important but it's not seen as politically important. … You can see that in that when it comes to parliamentary debates and so on, it's an area in which the opposition and the government, in almost all countries, don't really battle it out. They have very similar perspectives. The only difference might be in how different government departments decide to manage science and technology – whether they manage it in the context of higher education as a kind of cultural good, or whether they manage it in a department of business and enterprise as a kind of economic driver, or whether they manage it as a separate department of science and technology. (Key informant)

> Firstly, let me say that I tend to work with more than one department [DST and Department of Higher Education and Training], and I work with the senior level. I'm not sure in those departments that I've worked with that I've ever encountered that they felt they were threatened [politically]. But these are two departments that have not been in the news for the wrong reasons! Both DHET and DST get clean audits year after year. The officials we've worked with – various DGs and Deputy DGs – they don't get

redeployed; they retire or --. And also you go to the budget vote in Parliament. For science and technology it's like all the parties are agreeing with one another – you know, the [Democratic Alliance party] says: give more money for science and technology; the [Economic Freedom Fighters party] says: give more money for science and technology. So I haven't seen it in like, let's say, other departments where the DGs keep changing. (Key informant)

Of course it's politicised, the whole science system is politicised in the way people tailor their objectives to the wind blowing from the Presidency in Pretoria, but less so because the opportunities for looting have been much more restricted. … It's only when something is up for grabs and it's big enough that the hyenas begin to gather. Otherwise leave it alone – I mean, who cares about science. There's no value to be had in messing in that. There are much bigger pots to go for. (Key informant)

4.3.4   Policy advice for the national system of innovation

According to Wilsdon et al. (2014: 38), the South African government has access to a 'loose and highly elaborated network of centres of scientific advice', both statutory and non-statutory in nature, from which it can obtain scientific policy advice. Unlike some other countries, the government does not have an office of a chief science advisor. The Minister of S&T can, however, 'appoint personal advisors with specific technical or scientific expertise' (ibid.). In this regard, Pistorius (2008: 78) notes different preferences among Ministers with regard to the use of personal science advisors (e.g. while Minister Mosibudi Mangena elected not to have personal advisors, Ministers Ben Ngubane and Naledi Pandor did). The DST itself is a core advisor to the Minister. For instance, for a period of time the DST had as one of its programmes 'Science and Technology Expert Services' whose role it was 'to support the department by providing expert services in science and technology policy, implementation, monitoring and reviewing initiatives', and NACI was located in this programme (DST, 2006a: 18).

Of course, NACI is the advisory body mandated to provide advice to the Minister of S&T. Two other statutory bodies are mandated to provide STI-related advice to their respective ministers. ASSAf, which also falls under the purview of the DST, was established by the Academy of Science of South Africa Act (No. 67 of 2001). It is mandated to promote common ground in scientific thinking, to advise the Minister of S&T on matters concerning science, and to undertake research and investigations relating to its objectives as the Minister may assign to it. The CHE, established in 1997 by the Higher Education Act (No. 101 of 1997), is mandated with advice, quality assurance and monitoring functions. In its advisory capacity, the CHE's advice must be sought on, among others, the scope and range of operations of public and private HEIs individually or as a group; or decisions

pertaining to quality assurance, research, the structure and planning of the higher education system, and mechanisms for the allocation of public funds. The CHE falls under the purview of the Department of Higher Education and Training (DHET).

The Minister of S&T and the DST can, and do, draw on advice and expert input from across the system (see Pistorius, 2008; Wilsdon et al., 2014). Indeed, as the OECD Review (2007: 12) observed: 'South Africa has developed a strong capability to provide strategic intelligence and analysis to support policy.' Within the government sphere this would include other government departments; the science councils; government agencies (e.g. the NRF and Statistics South Africa); national facilities (e.g. the South African National Space Agency, the National Health Laboratory Service, and the Technology Innovation Agency); and state-owned enterprises (e.g. Eskom, Denel and PetroSA). Some government departments with STI-related foci have advisory functions embedded in their work through different kinds of structures (see examples provided in Box 4.2 below). Policy advice can also be sought from various sources outside of government, such as from individual experts or research institutes/units within universities, as well as non-governmental and sectoral stakeholder bodies which operate 'at the interface of the macro, intermediate and performer levels' within the NSI (Mouton et al., 2001: 64). Current examples include the NSTF, trade associations, professional bodies and business organisations, the Committee of Heads of Organisations of Research and Technology, and Universities South Africa.

Box 4.2: Examples of advisory functions embedded in the work of government departments

- The DTI's Economic Research Advisory Network[44] comprises representatives from the national and provincial economic development government departments, government entities, universities and research institutions. The Network's core functions are to advise, support and advocate for quality research. Also associated with the DTI is the National Small Business Advisory Council, which acts as an advisory body to the Minister of Trade and Industry on matters pertaining to the promotion of small business in the country.[45]
- The Department of Agriculture, Forestry and Fisheries contains a Directorate for Research and Development. The primary role of this Directorate is to 'advise on and promote the sustainable utilisation of fisheries resources and ecosystems, and the sustainable development of aquaculture by leading, managing and supporting appropriate natural science and fisheries research.'[46] The Directorate appoints a number of scientific working groups to formulate evidence-based advice.
- The Department of Mineral Resources' Mineral and Petroleum Board[47] is mandated to provide advice to the Minister for Mineral Resources on, among others, the sustainable development of the nation's mineral and petroleum resources, and the transformation and downscaling of the minerals and

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[44] https://www.thedti.gov.za/ERPC/ERAN.jsp, accessed November 2015.
[45] National Small Business Advisory Council Strategic Business Plan April 2010 – March 2013.
[46] http://www.daff.gov.za/daffweb3/Branches/Fisheries-Management/Fisheries-Research-and-Development, accessed November 2015.
[47] http://www.dmr.gov.za/mineral-a-mining-board.html, accessed November 2015.

> petroleum industries. Also in this policy sector, the Mine Health and Safety Council is mandated to 'advise the Minister of Mineral Resources on occupational health and safety legislation and research outcomes focused on improving and promoting occupational health and safety in South African mines.'[48]
> - The Department of Environmental Affairs' Environmental Advisory Services division's main purpose is to 'provide strategic environmental advisory and implementation support services to the department's national and international environmental and sustainable development mandates.'[49]

In their review of the provision of science advice in South Africa, Wilsdon et al. (2014: 39) argued that the 'strength of the present 'model' is its informality and diversity, thereby allowing many voices to be heard.' A key informant echoed this view:

> What we have in South Africa – and it's a strength – is a decentralised informal system of providing science advice. Whether it is listened to is another matter but we have it and that's because we have a very dispersed science system where it's not that difficult to find an expert on land or an expert on ecology or an expert on bees or an expert on water. We have got all of these people [and] you can get high quality advice from international experts. (Key informant)

However, Wilsdon et al. (ibid.) also point to the weaknesses inherent in the system, namely 'that coordination of effort is difficult, and its informal nature results in a contestation between sources of advice for a share of the limited resources available to advisory entities.'

Finally, a significant source of evidence-based advice relating to the NSI has been the various audits, reviews and priority-setting exercises relating to the NSI (STI policy and institutional arrangements) that have been undertaken over the years. These are summarised below, and some are referred to quite extensively in subsequent chapters. They also provide the reader with an idea of the areas of STI governance, policy and performance that have been of concern over the years – an important context and potential area of contribution for NACI.

Reviews of STI policy and landscape

One of the DACST's first initiatives was the National Research and Technology Foresight Project which aimed to involve key stakeholders in identifying research and technology priorities for the next 10-15 years. Begun in 1995, the project involved a series of workshops across the country during which 12 key sectors were identified[50] as well as three cross-cutting sectors[51] (DACST, 2001: 99; Mouton et al., 2001: 92). Each of the sectoral reports included a 'prioritised list of research and

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[48] http://www.mhsc.org.za/, accessed March 2016.

[49] https://www.environment.gov.za/branches/environmental_advisoryservices, accessed March 2016.

[50] Including agriculture and agro-processing, biodiversity, financial services, energy, environment, health, information and communication technologies, manufacturing and materials, mining and metallurgy, crime and crime prevention, tourism, and youth.

[51] Beneficiation; business development; and education, human resource development and skills development.

technology topics' as well as 'long-term research and technology objectives' and strategies for achieving these (Mouton et al., 2001: 93). The final report was presented to President Thabo Mbeki in March 2000. The White Paper on S&T had noted that the results of the exercise were to inform areas such as R&D investments, the science budget, the management of the Innovation Fund, and 'the system of support for research capacity building in the higher education sector' (DACST, 1996a: 21).

In 1997, the Ministers' Committee on Science and Technology mandated DACST to initiate a system-wide review of public sector science, engineering and technology institutions (SETIs) (see DACST, 1998a)[52], which was undertaken by teams of local and international experts. The aim of the review 'was to establish how these institutions could be restructured in line with broad national goals' (Mouton et al., 2001: 93). The recommendations of the report related to independence, alignment, transparency and accountability; planning and M&E; funding levels and modalities; leadership and strategic management; transformation and human resources; interaction, integration and co-operation; commercialisation; internationalisation and strategic alliances; and restructuring.

In 1998, DACST commissioned the erstwhile Foundation for Research Development to undertake a National Research and Technology Audit (see DACST, 1998b), the final report of which was based on the findings of five surveys, and the inputs of an analytical task team comprising individuals from universities, government departments and consultancies as well as several external reviewers. The audit investigated the existing S&T environment including government policy initiatives and current and future needs, roles and challenges of the S&T system; and the state of S&T infrastructure, human resources, R&D outputs, the technology base of the business sector, and research and training equipment. According to Mouton et al. (2001: 84), the results of the audit were intended 'to provide data and information as an input into policy making.' The report reflected on the implications of the findings and made a series of recommendations. Among these were observations relating to the national-level governance of the system including that while the government had established clear socio-economic priorities, the 'mechanism for translating these national priorities into desired outcomes and priorities for entities within the science and technology system [had] yet to take effect' (DACST, 1998b: v). Furthermore, while a range of appropriate governance structures for S&T had been established, the challenge remained to ensure that these structures and systems would 'function to create a coherent interface' between the national S&T system and the NSI, and

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[52] The institutions included in the review were the Africa Institute of South Africa, the Agricultural Research Council, the Atomic Energy Corporation, the Council for Geoscience, the CSIR, the HSRC, Mintek, the Medical Research Council, the South African Bureau of Standards, the South African Weather Bureau, and the NRF.

that such coherence would be reflected in the outputs and outcomes as related to the national macro-economic goals (ibid.: vi).

The next major review was that undertaken by the OECD in 2007 on innovation policy in South Africa. The review was requested by the DST and drew input from a background report on the South African NSI produced by NACI (see NACI, 2006a) as well as interviews with key stakeholders across the system. A very comprehensive review, the final report (see OECD, 2007) covered aspects such as economic performance and structural adjustment, features of and policy challenges facing the current innovation system, the business sector in innovation, as well as the institutions, policy implementation and governance related to innovation. While pointing to the significant strides made since 1994, the report highlighted a range of remaining challenges and made recommendations in relation to shortcomings in policy responses such as the practical implications of a too-narrow definition of what constitutes the NSI; decision-making and choice which results in spreading limited resources across too many activities; limited connection between strategies and their implementation; and organisational structure governance issues relating to vertical specialisation and differentiation and horizontal integration and coordination (ibid.: 15-17).

In July 2010, the Minister of S&T commissioned a ministerial committee to review the STI landscape, the final report of which was delivered to the Minister in 2011 (see Ministerial Review Committee, 2012). The review was structured into two phases. The first aimed to provide advice to the Minister on the 'degree to which the recommendations of the OECD Review [2007] had been acted upon' and the 'adequacy of existing documentary data to inform an assessment of the strengths, shortcomings and responsiveness of the system' (ibid.: 2). The second phase involved a review of the NSI in terms of size and shape, governance and structure, resourcing and financing, capacity for M&E, and adaptability of the system to changing circumstances. Specifically, phase two required the committee to make recommendations relating to coordination and coherence as well as institutional arrangements and structures for optimising the system. As such, the recommendations spanned aspects including a framework for and governance of the NSI, an enabling environment for innovation in the private and social sectors, human capital and knowledge infrastructure, M&E, and financing for the system. One of the critiques of the report was 'the lack of effectiveness of the means that government has mobilised, especially those centred on the roles and powers of the DST and NACI as designated coordinators of an otherwise fragmented and diverse NSI' (ibid.: 61). In this regard the review pointed to the 'blurring of boundaries between the functions of various important

public sector agencies, while line-function sectoral agencies have maintained impermeable boundaries and operated quite autonomously in spite of declared policy intent' (ibid.).

In 2012, the DST commissioned ASSAf to undertake a review of the state of the STI system in South Africa (see ASSAf, 2013). Described in the executive summary of the report as an 'independent critical appraisal', the review built on the 2007 OECD Review and the 2012 Ministerial Review Committee report (ibid.: 9). The review distinguished itself from these earlier initiatives in terms of its focus on addressing the gaps in the NDP relating to STI; employing economic analysis and consensus-reporting (rather than policy analysis as such); and drawing on international experience to assist in teasing out the issues (ibid.: 9,15). The recommendations of the report focused on, among others, the lack of clarity surrounding the notion of an innovation system; how the NSI can be better harnessed to contribute to the imperatives and objectives of the NDP; and possible future areas of research.

Finally, in 2015, the Minister of S&T constituted a ministerial review panel to undertake another review of the South African STI institutional landscape, the final report for which was published in 2017 (see Ministerial Review Panel, 2017). Based on an extensive diagnostic analysis of the state of the STI landscape which included a survey, interviews with numerous stakeholders, desktop research, reviews of relevant reports, and the experience and expertise of the panel members, the review made a range of recommendations relating to the policy framework, mandate, efficiencies, expansion and regulation of public research institutes.

However, despite the numerous evidence-based reviews of the NSI over the years, a key informant noted that the DST had not always taken the advice:

> The OECD Review of 2007, could you describe that as evidence-based policy? If the answer is yes, then the next question is: well, the Department received internationally recognised evidence regarding certain aspects of dysfunction. Did the Department act on it? Is there any evidence of action? When you are given literally the best possible advice which you've even paid for – what did you do with it? (Key informant)

The 2012 review report made similar observations. For instance, in the preface it noted: 'The Committee was conscious of the prior efforts of numerous reviews and evaluations that recommended significant NSI organisational and structural changes, only to see things remain as they were' (Ministerial Review Committee, 2012: 1). With regard to the National Research and Technology Foresight exercise, the report noted (ibid.: 56):

> The immense effort of the [National Research and Technology Foresight] was not rewarded with take-up in line departments or even in the policy trajectories of the DST itself. The main legacy of the exercise (as in the case of the Green and White Papers before it) was the entrainment of a large number of potential participants in the national S&T policy-making and development agenda, some remaining engaged in a diversity of ways, and others becoming passive onlookers or active critics from the vantage of their main preoccupations.

With regard to the 2007 OECD review, the report noted that the DST's Ten-Year Plan did not address some of the most central recommendations of the review – 'especially bringing the private sector more centrally into the NSI, and resolving the considerable vertical and horizontal coordination difficulties arising from the current governance and institutional architecture of the NSI' (ibid.: 10-11).

4.4   Conclusion

The new government in 1994 had its hands full in terms of transforming and strengthening the fundamentally flawed apartheid S&T system (to the extent that it could be called a system), which has variously been described as inequitable in terms of race and gender, focused on a narrow set of strategic interests with low levels of investment and innovative capacity, fragmented and poorly coordinated, and a policy process that was lacking in transparency and legitimacy. There was also no formal S&T or innovation policy. At the same time, the system did contain pockets of excellence in certain science councils (such as the CSIR) and top-performing, historically white universities, which were well-resourced, contained powerful and influential individuals and networks, and the support of the political administration. Although S&T had not been a strong focus in the policies of the ANC and other liberation organisations during apartheid, it was on the agenda during the interregnum in preparation for the transition to a democratic government. A major input in this regard in the early 1990s was the IDRC review of S&T policy in South Africa which undertook detailed analyses and made recommendations for changes at every level of the system.

The years following the 1994 election saw a flurry of institutional and policy development and reform in the country in general. Alignment with 'national objectives' was a standard practice as the nation corralled its resources to set the reconstruction and development of the country in motion. The buzzword was 'transformation' and the intention across the board was to create new conditions that would bring about the re-envisioned South Africa. In line with the national agenda, significant steps were taken to get the ball rolling with the transformation of public sector S&T into a system that was equitable (particularly along the lines of race and gender) in terms of both participation in

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and benefits of S&T, and which could contribute to socio-economic development in the country. Starting with the foundational White Paper on S&T in 1996 and the R&D Strategy in 2002, the ministry responsible for S&T has produced a range of strategies, plans and subsector-specific policies. From the outset, DACST and its later iteration the DST were accorded the functions of promoting coherence and coordination across the NSI and inter-governmentally (policy, strategies, initiatives and activities); monitoring and evaluation performance and finance systems; oversight of and advising the Minister on policy, governance, resourcing and management relating to the public sector; line function responsibility for certain science-performing institutions; and providing the link between government and NACI. On the whole, S&T has not been regarded as a particularly politicised domain – everyone appears to agree on its importance and it has had a relatively stable politico-administrative system.

In addition to the formally mandated bodies such as NACI, ASSAf and the CHE, the government has had access to a diverse and largely informal pool of advice for S&T. There have also been a number of substantial external reviews of STI governance, policy and institutional arrangements undertaken over the years which have offered comprehensive, expert advice for the Minister, the DST and other key stakeholders. If these external reviews are anything to go by, while some improvements have been made in the system since 1994, it is still beset with challenges, including those relating to governance (particularly coordination of the NSI), priority-setting and policy implementation, among many others. With this background context in mind, I now turn to the institutional case study of NACI in the following chapter.

CHAPTER 5: THE NATIONAL ADVISORY COUNCIL ON INNOVATION

5.1   Introduction

In this chapter, I explore NACI's institutional and organisational design and highlight changes in these features over time. The review covers NACI's advisory mandate as articulated in the NACI Act; NACI's structure, composition, financing and accountability; and the ways in which NACI goes about formulating its advice, including the guiding principles and procedures followed, the nature of the inputs into the process, how the advice is formulated and finalised, and how and to whom it is communicated. In Chapter 6, I take a deeper look at how NACI's institutional and organisational design plays out through the lens of one of NACI's long-term advisory initiatives, and in this provide an idea of the nature of NACI's advisory outputs. This chapter concludes with a brief overview of assessments of the effectiveness of NACI and its advice. To begin with, however, this chapter goes back in time to explore the historical roots of NACI, with a brief sketch of the science advisory landscape during apartheid, and some of the discussions and influencing factors that laid the groundwork for the shape and form that NACI ultimately took.

The data for this chapter are gleaned from three primary sources. The first is official NACI and DST documents such as annual reports and corporate business plans. The second is interviews with key informants which provide clarification and nuance of official accounts, and which represent a cross-spectrum of voices and perspectives from within NACI and among external actors. The third source of data comprises various reviews of NACI undertaken over the years which extend the range of voices and inputs, given the composition of the review panels as well as the people they interviewed and the documents they were able to source. The first external review, commissioned by the NACI Council and administered by the NRF, was conducted in October 2002 by an external review panel (see Gevers et al., 2002).[53] The focus of the review was on NACI's performance in executing its statutory mandate over the period 1998-2002. The recommendations of the review report covered issues to do with, among others, NACI's role in the NSI; the need for role differentiation between NACI and other key roleplayers in the NSI; the need for NACI to focus its advice on innovation in particular; the methodology employed by NACI in the formulation of its advice; as well as NACI's

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[53] The review panel included Wieland Gevers (Deputy Vice-Chancellor, UCT), Saleem Badat (CEO, CHE), Dennis Hunt (South African Chamber of Business) and Jim Mullin (Mullin Consulting Ltd, Canada).

organisational structure, resources and the composition of the Council. An external peer review of NACI's second term of office (with emphasis on the period 2004-2007) was commissioned by the Minister of S&T and undertaken in May 2008 (see Havenstein et al., 2008).[54] The review explored, among others, the relevance of and performance relating to NACI's mandate, objectives and functions as set out in the NACI Act; NACI's independence, objectiveness, transparency and governance; the role differentiation between the leadership of NACI; the operations, structure and competencies of the NACI Secretariat; and possible future areas of NACI's focus in the provision of advice in relation to the evolving context of the NSI. NACI has also been the subject of other reviews focusing on the NSI as a whole. Significant among these, both of which were highlighted in Chapter 4, were the 2007 OECD review of South Africa's innovation policy, and the 2012 Ministerial Review of the South African STI landscape. Together, these reviews served, in many instances, as catalysts for change relating to NACI's structure and role, and the substantive critiques and recommendations of the reviews are highlighted throughout this and subsequent chapters relating to particular themes.

5.2   The roots and genesis of NACI

What follows is more of a sketch than a comprehensive history of the antecedents of NACI. Indeed, that would constitute a study of its own. The aim of this section, rather, is to provide some context to the emergence of NACI in terms of some of the discussions, debates and proposals that preceded its establishment. The historical narrative constructed here has been pieced together from a selection of key sources including interviews with three individuals who were involved in some way or another in the discussions and developments regarding the STI landscape and policy from the final days of apartheid and into the new democratic dispensation; a symposium held in 1992 which focused on the future of research in South Africa, and which involved academics and others from within the mass democratic movement, as well as representatives from existing statutory bodies; the IDRC reports (1993, 1995); as well as other reports written by local academics on the STI system in South Africa and its advisory landscape. There is always the risk of presenting an historical account as a cohesive narrative. In this regard, it should be noted that when reference is made to groupings such as the apartheid government, the mass democratic movement or the S&T system, these were

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[54] The review panel, appointed by the Minister, included Ralph Havenstein (former CEO, Anglo Platinum), Susan Cozzens (School of Public Policy, Georgia Institute of Technology), Per Koch (Research Council of Norway) and Phuti Ngoepe (University of Limpopo).

not homogenous in their perspectives or views; rather, they were sites of engagement and contestation among competing factions and interests.

5.2.1 The apartheid science advisory landscape

In his review of the history of science advisory structures in South Africa, Pistorius (2008: 53) notes that the country 'is no stranger to the notion of advisory bodies that provide independent advice to government, including scientific advisory bodies.' The first such advisory body, the Industry Advisory Board, was established in 1916.[55] Sponsored by the then Ministry of Mines and representatives from commerce and industry, this was the first government initiative 'to support academic and industrial research' (NACI, 2006a: 19). The Board established a Scientific and Technical Committee which, among others, formulated an industrial development policy (Mouton et al., 2001: 20). The first Scientific and Technical Advisor (Hendrik van der Bijl) to the Prime Minister was appointed in 1919, a move which Pistorius (2008: 53) characterises as representing 'one of the most important developments in the first decade of formal science and technology policy development' in South Africa. Following the Second World War, in 1945 a Scientific Advisor to the Prime Minister was appointed (Basil Schonland) whose 'major objective was to formulate a strategy for establishing a body to advise the South African government on the best methods to co-ordinate scientific research in the national interest and for developing the country's natural resources to the full' (ibid.: 54). Following the Canadian and Australian research council models at the time, the Scientific Research Council Act was passed in June 1945 which led to the establishment of the CSIR as a state research laboratory (Marais, 2000: 69; Pistorius, 2008: 54). As such, the CSIR was a primary source of advice to the government. Over time, other research institutes were established including, among others, the Atomic Energy Corporation, the Council on Minerals Technology (which later became Mintek), the Council on Geosciences, the Medical Research Council and the HSRC which, according to Pistorius (2008: 55), despite their core focus of R&D in their respective fields, 'were also in one way or another involved in producing science advice.'

The next major development was the establishment, in 1962, of the Scientific Advisory Council (SAC) which reported to the Prime Minister (and later the State President)[56] and which was chaired by the

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[55] This Board was eventually dissolved in 1923 (Mouton et al., 2001: 21).
[56] Following constitutional reforms in 1983, the position of Prime Minister gave way to that of State President in 1984.

Scientific Advisor to the Prime Minister (Marais, 2000: 94; Pistorius, 2008: 55). According to Pistorius (ibid.):

> The main task of the Science Advisory Council was meaningful advice from the scientific community to the authorities, the coordination of the state funded research effort and informed input regarding the allocation of funds. It was the scientific advisor's responsibility to advise government on research priorities – for this reason the council devoted its energies primarily to the formulation of a national science policy.

Other priorities on the SAC's agenda included 'an audit of the science policy and system, and accounting for the anticipated constitutional changes' (Marais, 2000: 94). In 1980, the position of Scientific Advisor was abolished and SAC no longer provided advice directly to the Prime Minister but to the Minister of Constitutional Development and Planning (up until 1985) and then to the Minister of National Education. In this regard, Pistorius (2008: 55) observes that these 'changes not only extended the science advisory channels to the highest authorities, but also placed the final authority for science coordination in the hands of the respective ministers.' At this stage, the Council was required to advise the Minister of National Education on the objectives of the national strategy in the field of science; general areas of priority for R&D (taking into account socio-economic objectives); provision of S&T workers; promotion of the coordination of R&D; promotion of the use of research results; operation of the science system; adjustments to the staff administrative norms and funding of the science councils under a dispensation of framework autonomy; and interaction with neighbouring countries and the international scientific community (IDRC, 1995: 17-18). Another core function of SAC was, according to Pistorius (2008: 55), 'to coordinate the annual financial proposals of the then five statutory research bodies (CSIR, HSRC, [Medical Research Council], Mintek and the [South African Bureau of Standards]), negotiate the budget with Treasury and advise Treasury on the distribution on the final Treasury award among these bodies.' It is also interesting to note that it was upon the advice and recommendation of SAC that a Minister of Economic Affairs and Technology was appointed and an Advisory Council for Technology established in 1987 (ibid.: 56). As will be seen, many of the functions assigned to SAC found their way into the founding legislation of NACI, including the identification of R&D priorities for the system, the promotion and coordination of S&T-related policies and strategies, and direct involvement in decisions regarding the allocation of funds to the science councils.

According to a key informant, the position of the Scientific Advisor and later the SAC were powerful in their sphere of influence, in part because they had the Prime Minister's ear:

> If you look at the history of South African science policy and institutionalisation, you will see that the Science Advisor, and later the Science Advisory Council, were really powerful. They even tell the story, and it's anecdotal, that the Prime Minister could have had a meeting in his office in the Union Buildings

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in Pretoria and if the Science Advisor arrived the secretary would say: Mr Prime Minister, we have got the Science Advisor here. He would cut short that meeting in order to see the Science Advisor. So they were pretty important. (Key informant)

It is worth noting here the existence of another advisory body during the apartheid years, namely the Economic Advisory Council which, established in 1960, also reported directly to the Prime Minister (at first HF Verwoerd and later PW Botha). According to Pretorius (2011: 367), this Council 'was a partly representative and partly expert body with the brief of advising the Prime Minister on economic issues and policies.' The membership comprised business leaders from private sector companies and were explicitly intended to represent private sector interests (ibid.: 372), which would, given that the membership was entirely white in accordance with the racial orientation of the apartheid government, have meant that it was representing the interests of white capital.[57] According to a key informant, the Economic Advisory Council was more powerful than SAC and had put in place what was then known as the 'normative economic model' which 'was developed largely with financial capital's interests in mind' and which became apartheid's macro-economic policy.

By the late 1980s, SAC had started to come under fire on a number of fronts from both inside and outside of government. Firstly, there were critiques of the Council's lack of transparency with regard to its activities. According to Kaplan (1996: 113), the 'determination of priorities for science development and funding was particularly non-transparent.' The IDRC review noted: 'The SAC is constrained by the cloak of confidentiality that shrouds its activities. No independent assessment can be made of the extent, quality, relevance, or impact of its advice in the absence of a public record of its activities' (IDRC, 1995: 18). This norm of confidentiality was also a key feature of the Economic Advisory Council during the apartheid years (see Pretorius, 2011). Secondly, SAC had limited oversight of the system, and no oversight of technology or the government research facilities. The IDRC (1993: 26) reported: 'The overall impression we gained is that of a body which devotes its energies to matters of detail within the existing system, rather than taking a broad view, and tackling the many problems which confront South African S&T.' Thirdly were issues to do with the composition of SAC's membership which 'did not include representation of stakeholder groups, and was characterised by 'race', class and gender inequities' (CHE, 2004: 108). Furthermore, Council membership, which was 'heavily weighted in favour of pure science interests' appeared, according to the IDRC (1995: 18), 'to believe that technology policy should not be within the SAC's mandate.' Kaplan (1995a: 7) similarly noted that the science orientation of the SAC meant that it 'effectively ignored technology policy.' Fourthly, and one of the strongest critiques, was the lack of an

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[57] The only exception to this was that, in 1975, one Indian and one 'coloured' member were appointed, although only in their personal capacities (Pretorius, 2011: 375).

independent secretariat given SAC's location within the then Department of National Education (CHE, 2004: 108; IDRC, 1993: 25-26; Kaplan, 1995a: 7; Pistorius, 2008: 56). With regard to the dependence of the secretariat on resources from the Department of National Education, the IDRC noted that the Department was 'an inappropriate source of secretariat assistance, since much of the council's work should involve critical analysis of that department' (IDRC, 1993: 25). Finally, a key informant suggested that concerns about whether the SAC represented the vested interests of particular factions of the ruling elite or the genuine general interests of the field of science as a whole were confirmed by the institution being referenced in documentation of the State Security Council and its sub-committees. This documentation confirmed that the participation of many of the heads of the institutions – universities and public research institutions such as the CSIR, the HSRC and the Atomic Energy Corporation – as well as senior officials in government departments such as national education, were members of a small group of families. He concluded that 'we should not accept in the rhetorical form that the Science Advisory Council … was completely an homogenous, functional unit of the apartheid state.' As will be seen, over the years NACI has been criticised along many of these same lines. The SAC was dissolved in 1994.[58]

5.2.2   Discussions and developments relating to new advisory arrangements

As was highlighted in Chapter 4, following the unbanning of the ANC in 1990, there was considerable consultation and debate in anticipation of and preparation for the transition to a democratic government. As part of these discussions, there were calls for the establishment of intermediary bodies of some kind or another in a range of policy domains, including the STI policy sector.

In January 1992, a number of individuals from the mass democratic movement (including political activists, trade unionists and academics) as well as representatives from existing research organisations and vice-chancellors of universities, and experts from other African countries, came together in a symposium entitled 'The Role of Research in Transforming South Africa' that was hosted jointly by the journal *Transformation: Critical Perspectives on Southern Africa* and the IDRC.[59] A number of the core issues that were raised during this symposium provide a useful glimpse into

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[58] As a matter of interest, the last Chair of SAC (1991-1994) was Professor Christoph Garbers, who was President of the CSIR from 1980-1990 (https://prabook.com/web/christoph_friedrich.garbers/339176, accessed June 2019).
[59] The edited papers and discussions from this symposium were published in a special issue of the journal (volume 18, 1992).

the discussions and debates regarding policy and institutional arrangements for research and S&T in the new South Africa during the interregnum.

Firstly, as noted in Bill Freund and Mike Morris's opening remarks to the special edition, there was recognition at the time that the relationship between the mass democratic movement and (social science) research was complicated: on the one hand, research – especially that which had been institutionalised in certain state-sponsored research centres – had been a handmaiden to serve the interests of and maintain the apartheid regime; on the other hand, it had provided invaluable input into the struggle movement. In particular, Freund and Morris (1992) noted that some struggle organisations had 'resisted analyses from outside their own ranks which differed from their own policies, programs and agendas.' Along these same lines, Morris (1992: 3) observed: 'Activists tend to want to subordinate research to their immediate and short term organisational needs, tend to resist conclusions and debates which run contrary to their immediate political agendas, and tend to adopt essentially a moral vision alienated by the objective necessities of rational enquiry.' There were also tensions between 'organisational control and independent analytic inquiry' (Freund & Morris, 1992). These observations are significant given the fact that the ANC and its tripartite alliance with the Congress of South African Trade Unions and the South African Communist Party – key bodies in the mass democratic movement – would be at the helm of the South African government in the new democratic dispensation, and thus carried this ethos and these tensions with them into the policy-making environment.

Secondly, discussions at the symposium also focused on the institutional arrangements for research and S&T. One dimension of this had to do with whether the existing institutions – many of which were regarded as having been supportive of the apartheid regime – should be abolished in toto or reformed in some way to reflect the progressive orientations and goals of the liberation organisations. This included the bodies responsible for policy decision-making and advice – how they would function, the interests they would serve, and how they would contribute to the democratisation of the policy and knowledge space. The following quote from Mala Singh's presentation at the symposium articulates these issues eloquently (Singh, 1992: 66-69):

> Also important for consideration are the policy structures and mechanisms, both institutionalised and ad hoc, in and through which policy preparation takes place e.g. commissions, think tanks, task forces, policy and planning committees, advisory councils, etc. Such structures often influence policy outcomes through their character, especially with regard to the measure and nature of the interaction they allow among the different participants in the policy process. … The direct and indirect relationships obtaining between and among these players in the policy process raise a number of questions that have a bearing on the construction of democratic institutions and processes. Some of the most central of these concern the link between policy and the vested interests of clients, researchers and funders; the

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autonomy and accountability of researchers and research institutions; and the extent, modes and mechanisms of beneficiary participation in policy generation or evaluation. Within the present context of political transition in South Africa, a number of ambiguities surround the issue of policy work. Some of the most decisive of these concern the changing identities and interests of the client/s, shifts in the conceptualisation of the beneficiary and its role in the policy process, the relationship between policy research and continuing mass struggle, the tension between the demands of urgent and efficient policy preparation and the slow, messy and unpredictable ways of the democratic process, the entry of new funding interests, the role and responsibilities of established research communities on the new policy terrain and the necessity to engender a more representative research community. … The second issue, which has a more direct bearing on the role and responsibilities of intellectuals, concerns the facilitation of access to policy information, debates, and proposals. The dissemination, in accessible forms and forums, of policy discussions will be crucial to a deepening of the democratic process insofar as it could ensure that such knowledge does not remain the 'property' of political decisionmakers and experts.

In a presentation that focused on matters of academic freedom, Alec Erwin (an academic and trade unionist at the time) made an argument for the need for researchers in the new dispensation to operate at arm's length from policy-making (Erwin, 1992: 5):

If the research method is going to be good and the results, therefore, of some worth, a particular relationship has to be established. I would refer to this as an 'arm's length relationship'. This implies a distinction between the process of formulating policy and that of doing research. I would argue that this relationship is healthy and arm's length if the researcher not only attempts to answer questions within the problematic of the policy maker but is also able to question the problematic in order to reach the best results. … We have made many mistakes in the past and we must not make them in the future. … We need to fight for such an ethos both in the research community and in the institutions that will use research for policy or product development purposes.

Singh (1992: 70) similarly foresaw the likelihood of policy researchers having to navigate the landscape of vested interests:

Since research production and utilisation is neither a neutral nor a technical issue, researchers will not be able to avoid working within networks of interests that may seek to appropriate research for self-serving purposes. How are policy researchers to negotiate the complexities of and tensions between what represents national interests and a variety of special interests like the advancement of party politics or the facilitation of elite formation?

Marcel Golding (then Secretary General of the National Union of Mineworkers) warned that attempting to reform institutions was going to be challenging as a result of, among others, the entrenched nature of existing organisations and the strong vested interests that would come into play (Golding, 1992: 182-183):

The first thing about the parastatals, universities, and those organisations that have generated research over a long period. I think the discussion is very interesting, but I think it seems to have been obsessive with the idea that one either has to get rid of those institutions and/or build something new. It seems to me that this dichotomy of trying to say that either this organisation is totally useless and we need to get something else in its place, or the idea that we should capture them and hope that they will change, is far too simplistic a notion. I think the whole process depends on capacity; the process depends on what our objectives are; and I think it also depends on the specific focus and demands that we do have. But more importantly, I think, given the history of such organisations, both universities and organisations such as the CSIR and so on, there has been a history of patronage that's been built up

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over a long period of time, and I think the prospect of changing that is going to be extremely difficult. … But no doubt when we are trying to change those organisations – we are not acting independently. We are acting against other competing interests that may have their own agendas. I think one mustn't get the impression that whilst we are struggling on one track, other organisations also wish to change them for their particular purposes and are operating on other tracks. … But I think the important thing in fashioning transformation, it's got to be linked to the perspective that we are having, in particular the socio-economic growth path and the socio-political transformation that you wish to effect.

The discussions at the symposium also turned to matters relating to S&T, although much less substantively. Ania Grobicki, then the Coordinator for the ANC's Science and Technology Group, reported that there had 'not been a great deal of policy research done in the area of science and technology' within the liberation movement, and that one of the challenges of the fragmentation and decentralisation of S&T-related policy and institutions, as well as the 'very radical shifts in state policy' at the time, was that the group was constantly 'aiming at a moving target' (Grobicki, 1992: 172). Garrett and Clark (1992: 16) also noted the lack of coordination and a national strategy for S&T, and the challenges that would be presented because of the fragmentation of, and competition in, the system in general:

> Any improvement in attitudes towards technology and the effective management of the S&T system is hampered by, inter alia, internecine squabbles between the various parties concerned, and our inability as a 'community' to get our co-operative act together, minimal promotion of technology by public and private sector leaders; and investment preferences geared to financial rather than physical assets. Co-operation and co-ordination between the various parties in order to use limited resources optimally are also impeded by a lack of national, general strategies for technology, industry and science. This leads to uncertainty as a result of ad hoc decision-making and increasing competition between organisations in the S&T field for short-term survival.

As was highlighted earlier, the IDRC review, which began in 1993, was highly critical of the SAC. It concluded that 'as currently constituted and constrained', it was not a 'useful mechanism for advising on S&T policy', nor an appropriate structure for the new dispensation (IDRC, 1995: 18). The IDRC report highlighted different models of S&T policy advice adopted in other countries for the new government to consider (ibid.: 19). Reflecting on the interactions and viewpoints at the time, a key informant said that the statutory grouping that had participated in the IDRC review had themselves 'indicated scepticism about the way the SAC was structured', thus providing the perfect opportunity for the mass democratic movement to state the case for not replicating the SAC in the post-apartheid regime and instead to take a different route:

> To say: well, if you are not so sure about it, we want to definitely make sure that in the post-apartheid South Africa we don't reproduce or replicate the SAC … So the view taken at that point was the way in which a future advisory council was set up, you would want to *not* recreate the past that everyone – both for and against – told you wasn't working. And the thing about that was the secretariat function. So the argument was if the SAC secretariat was provided by the Department of National Education – in

other words, FW [de Klerk][60] – it would toe FW's line. In a similar form, if in a post-apartheid South Africa the Department of Science or Education provided the secretariat, how can it be an advisory group to the institutional form (not in a sociological sense) that it is meant to advise? It's kind of: I am advising myself or getting my hand to do something – it's part of the same body, and to think it will help autonomy or the possibility of autonomy is like zero. (Key informant)

According to Kaplan (1995a: 7), among the suggestions emerging from discussions following the IDRC review was the establishment of a National Advisory Council on Science and Technology (NACOST) to replace the SAC. This idea subsequently appeared in the Green Paper on S&T (see DACST, 1996b) which was published in January 1996 for public comment and input. The Green Paper, in its outline of options for the role of government stakeholders in the functions of the NSI, had the key role for advisory bodies focused on policy and resource allocation, with space to contribute to regulatory functions at the policy level, but with no implementation functions (e.g. associated with performance, human resource development or infrastructure provision). The Green Paper proposed consideration of the establishment of a NACOST which it framed as 'a statutory body, consisting of SET and policy experts, to advise government, specifically the Cabinet, the Minister and the Minister's Council on Science and Technology on SET issues' (ibid.: 36).[61] The rationale for the advisory council as a body of experts (as opposed to being representative) was implied in the following statement (ibid.): 'The main motivation for such a [NACOST] is that SET issues, although they have wider implications, usually involve a level of detail which non-specialists cannot provide.'

A mere six months after the publication of the Green Paper, in September of 1996, the White Paper on S&T officially called for the creation of an advisory body – not one on S&T but instead on innovation. In this regard, it is possible that the government's early adoption of the concept of a national system of innovation – which was understood as having a much broader scope than S&T or R&D activities – was thus incorporated into NACI's title. The conceptualisation of this new body started to take shape in the White Paper and the specific parameters for the new NACI as set out are presented in Box 5.1 below. An analysis of these against earlier ideas and proposals reveals some pertinent insights. Firstly, in contrast to the Green Paper, the White Paper foresaw that the NACI

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[60] Prior to becoming the State President in 1989, FW de Klerk had been the Minister of National Education and Planning.

[61] The Green Paper actually proffered three scenarios: one, that NACOST be accountable to stakeholders, which would make it very similar to, or even a continuation of, the NSTF; two, that NACOST be appointed and chaired by, and accountable to, the Minister of Arts, Culture, Science and Technology, and have an independent secretariat; or three, that NACOST be appointed by the President and advise government through the Minister.

Council would comprise individuals drawn from stakeholder groups – as opposed to being a grouping of policy experts, and that it would respond to requests from the Minister of S&T – rather than the proposed interaction with government more broadly. Secondly, the White Paper provides for a consultative and evidence-based approach to advice formulation (where necessary) and also anticipates some degree of transparency in NACI's activities and outputs. Thirdly, in spite of the widespread criticism of the erstwhile SAC's dependence on its parent department for its administration and finance, the White Paper sets out just such a relationship between NACI and DACST.

Box 5.1: White Paper on S&T's parameters for the proposed NACI
• Consist of up to 22 individuals, appointed in their own capacities by the Minister, and drawn from the different stakeholder groups in the NSI • Conduct enquiries, studies and consultations consistent with its legislated mandate and initiated on the request of the Minister • Take steps to ensure that the subjects and terms of reference of its activities are made public • Be provided with a small independent secretariat and a budget administered by DACST with which to commission relevant activities, including policy research, in support of its programme of work • Play an advisory rather than an operational role (the latter to be the purview of DACST) *Source: DACST (1996a: 20)*

As will be seen in the next section, with the promulgation of the legislation that established NACI there were further refinements and elaboration. Reflections on the different conceptions of such an advisory body and the form it ultimately took are outlined in section 5.5 as part of the conclusion to this chapter. For now, I consider NACI's institutional design and in what respects this has changed over time in response to certain internal and external shifts, critiques and pressures.

5.3   Institutional design

5.3.1   Advisory mandate

NACI was established as a statutory body by the National Advisory Council on Innovation Act (No. 55 of 1997)[62] (hereafter referred to as the NACI Act) to advise the Minister responsible for S&T on

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[62] Amendments were made to this Act via the Science and Technology Laws Amendment Act (No. 16 of 2011) and these amendments are indicated where relevant.

matters pertaining to the development of the NSI. More specifically, the NACI Act (Section 4(1)) states that 'NACI may, or shall on request of the Minister' advise on a range of aspects and these are indicated in Box 5.2 below. These might be summarised as advice on coordination relating to cooperation in the NSI, of S&T and other policies and strategies, and of governance in the system; identification of R&D priorities; the funding system across the spectrum (e.g. for science councils and R&D); human resource development; the promotion of S&T, technology innovation, mathematics and the utilisation of scientific knowledge; the establishment and maintenance of M&E systems; and international liaison.

Box 5.2: Matters relating to the NSI on which NACI is mandated to provide advice

- The coordination, stimulation and promotion of cooperation within the NSI
- The development and maintenance of human resources for innovation through selective support for education, training and R&D in the higher education sector and at science councils, science and technology institutions and private institutions
- Strategies for the promotion of technology innovation, development, acquisition, transfer and implementation in all sectors
- International liaison and cooperation in the fields of science, technology and innovation
- The coordination of S&T policy and strategies with policies and strategies in other environments
- The structuring, governance and coordination of the S&T system
- The identification of R&D priorities in consultation with provincial departments and interested parties, and their incorporation in the process of government funding of R&D
- The funding of the S&T system in respect of its contribution to innovation, including
  - a framework for national and government expenditure on R&D
  - the building and maintenance of S&T capacity by way of the selective funding of training and R&D
  - the distribution of funds allocated to science councils
  - the funding of R&D in all sectors, and
  - the funding of national facilities utilised for research
- The establishment, phasing out, rationalisation, and management of science councils, national facilities utilised for research, national R&D programmes conducted by science councils, and science and technology institutions within the NSI
- The promotion of mathematics, the natural sciences and technology in the education sector in consultation with the Minister of Education and the Minister of Labour
- Strategies for the promotion of the dissemination and accessibility of scientific knowledge and technology, and the promotion of the public understanding of S&T and their supportive role in innovation for development and progress
- The establishment and maintenance of information systems to support the monitoring and evaluation of the overall management and functioning of the S&T system and the NSI, and the continuous revision of S&T policy to address changing and new circumstances
- Developments in the fields of science, technology and innovation which might require new legislation
- Any other matter relating to science, mathematics, innovation and technology, including indigenous technologies, which the Minister may refer to NACI, or in respect of which NACI may deem it necessary to advise the Minister

Source: NACI Act (Section 4(1))

A number of observations can be made at this point about the nature and extent of NACI's advisory mandate as set out in the NACI Act. First, the NACI Act (Section 4(1)) empowers NACI to initiate its

own advice (i.e. provide self-initiated, 'proactive advice') in addition to responding to requests for advice from the Minister (i.e. 'reactive advice') (whereas the White Paper on S&T envisaged only the latter). Second, while the White Paper on S&T foresaw that NACI would provide advice to DACST, the NACI Act states that the advice is to be provided to the Minister. Third, according to the Act, NACI is to provide advice to the Minister of S&T only and it is left to the Minister's discretion as to whether the advice is conveyed to other bodies. Specifically, the Act (Section 3) states: 'NACI shall advise the Minister, and through the Minister, the Ministers Committee and the Cabinet.' Fourth, while the White Paper on S&T stated that the Council would 'be charged with carrying out enquiries, studies and consultations with respect to the functioning of our national system of innovation, as requested by the Minister' (DACST, 1996a: 20), the NACI Act does not specifically state that the advice provided by NACI need be evidence-based. Nevertheless, NACI adopted the practice during the term of the first Council and remained a core strategy for advice formulation over the years. Finally, while the White Paper on S&T provided for a 'small independent secretariat' to assist the Council in its work (DACST, 1996a: 20), the NACI Act makes no reference to a secretariat at all. It is in fact vague with regard to the operational side of NACI and merely states: 'Work incidental to the performance functions shall be performed by the chief executive officer of NACI and officers appointed in terms of the Public Service Act, 1994' (Section 11(1)).

Figure 5.1 below indicates NACI's accountability, administrative and consultative relationships with other key actors in the NSI.

Figure 5.1: NACI's position in the national system of innovation
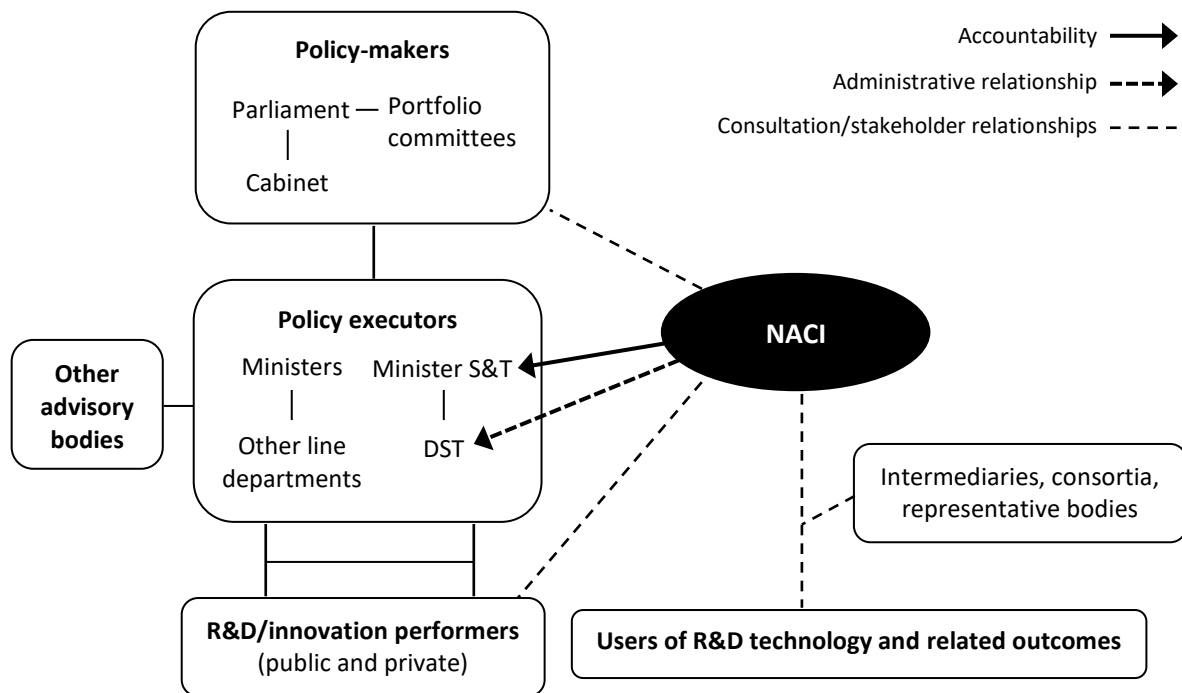
Sources: Compiled from NACI annual reports and corporate business plans

5.3.2 Structure and composition

Since its inception, NACI has comprised the members of Council, an Executive Committee, a Chief Executive Officer (CEO), a Secretariat and various advisory structures. These are discussed in greater detail below. Figure 5.2 below provides a snapshot of the organisational structure and interrelationships between the component parts in terms of accountability and support.[63]

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[63] For various depictions of the organisational structure of NACI in annual reports over the years see, for example, NACI (2004, 2008, 2011, 2012, 2013, 2014).

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Figure 5.2: NACI's organisational structure
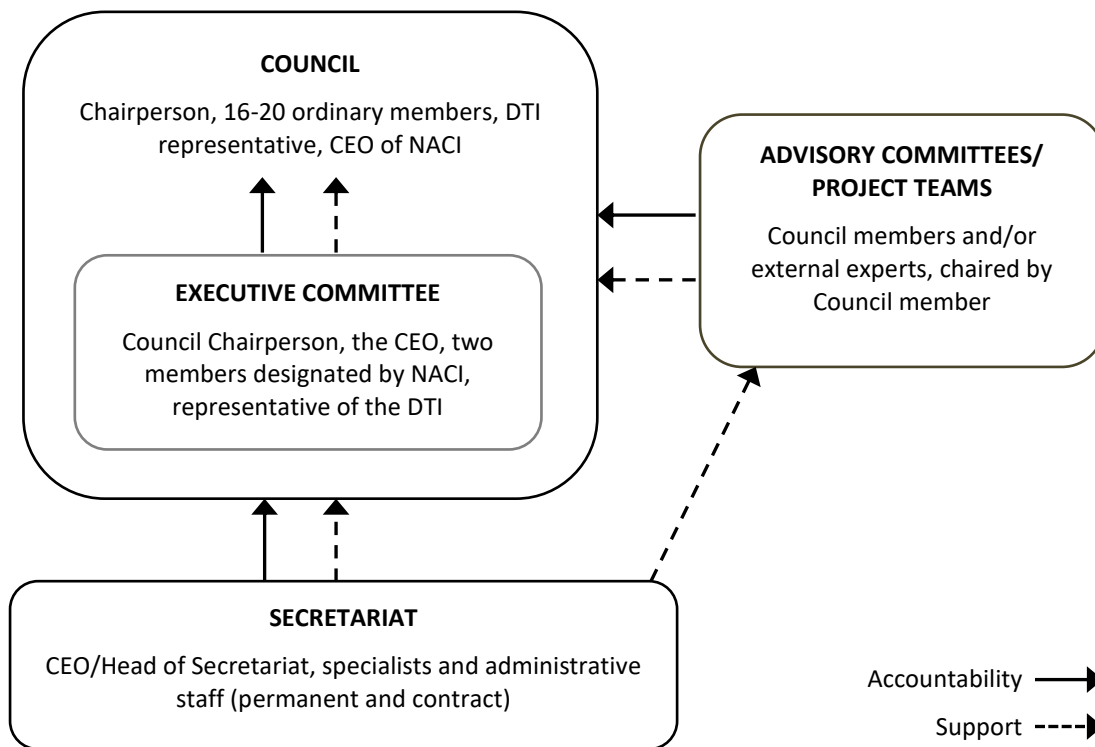
Figure 5.3 below provides an overview of the terms of office of the four NACI Councils, indicating the Chairpersons, CEOs, Heads of Secretariat and Ministers responsible for S&T from 1998-2018. It should be noted that in some cases the exact dates of the terms of the CEOs of NACI post-2011 (and the vacancies in between) are not indicated because they are not reported clearly in either the NACI annual reports or corporate business plans.

Figure 5.3: Council terms, Chairpersons, CEOs, Heads of the Secretariat and Ministers of S&T (1998-2018)

	First Council November 1998 – March 2004	Second Council April 2004 – February 2009	Third Council March 2009 – July 2014	Fourth Council August 2014 – 2018
Chairperson	Sibusiso Sibisi Nov 1998-Dec 2001 Roy Marcus Jan 2002-Oct 2003 Sibusiso Sibisi Nov 2003-Feb 2004	Calie Pistorius Mar 2004-Feb 2008 — Steve Lennon Mar 2008-July 2014		Cheryl de la Rey Aug 2014 - 2018
CEO	Rob Adam (DG: DACST/DST) Nov 1998-Feb 2006	Philemon Mjwara (DG: DST) Apr 2006 - 2011	Kelebogile Dilotsotlhe Aug 2012-Feb 2013 Thulani Mavuso 2013	Mlungisi Cele Aug 2015 to date
Head of Secretariat	Bok Marais 2001-Mar 2007	Vuyani Lingela Apr-Sep 2007 — Vacant Oct 2007-Jun 2010 — Krish Bharuth-Ram Jul 2010-Jul 2012		
Minister of S&T	Ben Ngubane Feb 1999-Feb 2004	Mosibudi Mangena Apr 2004-May 2009	Naledi Pandor May 2009-Oct 2012 Derek Hanekom Oct 2012-May 2014	Naledi Pandor May 2014 - 2018

Source: Compiled from NACI annual reports and corporate business plans

The NACI Council, Executive Committee and Secretariat

The key structure for carrying out NACI's mandate is the Council itself. The Council is tasked with providing strategic leadership to the NACI Secretariat, setting the direction of or priorities for NACI's work, appointing advisory committees for projects, making inputs into advice formulation, and finalising advice before making its submission to the Minister. The composition of the Council, as outlined in the NACI Act, is indicated in Box 5.3 below.

Box 5.3: Composition of the Council according to the NACI Act

- A Chairperson appointed by the Minister of S&T
- 16-20 ordinary members appointed by the Minister after consultation with the Ministers Committee for S&T, and after submission to Cabinet for notification
- The CEO of NACI, who would be the Director-General of DACST (and by extension the DST when it was established in 2002)
- An officer of the DTI appointed by the Minister with the concurrence of the Minister of Trade and Industry

Source: NACI Act (Section 5(1))

According to the Act (Section 5(2)), while the Chairperson and the ordinary Council members are to be 'appointed in their personal capacity and serve on a part-time basis', the CEO (who was the DG of DACST/DST) and DTI representative 'shall serve or be appointed, as the case may be, in their official capacity.' The NACI Act (Section 5(1)) indicates that the NACI Chair is to be appointed by the Minister, and the Council members 'appointed by the Minister after consultation with the Ministers Committee, and after submission to the Cabinet for notification.' In terms of the process of identifying potential Council members, according to one informant, the nominations for members of the first Council came from senior officials in DACST, who 'put their heads together' and consulted 'a few informed senior persons in academia, business, etc.' and then submitted the list of nominees to the Minister, who presented the list to Cabinet for approval. The NACI annual report for 2002/03 (NACI, 2003a: 18) described the process followed by the Minister in appointing the second Council as involving a call for nominations in the Sunday press as well as requests to existing Council members to submit the names of individuals for nomination and to indicate whether they would be available for a second term of office. The Minister then appointed an advisory panel of six individuals to compile a shortlist of candidates, which he then used as the basis for finalising the composition for approval by Cabinet. The Chair of the third Council described how during his tenure the appointment process was a combination of his own recommendations and a public call for nominations:

> You would have two parallel processes. So the way it worked when I was chairing NACI is that I would send a letter to the Minister along with a recommended Council structure, and in that letter I would indicate which Council members were available for re-selection, reappointment (and remember there

are limitations on the number of terms a Council member may serve) and a recommendation for continuity on the Council. And then recommendations from myself on new members and that was based upon what I determined NACI's priorities to be and what would assist the Minister. In parallel with that there was generally a public call for nominations. The Department would go through the letter written by myself to the Minister plus the nominations and the DG ultimately would come up with a recommended list which he would pass on to the Minister. The Minister would make any changes that he or she deemed necessary and make the final appointments. (Key informant)

The NACI Act prescribes both expertise and representativeness as criteria for membership of the Council. In Section 6(2) the Act states that NACI 'shall be broadly representative of all sectors and be constituted in a manner that will ensure a spread of expertise and experience regarding national and provincial interests, scientific and technological disciplines, innovation, the needs and opportunities in different socio-economic fields, and research and development in all sectors.' The specific areas of expertise for Council members (other than the CEO and the DTI representative) highlighted in the NACI Act are listed in Box 5.4 below. Appendix 1 contains the names and institutional affiliations of Council members for the four terms of office.[64]

Box 5.4: Areas of required expertise of Council members according to the NACI Act
• Achieved distinction in any field of S&T in their own right or in the context of innovation;   • Special knowledge or experience in relation to the management of S&T or innovation;   • Special insight into the role and contribution of innovation in promoting and achieving national and provincial objectives; or   • Special knowledge and experience of the functioning of the NSI within which the S&T system operates, the S&T system itself, or any other aspect of NACI'S domain of responsibility.   *Source: NACI Act (Section 6(1))*

The matter of the composition of the Council came up time and again over the years. For instance, the 2002 external review of NACI highlighted the need for participation by a wider range of government departments with a substantial interest in innovation, and recommended that these departments 'should occupy non-voting seats on NACI (i.e. be appointed by the Minister) in order to participate in all matters relating to policy-making in the NSI' (Gevers et al., 2002: 32). The review further recommended that at least half of the NACI members 'should have experience in the private sector in the area of commercialisation of innovations' (ibid.: 33). This shift towards a greater number of business representatives is reflected in Appendix 1. Later, the 2008 external review noted that while the second Council was 'reasonably representative of industry and government', civil society was not represented (Havenstein et al., 2008: 4). The issue of representation on the Council

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[64] I have also included a column indicating the broad sectors (e.g. academia, science councils, government departments and agencies, and private sector business) within which Council members were located.

was still on the table with the formation of the fourth Council. In this regard, the DST annual report for 2014/15 noted that in order to strengthen its advisory role, the newly-constituted Council would, among others, broaden its sectoral representation 'to include business executives from the financial services, information technology, economic sectors, science councils and the not-for-profit sector' (DST, 2015: 34). According to a former Chair, one of the ways the Council dealt with desired changes in composition informally was through the creation of sub-committees and engagement with a wider range of stakeholders:

> What we did do, as far as the Council structure was concerned, was created sub-committees and in those sub-committees we tried to ensure that there was greater representation. They were not actual Council members. The other thing that we did was have consultation processes, which we probably did not have enough of – conferences, workshops those kinds of things which we would open up to quite a broad community, and there was generally quite a lot of representation from civil society there. (Key informant)

As noted above, according to the NACI Act, Council members (other than the CEO and DTI representative) are there in their personal capacities and not representative of their organisations. This was reiterated by a former Chair: 'Whilst you use the sectoral representation as a selection criteria, once they are members of the Council they are there as individuals.' While this might be the case in principle, it does beg the question as to whether it is possible for Council members *not* to represent their organisations' interests, especially in cases where members are CEOs of science council or vice-chancellors of universities. A key informant referenced this issue when he pointed to the absence of representation by labour and civil society, arguing that the Council was therefore skewed towards the interests of already-powerful sections of the system and, in his view, thus towards the interests of capital. This had implications for the extent to which NACI had the capacity to deal with the social (and not just economic) dimensions of innovation. However, another key informant argued that Council members had the interests of science (and not their own) at heart.

In terms of the tenure of Council members, the NACI Act (Section 7) holds that other than the CEO and the DTI representative, the term of office shall be determined by the Minister but that members shall hold office for a maximum of four years. Despite this, the various Ministers extended the terms of the first three Councils by one year for various reasons. In the case of the first Council, the extension was given in order for the Council to complete outstanding projects. The extension to the term of the second Council was primarily 'to allow time for the external review and for the constitution of a new Council in 2009, based on the outcome of the review' (NACI, 2009a: 4). Furthermore, according to a key informant, the appointment of the third Council was also delayed by the impending general election (April 2009), which would result in a change of political

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leadership: 'There wasn't going to be clarity as to what the new Minister would want as far as the Council was concerned and so therefore it was just prudent to extend the term and let the new Minister decide on the Council.' The same occurred at what should have been the end of the third Council's term with the May 2014 general election coming up. The NACI Act (Section 7) states that a member whose period of office has expired may be reappointed[65] and the Minister has the power to terminate the membership of a member on grounds of misconduct, incapacity or incompetence. The Council members are required to meet four times a year for plenary sessions, and in special meetings when necessary. The plenary sessions have been the main context within which the Council deliberates on and finalises advice (see section 5.3.4 below).

The NACI Act (Section 4(2)) states that the 'chairperson of NACI shall have direct access to the Minister and members of the Ministers Committee to submit and discuss any report of NACI, any minutes of a meeting of NACI or any other matter relating to the functioning of NACI.' The former Chairs interviewed reported that they generally had good working relationships with the various Ministers and interacted with them on formal and informal bases:

> My relation with Minister Mangena I think was a cordial and a good one and if I wanted to see or speak to him then I could do that. I often saw him at a function when we sort of bumped into one another for whatever reason. If I formally wanted to speak to him or see him, I could speak to him on the phone and there wasn't anything stopping me from doing that. And very often – especially, I recall, towards the end of my term – when we gave advice to the Minister I would actually go to his office, usually with a few other Council members, specifically those who were involved in [the advice formulation]. (Key informant)

> As Chair I always made sure that I had a positive relationship with the different Ministers …. I always made sure at the start of my term that I sat down with them and said: what is it that you would like NACI to focus on? And then I would also have regular interactions with the DG … around not only the priority areas but also on the logistics around NACI. (Key informant)

In describing his role, a former Chair pointed to having had a fair degree of autonomy, and carrying out functions normally associated with an executive role (e.g. setting the strategic direction, managing Council members, and ensuring that NACI's work programme was producing credible and useful advice):

> Did I have as Chair a fair amount of autonomy? Definitely. If I wanted to do nothing then NACI probably would do very little, so I think the role of the Chair is absolutely essential as a leader. … The role of the Chair – whilst being a non-executive role – is actually closer to an executive role because you set the strategic direction, you manage the Councillors. It's very important as Chair to manage the Councillors. So where Councillors were not attending meetings, not participating – I then started a practice of writing letters to Councillors just saying: I am worried about your lack of participation; can you either up the ante or reconsider your membership? I could never call on a Councillor to resign. I could ask the

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[65] The S&T Amendment Act 2011 (Section 16) adds that a member whose period of office has expired 'is eligible to be reappointed for not more than two consecutive terms.'

> Minister to think about it but I never did that as I preferred to engage with them directly. In some cases they would resign and in other cases they would up the ante and start participating. And then making sure that the work programme of NACI – I mean I was always very conscious of NACI's image and the fact that NACI's primary role was to advise the Minister, and so we had to be credible, we had to have good quality advice that the Minister could relate to and *use* – practical stuff and not academic stuff. … So the Chair played a very important role. (Key informant)

The NACI Act (Section 8) enables NACI to establish an Executive Committee comprising the Chairperson of the Council, the CEO, two Council members designated by NACI, and the representative of the DTI. The tasks, terms of reference and decision-making power of the Executive Committee relating to each matter referred to it is to be determined by NACI, and the committee is to meet on a monthly basis. Effectively, the Committee is responsible for ensuring that NACI's mandate is executed and that its directives are carried out. Over the years, various functions of the Executive Committee have been highlighted in annual reports, such as approval of projects; dealing with matters referred to it by Council, urgent matters between Council meetings and routine operational matters that do not require the seating of a full Council; and guiding preparations for Council meetings (see e.g. NACI, 2002: 17; NACI, 2007a: 19; NACI, 2011: 25; NACI, 2014a: 15). A key informant described its role as follows: 'The Executive Committee would continue to meet monthly and it would act as a kind of management team, so it would manage the goings on, the operations of the Secretariat and act as programme managers to make sure that the work of NACI was actually being undertaken and delivered, quality controlled and that kind of thing.'

As was noted above, the NACI Act required that the DG of DACST is the CEO of NACI. In 2011, the Science and Technology Laws Amendment Act (No. 16 of 2011)[66] (Section 18) replaced this requirement with a sub-clause which states that the Minister 'must appoint a suitably qualified person' as CEO of NACI. Subsequently, a contract-based post of CEO was created by the DST (NACI, 2013: 18) and the first incumbent was appointed in August 2012. As will be seen in Chapter 7, proposals for this change had been put forward for many years and was a central concern in relation to NACI's independence. According to a key informant: 'The Chief Executive's role is an executive role and the Chief Executive is supposed to run the day-to-day operations, look after the Secretariat, manage the staff, manage the budget, ensure that the work programme is delivered.'

The Council has been supported in carrying out its mandate by a Secretariat of salaried staff, who is employed by the DST and who report to the DST at the Deputy DG level. In general, the Secretariat is

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[66] Hereinafter referred to as the S&T Amendment Act 2011.

responsible for administering and managing the operational aspects of the work of the Council, Executive Committee and advisory committees. Specific functions mentioned in NACI annual reports include administering formal NACI meetings (which involves generating relevant documentation); organising other meetings and events and participating in external meetings (including trips abroad); managing contracts with service providers, including those for commissioned research (e.g. advertising, selecting service providers, drafting and implementing the contracts); carrying out basic research; and drafting internal corporate or strategic plans. Key informants added to this the role of the Secretariat in drafting advice (see section 5.3.4 below). In the 2007/08 NACI annual report, the function of the Head of Secretariat was described as providing professional 'executive service to Council and strategic and intellectual support to the Chairperson' (NACI, 2008: 32).

For the first two years of its operations, NACI operated with a very small Secretariat comprising a Deputy Director and one Administrative Officer. The 2002 external review noted that during this period NACI's 'policy output was both very limited and mostly invisible to the wider NSI and public in general' (Gevers et al., 2002: 12). A marked increase in workload during 2000/01 led to Council approval in June 2001 to establish a 'fully-fledged' Secretariat (NACI, 2002: 12). This resulted in the appointment of additional staff, including the position of Head of the Secretariat, although all seven staff members at the time were on short-term contracts (ibid.). The first permanent employees were appointed in the 2004/05 financial year, along with contract staff and, in some subsequent years, one or two interns. In the 2007/08 NACI annual report, for the first time three Senior Specialist posts were indicated, namely those for policy analysis (identification of innovation priorities, evaluation of relevant information and conversion into advice), policy investigations (coordination and administration of projects, including financial control, project monitoring and quality control), and measurement of the STI system (analysis and interpretation of STI indicator information). During 2008/09, Specialists were appointed to work with the Senior Specialists in each of these areas. By 2015/16, the Secretariat comprised 13 permanent and contract staff members (specialists and administrative personnel). However, inadequate staffing of the Secretariat (in terms of both numbers and skill-sets) has been an ongoing challenge.

One of the most glaring problems was that the post of Head of the Secretariat was vacant for almost three years (September 2007 to July 2010), during which time senior Secretariat staff shared the responsibilities on a rotational basis. Furthermore, as can be seen from Figure 5.3 above, the position for CEO following the change in legislation has been an 'acting' position since 2012. A

former Chair described some of the dynamics around this issue and the impact it had on NACI's work:

> It was very difficult because the Secretariat was always a point of great contention between DST and NACI, and it was always a topic of discussion. One never wants to talk about the kind of mechanics of operation of an organisation like NACI with Ministers, but I would regularly raise the issue with the Minister and I would then conclude and say: it is an issue, we are battling with resources and I need finalisation on, for example, the Chief Executive/Head of Secretariat etc. It did make it very difficult and it was something that throughout my tenure as Chair we would have some good periods, but the big issue was, on the one hand, it was always money and the budget was determined by DST. We would provide input and I would go to the Minister and say: if you want NACI to do this over the next few years then these are the resources that you are going to have to provide. But at the end of the day it would always be the Department that would determine that. And then the actual recruitment and appointment process was *unbelievably* slow and bureaucratic because it was always done through the Department. So whilst the Secretariat was nominally an independent Secretariat, all of the employees in the Secretariat were either seconded from the DST or else were appointed into those posts in the Secretariat by DST. So we had to go through the DST human resources processes, and if they didn't have posts available or budget available or anything like that -- So it could take a year to fill a position. … And the fact that there was always uncertainty and when you have change of Minister – every time a Minister would come in they would always ask the question: what about the role of NACI, and what do we want them to do, and how would we want to position them, etc. As a result it was never possible to appoint, for example, the Chief Executive of NACI or the Head of NACI at any one time on the normal five-year contract. It was always a year-on-year contract and so as such it was very, very difficult to get the right calibre of person to take on that job. And when you had these long periods without a Head of the Secretariat or without a Chief Executive then basically it meant, on the one hand, as far as the logistics were concerned, the Department would supply a person, which would normally be a Deputy DG, which was fine. But it also put a hell of a load on the Chair because the Chair would end up having to pick up a lot of those responsibilities. The DST person would deal with the mechanistic operations but everything else the Chair would have to deal with. (Key informant)

Advisory structures

The NACI Act (Section 8(4)) enables NACI to establish committees 'to assist it in the performance of its functions, and may designate as members of such committees persons who are not members of NACI.' The chairperson of these committees is to be designated by NACI from among the members of the Council.

Over the years, NACI has established various committee-level advisory structures with different compositions, lifespans, terms of reference and modes of operation. It should be noted that the titles given to these advisory structures vary, and are used interchangeably, in the NACI annual reports and corporate business plans.[67] During the term of the first Council (1998-2004), NACI referred to these structures as reference groups which were responsible for steering the studies and projects that were being undertaken at the time. From 2003 onwards, another three types of

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[67] Examples include 'reference groups', 'sub-committees', 'expert committees', 'national advisory committees' and 'specialist advisory committees'.

advisory structure were in place; namely, permanent or specialist advisory committees (2003-2011), strategic thrust-related sub-committees (2004-2011), and, since 2012, strategic/policy thrust-related project teams (sometimes referred to as expert panels). The permanent/specialist advisory committees were 'responsible for policy research, analysis and generating advice' (NACI, 2012: 16). They were chaired by NACI Council members and inputs were made by both Council members and outside experts. The strategic thrust-related committees introduced in 2004 were the result of efforts by the Chair at the time to increase the participation and contribution of Council members beyond the plenary sessions:

> When I initially joined the Council, that was basically the only time that the full Council actually would meet and in fact the only time that the majority of Councillors would be involved in what NACI was doing. The majority of work would be happening behind the scenes and most of that would have been done by the Executive Committee and by the Secretariat. So when I took over as Chair I changed things because the reason that NACI members would be appointed was not to assess, proofread and rubber-stamp advice; what we needed was expertise. Then in the plenary, we would generally have topics for debate and those were strategic issues of importance to the country. … I would then facilitate a discussion of a few hours with the Councillors amongst that and we would then take the key outputs of that discussion and put that into a form of advice. And that was really useful and Councillors enjoyed that. I also then created sub-committees which were based upon the work programme of NACI. The sub-committee structures changed on an annual basis depending on what we were focusing on, and all Council members were allocated to different sub-committees and were expected then to participate, other than at plenaries in giving input to those sub-committees. (Key informant)

The main responsibilities of these committees were to advise Council on important strategic issues on which advice should be generated; approve the scope and evidence-gathering under their designated strategic theme; guide the drafting of any Ministerial advice on the particular strategic theme; and serve as an interface between NACI and prominent stakeholders and role players in their particular strategic area (NACI, 2005a: 22).

In the 2011/12 financial year, NACI moved away from the use of committees and introduced short-term project teams. The rationale for the shift to project teams was to enable NACI 'to do better business planning, create synergies and enhance efficiency of output' (NACI, 2013: 19) and to enable NACI to be more flexible, responsive and relevant: 'NACI as an organisation will be able to more readily respond to a rapidly changing innovation environment, be more responsive to the changing political environment and evolve into a policy development body on research development and innovation' (NACI, 2012: 7). The DST annual report for 2012/13 described this organisational change as bringing about 'a more flexible and output-driven project management approach' through which NACI had 'improved its performance by cutting down on the number of meetings per year and associated costs, strengthened independent and objective analysis, strengthened analytical skills within the secretariat and aligned NACI's policy work with pertinent national policy questions' (DST,

2013: 57). The task of the project teams was to 'direct and carry out pertinent research on topics agreed to with the Council and related to priority issues' (ibid.: 18). A fundamental difference between the project teams and earlier models is that, instead of Council members, project teams comprise experts drawn from universities, science councils, government, civil society organisations and industry, who have 'the expertise necessary to complete the project at hand' (NACI, 2012: 7). These individuals are engaged in joint agreements between NACI and their respective home institutions and serve for short-term periods linked to specific projects. The substantive remit of each of the project teams is linked to key thematic issues agreed to with the Minister (see section 5.3.4 below).

5.3.3   Financing and accountability

With regard to financing, the NACI Act (Section 10(1)) states: 'Expenditure incidental to the performance of the functions of NACI shall be defrayed from money voted by Parliament as part of the appropriation of the Department.' In Section 10(2), the Act provides for the remuneration of NACI Council and committee members, who are not employed by the state, 'including reimbursement for traveling, subsistence and other expenses, as the Minister may determine with the concurrence of the Minister of Finance.'

Since its inception, NACI's budget allocation has been integrated with that of the DST (i.e. as a line item in the DST budget rather than its own separate allocation from the National Treasury) and NACI expenditure has been accounted for in the DST's financial systems. According to a key informant, in the early years, the NACI Council did not make any input into NACI's financial allocation and its budget was instead drafted by Department officials. The 2003 NACI corporate business plan (NACI, 2003b: 21) indicated that an attempt was made around that time for NACI to 'take charge of all facets of its budget', which would require its own account. It stated that while the existing arrangement had 'worked well enough during the time that NACI was getting established', it was no longer tenable given that there was now a fully-fledged Secretariat in place with a portfolio of projects, and that the 'business of Council [had] increased significantly' (ibid.). As such, the Executive Committee 'approved the principle that Council should in future take charge of all facets of its budget and that the ExCo should also be informed on a monthly basis of the year-to-date financial situation of NACI' (ibid.). According to a key informant, from 2002 the procedure with regard to the development of NACI's budget did change insofar as in the drafting of its business plan, the NACI

Secretariat, in consultation with the Council, also included a budget. However, the intention for NACI to have its own account to which funds would be transferred did not come to pass – although the Secretariat did develop its own financial control system (NACI, 2003a: 11). While in February 2003 the DST had 'indicated that the NACI allocation would in future be transferred to a NACI account and treated in a way similar to other transfer entities' (e.g. science councils) (NACI, 2003b: 21), this did not in fact occur. The 2008 external review of NACI also made recommendations for change in the financial arrangements, particularly in relation to NACI's control over its own budget: 'For the purpose of administrative services, we propose that NACI still reside close to the DST, but … that the NACI budget would be a one-liner in DST appropriation, with full budget control residing in NACI itself' (Havenstein et al., 2008: 8). At the time of writing, NACI's budget and expenditure was still administered via the DST since it remained an unlisted entity (unlike the science councils) and did not have its own corporate services function. As will be seen in Chapter 7, the embeddedness of NACI's finances in the DST system had implications for NACI's work and was the subject of ongoing critique for many years.

Both the external reviews of NACI recommended that it should be enabled to seek funding from other sources. The 2002 review referred to sourcing funding from international and local donors, as well as contributions from 'organisations and institutions committed to developing the NSI' (Gevers et al., 2002: 31). The 2008 review referred to the possibility of financial and other resources being made available from other government ministries (Havenstein et al., 2008: 8-9):

> … it is proposed that the potential be created for other ministries to invest financial and human resources in NACI for broader studies and advice, which would probably be channelled through the [proposed Ministers' Committee on Innovation], but might also result from direct approaches to the Secretariat. This construct would elevate the importance of innovation to the shared growth objective of the nation and contribute to overcoming the fragmentation of the present innovation system that the OECD report refers to by addressing the cross-cutting issues at ministerial level.

What these recommendations point to is the idea that NACI should be serving a wider range of government departments – an issue picked up again in Chapter 7.

Table 5.1 below provides a snapshot of NACI's budget allocation and expenditure from 2001/02-2014/15, as well as the reasons cited in annual reports for underspending. As can be seen, the most common reason for underspending was staff vacancies in the Secretariat which had not been filled. It is interesting to note that for the first time in its financial reporting, the NACI annual report for 2006/07 broke down costs relating to 'evidence-based research studies' and 'advice development'. It describes these two categories as follows (NACI, 2007a: 32):

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The category of evidence-based research studies reflects payments to consultants for performing research, editing reports and reviewing projects. The category of advice development reflects expenditure on the facilitation of advice development or capacity building towards advice development, including the sub-items of advertising and marketing, communication, catering, courier services, computer hardware, stationery, printing, domestic and international travel, subsistence, training and staff development.

NACI's accountability to both its parent Ministry and Parliament is set out in the NACI Act (Sections 12(1) and 12(2)), which requires that NACI submits an annual report on its activities (including an assessment of the extent to which it has achieved its objectives) to the Minister, who in turn must table the report in Parliament. NACI has produced annual reports each year since its inception which include an overview of both performance and expenditure. From 2003 onwards, the NACI Secretariat has also been required to present its strategic/business plan and annual report to Parliament's Portfolio Committee on S&T although, according to a key informant, the Portfolio Committee does not add much value. Finally, according to Pistorius (2008: 61), post-1994 it became 'established practice for science councils and related organisations to be reviewed and evaluated from time to time.' Thus, although not required by the NACI Act, NACI has been subject to various internal and external performance reviews over the years. In May 2004, an internal self-assessment of performance was undertaken by the first Council at the end of its term and moderated by the CEO of a large foreign government R&D institution. The review report focused on issues related to strategic policy and prioritisation, tactical implementation, results assessment, and change and repositioning of NACI. In the same year, a new format for NACI's annual performance report was introduced (NACI, 2005a: 27). The format required that for the first three years of its term, the NACI Chairperson and CEO would submit an internal evaluation report to Council. The report would be moderated by an external specialist and then submitted to the Minister. In the fourth year, NACI would undergo a comprehensive external review.

Table 5.1: NACI budget and expenditure (2001/02–2014/15)

Financial year	Original allocation	Adjusted allocation	Expenditure	Reason for adjustment/underspending
1999/2000				
2000/01				
2001/02	R4,000,000	--	R3,194,000	--
2002/03	R6,500,000	--	R6,404,588	--
2003/04	R6,256,000	R5,472,000	R5,458,000	Vacancies that could not be filled
2004/05	R6,500,000	R6,100,000	R6,100,000	Funds saved under 'goods and services'; result of delayed tenders contracted but not completed during the 2004/05 financial year
2005/06	R8,228,000	R7,701,000	R7,701,000	Vacancies that could not be filled and tenders that could not be awarded by 31 March 2006
2006/07	R8,228,000	R10,193,000	R10,130,000	--
2007/08	R9,242,000	R6,428,000	R6,098,000	High staff turnover, including position of Head of Secretariat still vacant; significant underspending relating to advice development (consultants, goods and services acquired for the facilitation of advice development)
2008/09	R9,486,000	--	R8,354,000	Savings through performing projects in-house, rather than outsourcing
2009/10	R13,786,000	--	R13,785,000	Significant increase in budget allocation and expenditure attributed to: relocation of premises in September 2009 (including refurbishment); increase in expenditure on goods and services; increased compensation of employees following the upgrading of the position of Head of Secretariat and transfer of senior staff member from the DST
2010/11	R14,922,000	--	R13,863,000	--
2011/12	Not available in annual report			
2012/13	R15,544,410	--	R11,741,431	--
2013/14	R12,503,000	--	R11,760,656	Vacancy of NACI CEO not filled
2014/15	R18,300,000	--	R10,900,000	Vacancy of NACI CEO not filled; project prioritisation and use of in-house capacity

Source: Compiled from NACI annual reports

5.3.4   Advice formulation process(es)

Principles and modalities

The NACI Act makes no reference to the advice formulation process itself. Over time, NACI has developed, refined and expanded its methodologies. According to a key informant, initially NACI's approach to advice formulation emerged organically. The 2002 external review, however, while recognising the need for 'process flexibility', proposed a 'generalised process model for advice generation', suggesting that such a model would assist in the 'consistent achievement of high-level advice' (Gevers et al., 2002: 23). The review recommended the development of a manual for Council members and project managers on the policies and procedures relating to advice formulation; in other words, 'the steps to be followed from the conception of a policy to the authorised document and the steps to be followed thereafter', the documentation that would be needed, and who would be responsible for which tasks (ibid.: 24). To this end, according to a former NACI Chair, a document entitled *Guidelines to NACI's Operations* targeted at Council members was developed.[68] Furthermore, over the years, based on its own initiative as well as in response to the recommendations of external reviews, NACI has adopted a range of key principles which should inform and guide the formulation of advice. These are highlighted in Box 5.5 and are discussed in greater detail below. A stylised version of the evidence-based advice formulation process is presented in Figure 5.4.

Box 5.5: Key principles underpinning NACI's advice formulation process

- Timely initiation, formulation and submission of advice
- Research-informed
- Based on analysis and interpretation (and not merely a collation) of evidence and other inputs
- Takes into account political and policy feasibility and constraints
- Aligned with national and government priorities and needs, as well as NACI's own reading of the NSI environment
- Informed by inputs from relevant constituencies and stakeholders in the local NSI, as well as international networks
- Peer-reviewed (research and advice)
- At arm's length from the DST and other relevant government bodies in order to produce independent advice that critically engages government/DST programmes and plans

Source: NACI annual reports and external reviews

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[68] I could not get access to this document.

Figure 5.4: Stylised version of the NACI evidence-based advice formulation process
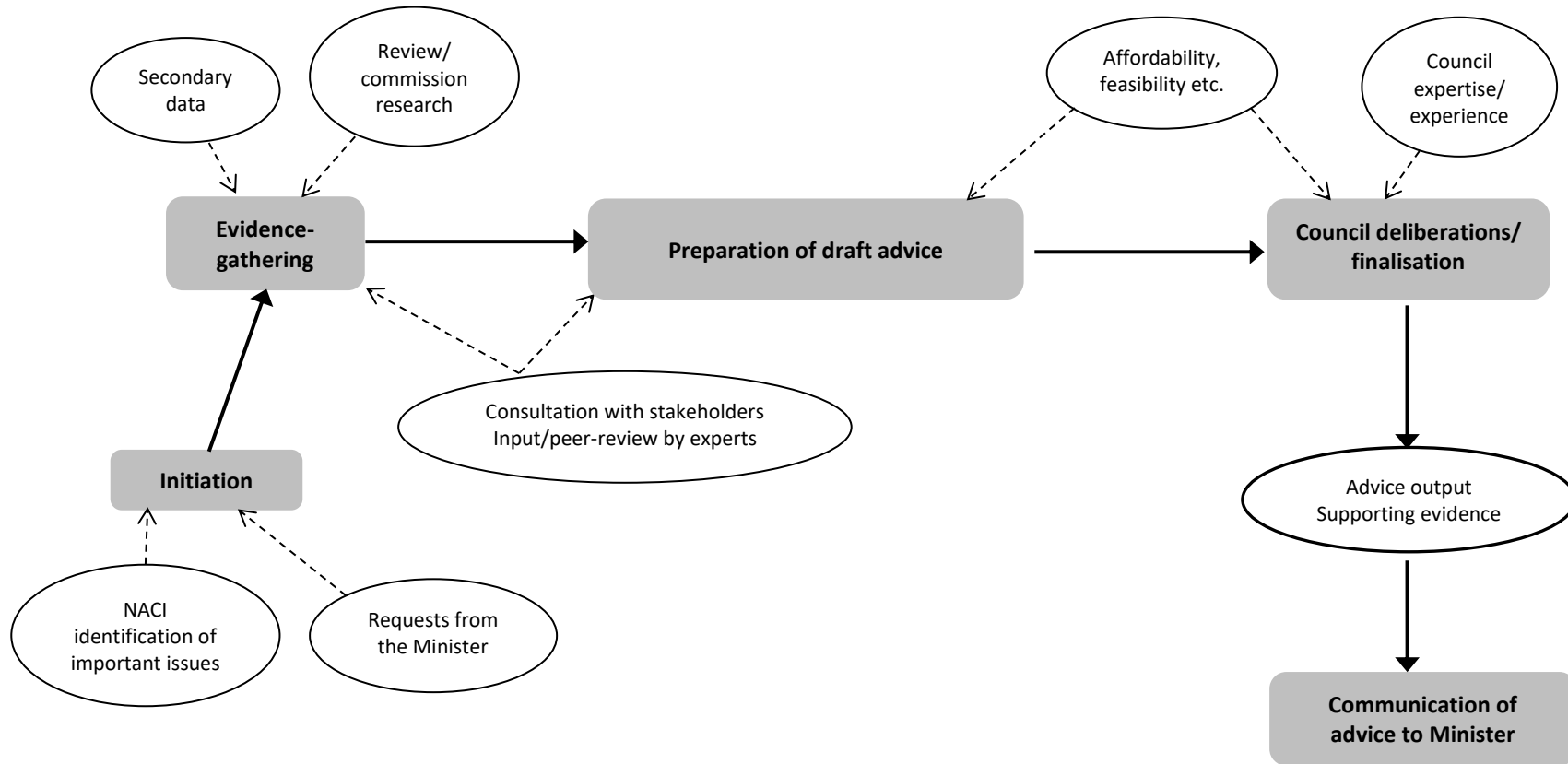
The NACI Act makes no reference to the independence of the advice, although Pistorius (2008: 58) assumes that the 'fact that a council populated by external experts was proposed [in the White Paper on S&T], implies that the principle of independent advice was similarly recognised and endorsed.' According to a former NACI Chair, both he and his predecessors had emphasised the need for the provision of independent, evidence-based advice: 'The principle of independence was there to ensure that there was credibility of advice, and the evidence-based is to make sure that you have got a rationale behind the provision of that advice.' He added that he had also promoted the importance of combining evidence with the collective wisdom of the Council: 'You have got a core of evidence-based work that largely has been contracted out to consultants, but I wanted to take the collective wisdom of Council in the actual formulation of the advice.' A review of the NACI annual reports reveals that it is only in the 2011/12 edition that the notion of independence emerged as part of NACI's conceptualisation of its advice, where it is stated that 'NACI is mandated to deliver clear, evidence-based, autonomous and independent advice to the Minister of Science and Technology (and Cabinet)' (NACI, 2012: 2). Importantly, as will be seen in Chapter 7, the issue of NACI's independence in terms of its institutional standing and operations has been of concern for many years.

A review of NACI's annual reports, which are replete with lists of research projects commissioned, reveals that the majority of NACI's advice outputs have been evidence-based; that is, underpinned and informed by research of some kind (see Appendix 2). However, in practice – whether in response to demand, external reviews or on own initiative – NACI has used different modalities for producing advice which a NACI annual report described as 'a system of different but interlinked modes of advice to the Minister' (NACI, 2002: 12). A typology of these was included in the 2005 corporate plan and is summarised in Table 5.2 below. Each category of advice is associated with the kind of advice required and in what timeframe, as well as the methodology utilised. Which of these is used depends on factors such as the purpose of the advice, the urgency of the need for advice, existing knowledge on the topic, available expertise and/or capacity in the Council or Secretariat, resources available, and the nature of the policy issue.

Table 5.2: NACI typology of advice

Category of advice	Typical issue	Timeframe	Methodology
Quick response advice	Unexpected events	Immediate to very short term	Expertise of Council members and from within NACI networks; desk research etc.
Researched advice	Issues in S&T system and structure	± 4-8 months	Commissioned research
Beyond-the-horizon advice[69]	Anticipation of future developments	One year	Think-tanks, futures studies, etc.
Annual advice	Annual overview of state of S&T in South Africa	As programmed	Combination
Briefings	Salient issues in NSI	Two per year	Evidence-based advice to portfolio committees and other forums
Mixed forms of advice	Variable	± One month	Information sources

Source: Adapted from NACI (2005b: 18)

As can be seen, the different categories of advice generate and/or draw on different types of evidence, and in some instances do not draw on evidence at all. An example of the latter is the 'quick response advice' (also referred to sometimes as 'rapid advice') which was introduced as a modality by the second Council and is described as 'information/advice on very salient issues that the Minister would request over the very short term or that NACI provides on its own initiative' (NACI, 2005b: 22). This involves Council members 'applying their minds collectively to a specific issue to produce a concise advisory note' and, thus, quick response advice can have a turnaround time of as little as one week (NACI, 2009b: 1-2). An example of rapid advice was that presented to the Minister in 2008 'on responding to the challenges of the current global financial crisis and its perceived impact on the national system of innovation' (NACI, 2009c: 17). The emergence of the 'quick response' modality appears to have been in response to the needs of or requests by the Ministers and senior DST officials. NACI's evidence-based advice can take a long time to deliver, primarily because research takes time but also because Council generally only works on finalising the advice at quarterly plenary sessions. However, it seems that whether or not NACI should engage in this kind of advice provision was the subject of ongoing discussion as it raised issues about NACI's role in the advisory landscape; for example, vis-à-vis the DST and its short-term, direct advice to the Minister and ASSAf which was also producing evidence-based advice.

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[69] Beyond-the-horizon advice refers to advice inputs which deal with 'anticipated events and or developments that lie beyond the time horizon', drawing on the expertise of 'top visionaries and thinkers in the country' (NACI, 2005b: 22).

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The Deputy DG said: but we must remember there are 15 to 20 people sitting around the table, the Councillors, and they are all experts in their fields of expertise and we must just tap their brains, which is a very valid point. We should not research everything that we think we should render advice on. So that was more or less the development path, as it were, that our work in NACI took. (Key informant)

It might be that the Minister had some issue and needed advice very quickly, and he needs people to help him think about this. In that case he could say: well, you got a couple of smart people around, what do you think about this, and give a quick response about -- these are the 20 or 30 or however many people were on the Council then, their consolidated and considered view on the issue. That was the quick response and it goes directly to the Minister. (Key informant)

There was kind of a background conversation about: well, NACI's always giving this very complex advice which can only really be taken on board over long periods of time, and it's very onerous, and why can't NACI also give short, quick pieces of advice. My recollection is that our response was: but there are already institutions that do that. So there was already an institution – the Royal Society of South Africa – that does quick diagnostic advice on a particular issue like mad cow disease. The conversation was sort of: well, you know, there's already such an institution but, okay, if you want NACI to do that kind of thing we'll try and do that as well. And that was trying to accommodate, I suppose, these views from the DST, and wanting to be everything, which in retrospect I don't think was wise or appropriate. And even as NACI, we didn't then reflect deeply ourselves. We did try, we did discuss what to do about the difficulties that the DST had with taking our advice into the system. But we were aware that this was not just a problem with the DST and NACI, this was a general problem of everything in government. It wasn't as dire as it is now, but it was already happening that a lot of advice was being given in different places on different issues – on HIV/AIDS, for example. And so the kind of conversation was: well, we've got to keep on doing what we're doing, we've got to keep on giving this complex advice. We're not going to stop doing that because that is the official mandate; it's what we believe we are competent to do and therefore should spend our time doing. But we will also look into giving this sort of short-term, quick diagnostic advice. (Key informant)

Quite frankly the Minister's first recourse for advice is generally the Department and I often had with Ministers over the years where the Minister would turn to the DG and say: why didn't we ask NACI to help us on this? On reflection, the Department gave me the wrong advice; NACI would have given me better advice. And so that was always something I had to deal with. NACI was never really top of the mind as far as those kinds of immediate advice was concerned, and I think part of that was because historically NACI was incapable of delivering advice very quickly because the process for approval on advice was very time-consuming and it would always wait for the plenaries. So if the Minister wanted quick advice it would take six months opposed to something that they could get in a week. I changed that process to enable us to give quick advice, and we did. … The way that would work is the request would come to myself, I would then go to the Secretariat and say: please could you do this, this and this. A lot of that work I would end up doing myself as well and then I would send something out – generally to the Executive Committee saying: we have been asked to do the work, here is a draft of it; if you have got any input, give it to me or otherwise hold your peace, I am going ahead with it. And then I would send a letter to the Minister. There wasn't a lot of that. As I say, the Minister's first recourse generally was to the Department but it did come up every now and then. (Key informant)

Former Chairs reported that instances of quick advice were rare. One remarked that it had only happened four or five times during his tenure. Another described the ratio of different types of advice provision:

The ongoing [evidence-based advisory] programme was the lion's share of the work, and then we would have some of the ad hoc stuff that went through the year. So probably if you were to look at it – 80% is the established upfront programme, probably 15% would be ad hoc stuff like science and

technology summits and those kinds of things, International Council of Science, OECD activities, some of which came at quite short notice, and probably 5% was short advice. (Key informant)

Agenda-setting and initiation

As highlighted in section 5.3.1 above, in addition to responding to requests for advice from the Minister (reactive advice), the NACI Act (Section 4(1)) empowers NACI to provide self-initiated, proactive advice. Correspondingly, NACI's programme of advice at any one time is a combination of inputs from the Minister of S&T as well as NACI's own assessment of important policy issues.

The NACI annual reports only occasionally make reference to requests for specific pieces of advice but, where they have, these have included: during 2000/01, drafting of key performance areas for science councils, criteria for proposals for the equipment placement programme of DACST, and the drafting of the terms of reference for a national strategy on biotechnology; and in 2003/04, a request for a study to be undertaken on the profile of postgraduate higher education and the academic research community. There are many more reported instances of the Minister requesting NACI's input into or comments on draft bills;[70] cabinet memoranda;[71] the drafting of key performance areas for science councils; and drafts of the R&D Strategy, the DST's Ten-Year Plan, and the *Green Paper on National Strategic Planning*. NACI has also received requests for advice from Cabinet via the Minister of S&T,[72] and NACI has been requested to undertake audits and reviews, significant among which was the background report for the OECD's 2007 review of innovation policy in South Africa.[73] When asked whether NACI ever received requests directly from the DST, a former Chair said that this would not happen because it would run counter to the legislative parameters:

> The DG would not ask NACI for advice because that would be contrary to the legislation. In discussions between the Minister and departmental management, issues might arise where the Department might suggest to the Minister that this is something we could ask NACI to do. So the original thought might arise with the Department or in consultation between the Department and Minister, but the formal request could never come from the DG. It always has to come from the Minister. Then there might be instances where the Minister decides on their own, or in consultation with the Minister's advisors, without reference to the Department at all, to seek advice from NACI on something. So the process would always be strictly in compliance with the legislation. (Key informant)

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[70] For example, the Indigenous Knowledge Bill, the Science Academy of South Africa Bill, the Africa Institute of South Africa Bill, and the Institute for the Promotion of Sciences Bill.

[71] For example, on the contribution of S&T to growth and development (1999).

[72] During 2005/06, Cabinet requested a study be undertaken to track the benefits of R&D expenditure.

[73] Other examples include: in 2001/02, the audit of the implementation of the recommendations of the SETI reviews and an evaluation of the implementation of the innovation policy (which took the form of a performance audit); and during 2004/05, a review of the NSI after the first decade of democracy.

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The 2002 external review emphasised the need for NACI to play a role in identifying strategic areas of importance (Gevers et al., 2002: 18):

> As an advisory body that has a statutory role, NACI is expected to have its fingers on the pulse of the NSI and on developments internationally, and as part of the development of policy advice, to take the lead in stimulating debate on key issues that impact on, and affect the health of the NSI. By exploring alternative policies, instruments and strategies for promoting innovation as the core of its advisory role, NACI can usefully contribute to the DST's steering role in enhancing innovation.

According to a former NACI Chair, during NACI's early years at least, much of the advisory agenda was formulated by the NACI Council and Secretariat, in part, he argued, because of limited expertise in the Ministry and Department compared to that among Council members:

> Most of the topics on which NACI gave advice were Council-generated topics. There may have been a few that indirectly came through the science advisor from the Minister's office. But in general I would say most of them were self-generated and quite a few of them would have been from my colleagues' and my reading of the environment. For instance, in the case of biotechnology – the reference group for biotechnology would have generated issues and that would've passed through the NACI Council, but it would've come from NACI; in other words, it would not have been a request from the Minister. … Keep in mind that many of the relatively senior officials [in the DST] never happened to have been, for instance, a senior academic for more than three or four years, or a senior member of staff of a science council, hardly ever. The average period of professional experience at that stage of Council members was longer because it included vice-chancellors or deputy vice-chancellors or directors of research. (Key informant)

Another former Chair described the process NACI followed in developing its ideas for proactive advice as including workshops with Council members, input from advisory committees, and consultations with stakeholders:

> I recall having gone through workshops where the whole NACI Council would sit around and say: well, ok, so this is the brief of NACI, this is what we are supposed to be looking at or not looking at. What does NACI think that it should be advising the Minister on? … What are the issues we would like to address? And the Council would then say: right, we can't do everything, so we would focus on this and the next thing. One issue might be short-term and some might be longer. Then NACI would also establish [sub-committees or advisory committees] … and they would have more people who are experts in those fields doing some of the work. Many of those actually had consultations as well, depending on what the nature of the problem on the table was that they were addressing. [And then we would] go to or write to the Minister and say: well, Minister, these are the things that we are going to be addressing from our side. … and I don't recall a Minister ever coming back and saying: no, you shouldn't look at that and you shouldn't look at that. (Key informant)

Where NACI has set its own agenda, this has involved consultation with the Minister to some degree or another. By the way one former Chair described it, in terms of agenda-setting there was no real distinction between reactive and proactive inputs but rather an iterative blending of the two. This Chair employed the language of strategic planning, business and performance plans and gave examples of how advice priorities were derived from national and DST priorities and initiatives. Engagement with the Minister in this context was on a roughly quarterly basis and involved an exchange of proposed plans and inputs from the Minister.

It was actually a mixture of the two. The way that it would work is we would prepare an annual business plan. So we would have a NACI strategic planning session, and in that strategic planning session we would do things. For example, in 2010 looked at the Dinokeng Scenarios for South Africa, we looked at the State of the Nation Address – I am just now looking at the strategic planning agenda for 2010. We looked at the DST Ten-Year Plan, we would have a macroeconomic overview of the economy, we would have developments in the Presidency, and from that we would then develop the priority for NACI for the year. And so in this particular case we would have things like management of innovation, governance, human resources, etc. and from that we would then put together a business plan. That business plan would be submitted to the Minister, and that evolved into the classic annual performance plan. And we would do a mix of continuity – so there was some work in NACI that continued from the previous year, it was multi-year work, and others would be new work. We would send it to the Minister and then the Minister, in this particular case, came back and said: I am happy with your priorities but I want to draw your attention to these things; I want you to give me some strategic policy advice on the Ten-Year Innovation Plan and where we are falling short; I want you to include an analysis of the DST's priorities and support of the universities and innovation framework; I want feedback on the technology balance of payments. And then there were some mechanics around the actual work plan. This was Minister Pandor, but all of the Ministers that I worked with were pretty good; they would actually read the documents and they would be quite happy to engage on them. (Key informant)

He added that the development of the business plan 'was done in consultation with officials in the Department, and the DG and then ultimately the Minister's office.'

The strategic direction and substantive foci of NACI's advice have changed over time. The five permanent or specialist advisory committees which were established between 2003 and 2009 and their objectives or functions are indicated in Box 5.6 below. Their titles indicate the central focus of NACI's work during that time. Following the introduction of a new functional advisory structure in the form of sub-committees in 2004 (see section 5.3.2 above), the second NACI Council identified a number of 'strategic thrusts' which would guide and inform the formulation of advice, and these were subsequently discussed and fine-tuned with the Minister. This practice has remained in place since then, with new strategic thrusts developed in 2007 and 2013 (the latter slightly amended in 2014 following the inauguration of the fourth Council and a review of NACI's advisory programme). The strategic thrusts are summarised in Box 5.7 below.

Box 5.6: NACI's permanent/specialist advisory committees (2003-2011)

Science, Engineering and Technology for Women (SET4W)[74] established 2003	To provide expert advice on the promotion of gender equity and mainstreaming, and the development of women, in the STI environment
National Biotechnology Advisory Committee (NBAC) established 2006	To provide high-level strategic advice on, and interpretation of, the overall development of the South African biotechnology sector, as well as monitoring and advising on issues pertaining to bioethics
Indicators Reference Group (IRG) established 2006	To generate data and information for the development of a comprehensive STI indicator system, and monitor the performance of roleplayers in the NSI with a view to informing long-term national planning
Innovation for Development Committee (INNO4DEV) established 2009	To develop policy advice on the promotion of broad-based innovation (technological/non-technological, formal/non-formal), and encourage applications of these in response to socio-economic challenges
NACI-Skills Task Team[75] established 2009	To advise the Ministers of S&T and Higher Education and Training, via the NACI Council and the CHE, on the advancement of SET human capital for innovation

Source: Compiled from NACI annual reports

Box 5.7: Strategic thrusts of NACI's advice (2004-2014)

2004
- Infrastructure for innovation promotion
- Human capital and the knowledge base for innovation
- Science, technology and innovation for competitiveness
- The social dimensions of innovation
- The position and role of NACI in the NSI

2007
- The South African system of providing science advice to government
- Regular reporting on the state of the NSI
- Recommendations towards a National Innovation Strategy

2013
- Monitoring, coherence and coordination of the NSI
- Strengthening skills and infrastructure for research development and innovation
- Bioeconomy policies and strategies
- Innovation for economic development and social upliftment
- Gender mainstreaming in the science, technology and innovation environment

2014
- Monitoring, evaluation and indicators
- Structuring, governance and coordination of the NSI
- Strengthening skills for mathematics, science and technology
- Niches for new innovations in the bioeconomy sector
- Innovation for economic development and social upliftment
- Gender mainstreaming

Source: Compiled from NACI annual reports

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[74] Originally the South African Reference Group (SARG) on Women in Science, Engineering and Technology (see Chapter 6).
[75] Initially named the 'NACI-CHE Task Team'.

The focus areas for NACI's advice have been influenced and informed by a range of factors including: priorities, strategies and plans of the Minister and DST[76] as well as those of high-level government bodies such as Treasury or the National Planning Commission;[77] national and international developments;[78] internal and external reviews of NACI or the NSI more broadly; issues identified by NACI itself on the basis of its own investigations and analyses of the NSI; changes in institutional arrangements;[79] and NACI's own interpretation or understanding of its role within the landscape of NSI roleplayers.[80]

Another factor has been shifts in the focus and definitions of innovation permeating official discourse in government and other circles. Over the years, the NACI annual reports and reviews highlight shifts in definitions of innovation as well as calls for different foci in this regard. In the 2002/03 NACI annual report it was stated, with regard to the research studies being undertaken at the time, that 'the project portfolio covers the whole innovation chain from knowledge development, through its utilisation and user needs to production-user interactions' (NACI, 2003a: 7). However, the external reviews picked up on changing definitions of innovation and the implications for NACI's advisory focus. For instance, the 2002 external review recommended that NACI focus *more specifically and narrowly* on innovation; that is (Gevers et al., 2002: 20-21):

> … on those processes that are close to the market end of the inevitably complex "innovation value chains", that lead from the creation of new knowledge [to] the kind of technical change that promotes economic growth and societal development. Critical factors and supply lines in South Africa's education and training, research, economic and societal systems that support such innovation and growth must necessarily also enjoy attention.

The emphasis on the human capital dimension was referred to by the NACI CEO in the 2003/04 annual report as follows (NACI, 2004: 4):

> It is important to recognise that innovation is not limited to scientific, engineering and technological prowess. Very often, the key to successful innovation lies in the social and human elements. It is therefore fitting that NACI should also concern itself with human capital challenges as they pertain to the NSI. These include the supply of and demand for knowledge workers, as well as aspects relating to the education of scientists, engineers, technologists and technicians.

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[76] For example, the R&D Strategy and the DST's Ten-Year Plan.

[77] For example, the Medium Term Strategic Framework 2009-2014, the Framework for a New Growth Path for Economic Development of 2010, and the National Development Plan of 2012.

[78] For example, the HIV/AIDS debates around 2001.

[79] For example, the transfer of the DST's SET4W and Indicators Programme to NACI.

[80] For example, during 2001 a decision was taken by Council to narrow the focus of NACI's advice to systemic rather than institution-specific matters.

In direct contrast to the 2002 review, the 2008 review argued for a *broader* interpretation of innovation; namely, the inclusion of the non-technological and social dimensions (Havenstein et al., 2008: 2-3):[81]

> Some might argue that NACI has been too narrowly focused on the technological aspects of its broad mandate. A successful innovation system relies on the efficient interaction of a large number of actors and framework conditions, including – for instance – macroeconomic stability, social welfare and trust in the public services, an efficient educational system and access to human resources, positive social attitudes towards entrepreneurship and openness towards global innovation systems. … NACI's activities need to be expanded to include non-technological aspects of innovation, the second economy and social issues as encompassed by the broader definition of innovation without compromising the importance of technological innovations in the growth and revenue-generating sector of the economy.

In response to this recommendation, during 2009/10 NACI initiated various projects that were expected to underpin advice relating to this more inclusive notion of innovation, which incorporated non-technological forms of innovation and social innovation, as well as the 'critical role of community engagement in the uptake of innovation' (NACI, 2010a: 8). NACI also established the Innovation for Development Committee to assist in these endeavours.

Finally, various sources pointed to the influence on NACI's agenda by the interests of NACI Chairs and Council members. For instance, with regard to NACI's input into strategic areas for advice, Pistorius (2008: 68) points to the important role played by Council members' own interests:

> Although the national objectives and priorities are known and the DST's can be determined, every Councillor ultimately has his or her own particular areas of interest and expertise, as well as opinions on the issues that NACI should be advising the Minister on. Since NACI cannot advise on every function for which it is mandated in the Act, a small number of thrusts are identified and prioritised for consideration during a given period. Under the circumstances, these tend to typically be aligned with the members' interests, rather than necessarily with the highest and most pressing national issues.

A former NACI Chair said that the advice agenda is influenced by the composition of the Council:

> I think a lot of NACI's work – especially the component where *it* decides what it's going to advise the Minister on, as opposed to that where the Minister has to ask for advice – a lot of that will necessarily be influenced by who the people that are being appointed on NACI. So, hypothetically, if all 20 people on NACI are nuclear physicists, I wouldn't be surprised to see a lot of nuclear policy coming out of NACI. As I recall, there were many social scientists in my time, and I would take a guess even to this day, many of the things NACI gave advice on would've been social issues that influenced the national system of innovation; for example, do we have enough technical people in the country or not? As opposed to: should government build a nuclear reactor or not? It wasn't quite on the technical issues but more on the 'softer issues' and skill requirements; for example, how do you make sure that the role of women in science is highlighted? (Key informant)

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[81] The 2008 review panel also proposed that changes be made to the NACI Act 'to reflect the latest thinking that innovation is broader than only science and technology and R&D driven' (Havenstein et al., 2008: 9).

Another former Chair said that the focus on biotechnology was a combination of DST priorities and his own interest in the field:

> The creation of [the National Biotechnology Advisory Committee] really came from the DST and the DST's grand challenges … and I was always personally interested in it because I had a very strong interest in the biotechnology side from the very early 2000s when I was involved in the South African AIDS Vaccine Initiative, and I saw what incredible potential we had in South Africa in medical biotechnology. So it came out of that direction but also the general belief across Council in those strategic planning sessions was that bioeconomy had the potential to position South Africa as a leader in this area. (Key informant)

One key informant expressed quite a strong view that Council members and Chairs used their participation in NACI as a platform for advancing their own agendas:

> The way that NACI has conducted itself – you have got a public face and then of course you have a hidden face. The public face, what I saw – and this is not only confined to NACI – it is a kind of triumphalism that is characteristic of our government. It's to do with the need for recognition and: we are here and we run the show. … It's almost as if from the beginning the NACI Councillors saw this as an opportunity to promote their own egos. So their pictures are everywhere and NACI councillors are running projects or heading projects. Very unusual for a board to do that. Very, very unusual. They are running projects. So this one is driving something on IP, that one is driving something on gender, this one is doing something else. I don't know of another government board where that happens. The board is there for oversight, not to promote their immediate personal interests or their own egos. There is a lot of: I am here and I am going to use this platform to increase my public persona. It worries me; it still worries me. (Key informant)

However, other informants were less sceptical. For instance, one argued that while it was 'natural' for Council members to put forward matters relating to their own professional or sectoral interests – 'I mean they're just people with only so much headspace so there would be some degree of bias' – but she did not 'believe that people were so narrow that they were just trying to pursue their own agenda.' Another said:

> I don't believe, and I don't think I ever had cause to believe, that there was a dysfunctionality in the NACI Council as such, in the sense that it really was just one person's opinions that dominated. I don't think there is any evidence to that extent. And so I think that part of this mechanism has always worked. (Key informant)

Inputs into the advice formulation process

As has already been noted, the use of research to inform advice formulation has been a core practice of NACI since its inception. In some cases, research is undertaken in-house by Secretariat staff (usually smaller studies and where capacity is available), but mainly research is commissioned to outside researchers or research units (especially those studies that are more comprehensive in scope). In the latter case, the Secretariat is responsible for coordinating and managing the outsourcing (e.g. contracts, terms of reference, finances, scheduling, and reporting to Council).

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Advisory committees and/or the Secretariat are responsible for guiding research studies with regard to their scope, design framework and quality assurance, and converting research findings into advice. The final research reports are assessed/peer-reviewed by external and internal evaluators. NACI also draws upon secondary sources of data in the formulation of its advice. Appendix 2 contains the lists of research projects and advice over the period 1999-2014 as presented in the annual reports. What is evident from this list is that the projects reflect the key strategic thrusts of its own advisory programme very closely, with numerous research projects, and reports or documents of one kind or another, relating to human capital development (e.g. skills, mobility); the gender and race dimensions of STI (e.g. participation, benefits); M&E-related indicators and facts and figures; governance and coordination of STI; intellectual property; financing and incentives; infrastructure; aspects of tertiary education relating to STI (e.g. higher degree graduation rates, graduate employment); and subsector-specific strategies such as advanced manufacturing, biotechnology and ICT. The Appendix will give the reader a sense of the volume and scope of NACI's outputs, as well as the paucity of information provided on, particularly, the substance of advice.

The NACI annual reports and corporate business plans point to other important inputs, including the use of the individual and collective knowledge and experience of Council members, consultation with key stakeholders and constituencies, and drawing upon national and international networks and experts.

Council members are seen to be a key resource in the advice process, making substantive inputs from the initiation of the process through to the finalisation and communication of the advice output. As a former Chair remarked: 'The value of an advisory council such as NACI is first and foremost a function of the individual and collective prominence, reputation, expertise and commitment of the Councillors' (NACI, 2007a: 14). As highlighted in section 5.3.2, the NACI Act requires that the Council comprise a balance between expertise and representation from key S&T-related sectors. As can be seen from Appendix 1, Council members have tended to be high-level and often high-profile individuals in the NSI, primarily from academia (e.g. vice-chancellors and deans of universities), business and industry (e.g. CEOs of private sector companies), science councils (e.g. CSIR and the Agricultural Research Council) and state-owned enterprises (e.g. Eskom).

From the outset, NACI has recognised the importance of building and drawing upon networks, both within the South African NSI and internationally, in the formulation of quality advice. The need for NACI to draw on expertise from among role players in the local NSI was articulated in the very first

annual report which stated: 'The Council will strive as far as possible to draw on and use the specialist knowledge and expertise of local policy research and development agencies, consultants and individual researchers and academics' (NACI, 1999: 8). A decade later, the same emphasis applied where the 2010/11 annual report pointed to NACI obtaining input from a variety of sectors and perspectives in the local NSI (e.g. industry, government and NGOs, as well as different disciplines). This approach was seen to offer 'broad insight on matters affecting S&T and innovation, for cross-sectional policy recommendations aligned to the development goals of government while attentive to intellectual vigour and practical relevance' (NACI, 2011: 25). In this regard, throughout the years, NACI has established networks with a range of stakeholders in the South African NSI. In some cases, the collaboration between NACI and these bodies has been formalised via cooperative agreements,[82] while in others, members of Council and the Secretariat have served on the boards or committees of some of these bodies.[83] NACI develops and maintains its networks via hosting or participating in workshops, seminars, conferences and official meetings, as well as via fact-finding delegations abroad. NACI draws on its international networks for various reasons, namely to learn from the experiences and practices of similar advisory bodies in other countries; to identify experts for undertaking tasks such as commenting on draft documents, testing existing information, and peer-reviewing research studies and advice; and as a way of increasing NACI's capacity, visibility and credibility as an advisory body through international recognition of its work (see e.g. NACI, 2004: 11; NACI, 2005a: 13; NACI, 2007a: 13; NACI, 2009a: 14). Examples of how research and stakeholder engagement are combined in advice formulation are highlighted in Chapter 6 on the advisory initiative on women and SET.

Broader consultation and input is seen to make the advice more relevant, quality and acceptable. However, it is also considered necessary because of the encompassing nature of innovation and because innovation is a cross-departmental priority – both of which, in turn, require coordination of STI. This was highlighted in the 2008 review which concluded that 'the required broad-based "consultation" within executive government does not take place to the degree warranted by the broad definition of innovation' and that NACI's direct interaction with other ministries and departments was ad hoc at best (Havenstein et al., 2008: 6). This issue is revisited in Chapter 7.

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[82] For instance, with the NSTF in March 2003 and with ASSAf during 2013/14.

[83] For example, during 2005/06, NACI was invited to serve on the working group of the Joint Initiative on Priority Skills Acquisition and was also represented on the executive committee of the NSTF.

Formulation and communication of advice

Based on descriptions provided by key informants, there appears to have been a relatively standardised approach to the evidence-based formulation of advice. The first part of the process would entail the development of a project proposal by the Secretariat for approval by Council. Then the necessary research would be commissioned and handling of the project delegated to the relevant advisory committee. Once the research reports have been received and, where necessary, inputs obtained from external stakeholders, these were analysed by policy analysts (Secretariat staff, advisory committee members and sometimes outside experts), who were then tasked with formulating the draft advice. According to a former NACI Chair, the research that NACI had commissioned and had been working with was brought to bear on these discussions, and was part of the documentation provided to members before the meetings. Deliberations and debates about the draft evidence took place within advisory committees/project teams, as well as among the full Council membership during plenary sessions or at special meetings.

> The Secretariat would submit a project plan and methodology for approval. Normally a project committee or a reference group would be appointed for that project and they would have handled it then on behalf of and delegated by Council to serve the Secretariat as advisories. The Secretariat would commission a study if it meant a research project or even just writing up scanned literature, and they would then approve that report before going to Council. In many instances there would have been a workshop with other experts and NACI, the Secretariat, would then write up an advice, how to proceed with this. Normally every stage of the process would be approved by the Council. (Key informant)

> The Secretariat would mainly form part of translating whatever was in the research report into a format of policy advice to the Minister. The Secretariat didn't make the final decisions. They would prepare the documents for Council, including the reports that went to the NACI Council itself, which would then consider the original question that was posed, the research that came in, the evidence, how that was translated into advice for the Minister, and what the actual advice was we would be giving to the Minister. That would be put before the NACI Council where it could be discussed. (Key informant)

As alluded to in the quotation above, one of the key principles underpinning the formulation of the draft advice is that NACI must add value to the inputs received. In the case of research reports, rather than simply 'putting its own cover on the research reports and forwarding that to the Minister as advice' (Pistorius, 2008: 69), NACI should analyse and interpret the findings and recommendations, reach its own conclusions, and translate these into advice (NACI, 2007b: 9; Pistorius, 2008: 69). Similarly, with regard to the inputs of external stakeholders or experts, NACI should not merely 'mobilize, collate and aggregate these views', since 'this would reduce NACI to being a simple transmission mechanism for the views of stakeholders' (Gevers et al., 2002: 17). This implies a kind of 'knowledge-brokering' role whereby NACI is required to bring expertise to bear on

the analysis, interpretation and translation of the evidence into policy advice. A key informant talked about how this had been a point of concern and discussion during his time:

> It was a point of some introspection at one stage. In the early stages of my time at NACI, we had long discussions about: is NACI just – not even a knowledge-broker – is NACI not just then being a programme manager? And just commissioning work and then effectively taking the executive summary of that work and sticking it in as an advice letter to the Minister? So where is the added value from NACI? Where is the integration, where is this collective wisdom? … We were very concerned about NACI just being this kind of knowledge conduit, and we didn't think that was the role for NACI. NACI had to add value. So the approach of NACI just having, let's say, a single sub-contractor as opposed to having a core of evidence, having Council input, having Secretariat input, having external stakeholder input, and then integrating all of that into the final advice, became the practice that we would apply. (Key informant)

Another key principle is that, ideally, NACI's advice should also take into account other factors such as affordability and feasibility, strategic and political issues, as well as broader contextual issues (e.g. social, economic and environmental), and 'then weigh various options, alternatives and compromises' (Pistorius, 2008: 70). However, according to a key informant: 'Looking at feasibility perspectives really came later in NACI as NACI matured as an organisation.' At the same time as ensuring that the draft policy is aligned with national imperatives, takes into account stakeholders' views, and looks for options and alternatives relating to feasibility, NACI is also challenged to take a critical stance towards the policies, plans and implementation of government and especially the DST. This is discussed in greater detail in relation to issues of independence in Chapter 7.

As highlighted earlier, the draft advice is considered by Council during its quarterly plenary sessions (and sometimes special meetings). According to a NACI annual report, the proposed advice is considered by Council for 'overall alignment and coherence' (NACI, 2011: 29). A key informant elaborated further:

> Now in some cases you find some Councillors have special expertise on something and they give their views. What others need to do is look at the process and whether it was real evidence that came in, and what are the arguments? Does the process have integrity – that was a major thing – and what can we give to the Minister? (Key informant)

A former Chair described his direct involvement in finalising the advice:

> The advice would generally be put together by the Secretariat and then if it was in a working group or a sub-committee it would be signed off by that sub-committee. Then I would normally go through it in detail because at the end of the day my signature would be on the letter to the Minister. So I would go through it in detail and in many, many cases I would not so much change it but restructure the advice, focus it – I always found that the advice tended to be very, very woolly. And remember NACI is supposed to provide evidence-based advice which to my mind means that it should end up being quite specific. So then I would make it a lot more specific. If necessary I would add assumptions but I would come out and say: this is the very specific advice, this is how you can implement it. I would – wherever possible – say: this is how much it would cost and those kinds of things. So I would then act as the final -

- well I would generally add quite a bit of content to the advice but that content was normally -- it wouldn't change the core advice but just make it more implementable. (Key informant)

Former Chairs described how differences of opinion among Council members were handled in the finalisation of advice. It appears that the aim was to achieve consensus through discussion and debate (rather than using a voting system), and that any significant areas of disagreement would either be resolved or noted in the final advice to the Minister.

[The finalisation of advice] was all discussions. Most of the time, as I recall, there was consensus among the members. If somebody has a really strong view on something then we need to resolve it. But I think it was voting by consensus, unless somebody has a specific query or a question or an objection. … I don't recall the details but I think one way to do it is to either send the advice to the Minister with minority views included. The other way would be to say: well, if whoever on the Council makes a strong enough point – it may be that what was put before the Council wasn't right or wasn't quite put in the right way, so it was a legitimate concern as opposed to a different view. Then it needs to go back to be rewritten. … I think the integrity of the process is very important; whoever gets the advice should know what they are getting. (Key informant)

There would be debates, there might even have been differences of opinion, but I can't recall any cases where a minority report would have been produced. There could have been amendments to a report or to the advice, but it was always a consensus – albeit sometimes not a proclaimed consensus, but it was always a consensus. (Key informant)

We always had our discussions on the basis of consensus and so I would always go for unanimous support of the advice by Councillors and that would generally be done in the plenary meetings where the advice letters would be tabled for approval by Council. I never had a case where a Councillor would say: I am unhappy with this and I want to give a minority view type thing. Where I anticipated that kind of thing – and once again it comes down to the role of the Chair – is that if I knew there was a Councillor that had a different point of view I would try and make sure that that point of view was covered somehow in the advice, or I would have an engagement with the Councillor beforehand and say: this is the approach we are taking, are you happy that this will reflect a consensus viewpoint? Because minority opinions and those kinds of things: whilst they can be very important they often tend to detract and it's much better to come up with a consensus view. The downside of a consensus view is that you can often come out with the lowest common denominator, which is problematic. But I must admit, and I am not blowing my own trumpet, at the end of the day it comes down to the ability of the Chair to sway opinion. I don't know whether that is healthy or not but generally I was quite successful. (Key informant)

In the NACI annual reports, the advice outputs are referred to by various terms such as 'advisory notes', 'concise advisory notes', 'advice letters', 'advice memorandum', 'position papers', 'policy briefs' and 'discussion documents'. According to a key informant, whatever the case, the advice output would be accompanied by a covering letter to the Minister (either from the Chair and/or CEO):

It would be a cover letter saying: dear Minister, this is the issue that either you initiated or that we initiated, we've considered it and our response is putting forth recommendations, this is what we think. Depending on what the nature of the topic was, the issue and who raised it, it would have been formulated in a different way. (Key informant)

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In the early years, advice to the Minister was channelled through DACST and later the DST which, according to a NACI annual report, 'would normally add its perspectives on the advice to the report' (NACI, 2005a: 10). During 2004/05, Council approved and the Minister accepted a new procedure 'whereby NACI would submit its advice directly to him and it would be his prerogative to request additional inputs from the Department' (ibid.: 11).

There are mentions in a number of NACI annual reports that the research reports or a synthesis of a set of research reports were submitted alongside the advice to the Minister. As will be seen in Chapter 6, in some cases the advice output *was* the research output. The White Paper on S&T, in defining the broad parameters of NACI, stated that NACI would be required to '[t]ake steps to ensure that the subjects and terms of reference of its activities are made public' (DACST, 1996a: 20). However, as highlighted in Chapter 3, very little of NACI's outputs are available in the public domain. This issue is raised again in relation to NACI's lack of transparency in Chapter 7.

Finally, as highlighted in section 5.3.1 above, NACI is mandated to provide advice to the Minister of S&T and it is at his/her discretion as to whether the advice should be conveyed to other government ministers. Key informants confirmed this, although one respondent described a series of informal engagements with other government departments:

> For example, before Minister Pandor's first stint as Minister of Science and Technology, we had extensive engagements as NACI with her on education. Then in the very early days of NACI's partnership with the National Science and Technology Forum we also had extensive engagements with Kadar Asmal as Minister of Education. In fact, I was on the NSTF at that stage on maths and science teaching. Then we had engagements at the level of DG with the Department of Health on things like the Bioeconomy Strategy, on the standards and guidelines for biotechnology research, and those were generally quite successful. Then, through the Minister of Science and Technology, we were able to get letters to other ministers. It never really worked as much as I would have liked it to work. NACI worked directly with Treasury in the early days on the R&D tax incentives. So, yes, there were elements of that but it was never part of the standard methodology; it was always an exception. (Key informant)

5.4   Assessments of the effectiveness of NACI and its advice

On the basis of commentaries in the external reviews of NACI and the NSI, the interviews with key informants, and my own informal interactions with people in the system, I believe it would be fair to say that there is a widespread view that NACI has not been effective as an advisory body. The reasons why this might be the case are discussed at length in Chapter 7. The following quote from a key informant sums up many of the key issues and quite neatly shows how complex the reasons are:

I would probably be in the camp that NACI has not performed well, and the reasons for that are probably multiple. I think there has been a lot of confusion as to what NACI is supposed to do; what it should be doing and what it shouldn't be doing. I think this is partly because the clarity that comes from the top, partly because I think there is a leadership vacuum at the centre of NACI. It's a kind of consultative talk shop, basically. Its impact on policy is not strong. I think the composition of it is very poorly constituted; the wrong kind of people … You know, high profile people who are very busy. The Chair of NACI is too busy to give NACI the kind of attention it needs and deserves. So I think it's not a good Council, it doesn't work well. You'll know there is quite a lot of literature that suggests that advisory councils that talk to a [single] Ministry are recognised as having very little impact, and I think that's effectively what we've got. … There has been a kind of schizophrenia about: does NACI advise the Cabinet or just the Minister? In effect, NACI only advises the Minister and in effect it's the NACI Chair who goes to talk to the Minister, and so it hasn't been done that well. It has had some good projects, it's been a clearinghouse for ideas etc. but I don't think it's produced the goods. I can't think of a major effective thing that NACI has done. I mean, besides that ridiculous [DST] Ten-Year Plan, the system hasn't worked badly. As I say, it has continuity, it has structure, I think it's relatively efficient. So this is not, in my mind, one of the worst-performing departments. But in terms of clear, thought-through policies, clear policy initiatives, I don't think that has happened. For example, to me, one of the biggest questions the system has to face – and if anyone is going to say that at the systemic level NACI has a role to play – is: what are the key science and technology priorities in the system? What should we be doing? Which activities and how are we going support that? I mean in the Ten-Year Plan there are just far too many priorities. You have very small amounts of money and you're condemned to choose. I know it's not easy to choose. But what do you do? You spread this money all over the place and NACI just encourages that by allowing everything to come together, not asking the right questions, the hard questions: where can we actually do something? I don't think that has been adequately addressed. If you asked me has NACI identified the priorities, has NACI identified the binding constraints in the system: this has to be changed before we can move on; this is what the government must prioritise; this is what the Minister must take to Cabinet; this is what is really holding back our system; this is what will improve our system; clearer missions etc. I don't think that comes through NACI; I don't think that has ever been put on the agenda. (Key informant)

It perhaps goes without saying that everyone has their own ideas about what NACI should be doing and how it should be doing it, which inform their assessments. Yet, it is worth noting that the key informants I interviewed, including the former Chairs, were hard-pressed to identify specific instances of the use of NACI's advice, and where they were, they could not articulate the *way* in which it was used – for example, in the language of instrumental, political/strategic or conceptual use referred to in the conceptual framework (Chapter 2). A few respondents made reference to the visible integration of NACI's work and advice relating to R&D tax incentives, the Bioeconomy Strategy and the DST's Ten-Year Plan. Informants could give examples of where they felt that NACI had been bypassed by the DST on issues they thought were relevant to NACI; for example:

NBAC was interesting because we kept on trying as NACI and as NBAC to get into DST processes on the Bioeconomy Strategy, and we kept on raising these points and saying: why are you not coming to NBAC for this? And DST would basically ignore it until I raised it with the Minister, which was kind of at the eleventh hour, and the Minister was very irritated with the Department about this. As a result, NBAC got involved. We had seminars and workshops on the implementation of the Bioeconomy Strategy etc. (Key informant)

NACI itself has found it difficult to assess the influence of its advice. A main reason is that the Minister is not required to provide feedback to NACI about advice given, and reportedly seldom does. Furthermore, as far as I can tell, up until 2009 there was no formal monitoring or evaluation of the outcomes or impact of NACI's advice – on the part of either NACI itself or the DST.

Given that the focus of this study is on the institutional features of NACI and the broader policy environment within which it operates, the objective has not been to undertake an assessment of the specific uses of NACI's advice – although an exemplar of this is explored in Chapter 6 on the women and SET advisory initiative. Nevertheless, it is worth highlighting evidence I have found relating to the nature and extent of the uptake of NACI's advice and these are highlighted below. They are arguably quite superficial.

In 2008, the NACI Chair stated in an annual report that the 'success of NACI can only be measured by the degree to which its advice is implemented' (NACI, 2008: 5). Recognising the challenges associated with measuring 'impact', in a 2009 document reviewing its term of office, the second NACI Council actively engaged with notions and assessments of the utilisation of its advice. The document introduced the working notion of 'effects' instead (NACI, 2009b: 1, original emphasis):

> There is a considerable degree of consensus in the methodological literature and management experience that, while output is relatively easy to measure, the measurement of the impact of interventions in general and of policy advice in particular is at best problematic. The general term *effect(s)* has consequently been used in this draft report instead of *impact*.

The document outlined the types of effects or uses of NACI's advice for the period 2004-2009 based on their own assessment. Such effects or uses included 'knowledge about and perceived credibility of the source of advice, better understanding by stakeholders of an issue, contributions to the stock of knowledge on an issue, official implementation in the form of, e.g., a solution to a problem, new or amended policy instruments, strategies or policies' (NACI, 2009b: 1). Examples of 'inferred effects' identified in the document are captured in Box 5.8 below.

Box 5.8: Inferred effects of NACI's advice during its second term of office

- Account was taken of NACI's comments on draft policies such as the intellectual property policy framework, tax incentives for R&D, and research publishing
- Ministerial and departmental spokespersons used NACI advice as references in the mainstreaming of STI and public engagements (e.g. relating to aspects of biotechnology and gender issues)
- Some of the reports on salient issues had contributed to policy and strategy development (e.g. research worker mobility, research infrastructure, and biotechnology)
- Policy on a few systemic issues had been influenced by NACI's evidence-based advice (e.g. on the establishment of the Technology Innovation Agency and amendments to the NACI Act)
- At least one consultancy firm had reported that it made extensive use of the recommendations of the

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report on the utilisation of research findings in the development of regional innovation capacity
Source: NACI (2009b: 3)

The report noted that NACI 'should consider ways of, at least, monitoring – if not actively promoting – the implementation of its advice and related initiatives' (ibid.: 5-6). Thus, in 2009 NACI undertook an assessment of the impact (or effects) of its advice for the period 2004-2009 via a questionnaire that was completed by senior management of the DST. The study found that out of the 26 projects and associated advice outputs surveyed, the majority (19) were 'utilised as a supportive or substantive contribution to strategy/policy', two had contributed to 'the pool of knowledge in DST and/or incidental utilisation (e.g. in a speech)', while five had not been utilised in any way (NACI, 2010b: 10). The specific uses of project findings/recommendations and advice which were identified are provided in Table 5.3 below. The use of NACI's advice outputs during this period appears to have been predominantly in the development of the Human Capital Development Strategy.

Table 5.3: Uses of NACI advice (2004-2009) based on survey of DST officials

NACI advice being utilised	Contribution to policy or strategy
Good practice guidelines to enhance the participation of women in SET	Utilised in the development of the Human Capital Development Strategy
Tracking the benefits of public R&D expenditure: Inputs, outputs and impact indicators	Utilised in the assessment of the NRF
An assessment of the participation of women in SET industry	Utilised in strategies and contracts
OECD peer review of the South African NSI	Utilised in the development and presentation of DST's Ten-Year Plan, the Human Capital Strategy for Science Engineering and Technology, the Innovation Survey, fiscal packages, and Foundation for Technological Innovation
Problem with the employment of foreign nationals	Human Capital Development Strategy
The national problem with grade 12 mathematics and science performance	Youth into Science
Appropriate human resources for a productive NSI	Human Capital Development Strategy
Human capital knowledge base	Human Capital Development Strategy
Required physical infrastructure to attain the vision of the NSI: Secondary school education components	Youth into Science and infrastructure sub-unit
The required physical infrastructure to attain the vision of the NSI	Very useful in the structure of the DST/Medium Term Expenditure Framework budget bid to National Treasury and Emerging Research Areas + funding of infrastructure
Women in industrial S&T (SET through eyes of women; monitoring framework for benchmarking)	Human Capital Development Strategy
Tax incentives for R&D	Referenced in the Technology Innovation Agency business case development process

NACI advice being utilised	Contribution to policy or strategy
Strategic approach to research publishing in South Africa	Human Capital Development Strategy
Intellectual property rights from publicly-funded research	Used extensively in the Intellectual Property Rights for Publicly Funded Research (PFR) work
OECD evaluation of NSI – Phase 1 (Background report)	Referenced as part of the Technology Innovation Agency work, and Human Capital Development Strategy
Facing the facts: Women's participation in SET	Human Capital Development Strategy
A profile of postgraduate higher education and the academic research community in South Africa	Human Capital Development Strategy
The potential impact of the skills shortages in innovation capacity in capital engineering projects	Human Capital Development Strategy as input
The flight of the flamingo	Human Capital Development Strategy as input

Source: NACI (2010b: 10-11)

In 2014, NACI conducted another investigation into the use (or otherwise) of its advice presented to the Minister during the 2012/13-2013/14 financial years (see Netshiluvhi & Adons, 2014). In addition to its own need to identify the impact or otherwise of its advice, the report highlights that the Portfolio Committee on S&T had requested that NACI include advice presented to the Minister in its annual reports as well as feedback on its usefulness. Interviews were conducted with senior DST officials (Chief Directors) which focused on specific pieces of advice provided to the Minister during the period. These included advice on skills in mathematics and science, gender mainstreaming, bio-economy, and innovation for socio-economic impact. The interviews explored whether the advice had been accepted or not, whether it had been implemented, the reasons for not accepting the advice, and recommendations for how to improve the uptake of NACI's advice in the future. The interviews confirmed that some of the advice recommendations had informed aspects of the DST's work. However, the extent of the uptake appears to have been limited and DST interviewees reported various reasons for this relating to, among others, the use of multiple sources of advice; the nature of the advice outputs (form and focus); the expertise available in the NACI Council; and inadequate internal departmental systems, resources and/or capacity. These issues are summarised in Box 5.9 below and picked up again in Chapter 7. Interestingly, they focus almost entirely on problems to do with NACI's advice formulation and outputs – rather than any systemic issues or those to do with the Department's own functioning. The report also outlined recommendations made by the DST interview respondents about how the use of NACI's advice could be improved and these are highlighted in Box 5.10.

Box 5.9: Reasons for limited or non-use of NACI's advice from the DST's perspective

- The DST receives advice from multiple sources and thus does not take only NACI's advice into account in the development of policies and strategies
- The Department prefers to use baseline studies on which to draw its own recommendations; however, providing such studies is outside the purview of NACI since its mandate is to deliver only on innovation policy advice
- Some of DST's programmes could not easily access NACI's policy advice letters, and when advice letters were accessed, some were not accompanied by supporting documentation
- In some cases the policy advice was deemed irrelevant – specifically where recommendations were regarded to be 'flimsy and superficial' and limited in scope in terms of what could practically be implemented by the Department
- NACI's advice was regarded in some respects to be misaligned with the needs and politics of the DST and its sister departments, which was attributed to inadequate consultation with all relevant stakeholders (including the DST and other government departments) as part of NACI's agenda-setting process
- Lack of diversity of skills within the NACI Council and some project teams, owing to their composition, resulted in the development of advice premised only on academic issues
- In some cases, although the DST received important and relevant recommendations from NACI, it was not always able to implement these owing to a lack of resources and capacity

Source: Netshiluvhi & Adons (2014: 5-7)

Box 5.10: DST respondents' recommendations on how to improve the impact of NACI's advice

- The DST should create an internal mechanism that could improve access to NACI's advice (i.e. to establish a response system within the Minister's Office for managing and monitoring the internalisation of policy advice). The newly-established Policy Unit of the DST may facilitate dissemination processes and implementation of advice.
- Advice letters should be underpinned by strong evidence-based studies. A comprehensive review of the existing body of knowledge (baseline studies) would be useful to undertake before an advice is drafted. This warrants NACI to engage broadly with all key stakeholders or other policy advisory bodies. It will assist NACI to make informed recommendations which will guarantee an up-to-date policy advice relevant to DST's work.
- NACI's advice or policy recommendations should be well argued, relevant, and specific rather than general. This could ensure that NACI delivers high standard advice to the Department. It must be noted that the Department will only implement advice that falls within its mandate. In order to address policy advice that falls outside the policy parameters of the DST, the Minister of S&T should play a significant role in facilitating discussions between the DST and relevant sister departments.
- NACI should undertake an inclusive agenda-setting process for its advisory services to ensure that its advice is useful and relevant to all stakeholders, including the DST. NACI should therefore consider doing the following:
  o NACI's policy advice agenda should be informed by both the Minister and programmes of the DST to ensure alignment and proper timing of the advice.
  o DST's programmes/sub-programmes should have planning sessions with NACI to discuss relevant topical issues for NACI to consider. This will enable robust engagement between NACI and the DST officials in order to easily facilitate the uptake of policy advice. This engagement will 'hint' at innovation policy areas that NACI should consider in its agenda.
  o It should be a standard item in all NACI's advice to the Minister to demonstrate the relevance of its policy advice to specific parts of the DST's policies and strategies, as well as to identify specific policy gaps and opportunities in order to create synergies with policies and strategies of the sister departments. However, NACI should guard against assuming the role of a consultant to the Department – NACI is expected to maintain an arm's length relationship.
- NACI should play a leading role in developing innovation indicators for the DST's strategies.

Source: Netshiluvhi & Adons (2014: 8-9)

5.5   Conclusion

This chapter has described in detail various aspects of NACI's institutional and organisational design including its legal mandate, the composition and functioning of its Council, its organisational structure and operations, its financing and accountability, the ways in which it goes about formulating advice, and its relationship to its parent ministry and other stakeholders. In broad brushstrokes, NACI resembles the standard features of statutory advisory bodies in other countries (see Chapter 2, section 2.2.1). Furthermore, on the face of it, NACI has stuck to the letter of the law – responding to requests from the Minister for advice; generating a proactive advice agenda based on its own reading of the priorities in the system and in consultation with the Minister; commissioning research to inform its advice formulation; establishing advisory structures to undertake and guide the work related to advice provision; consulting with external stakeholders; holding its quarterly plenary sessions with Council members; and producing its annual performance and financial reports in terms of its accountability requirements.

NACI's structure, composition, processes and procedures have not, however, remained static. Over the past 20 years, it has undergone various shifts and adjustments – formally in response to critiques from external reviews or changes in legislation (one in particular), but also informally adapting to the challenges and constraints imposed by its broader policy and institutional environment, and in attempts to refine and improve its operations and effectiveness. One of the major and recurring critiques of NACI's institutional design has been its relationship to the DST – specifically the NACI Act's provision that the DG of the DST is the CEO of NACI, and NACI's reliance on the DST for its budget and administrative functions. The latter has created impediments to NACI's capacity to undertake its work, and both have been at the root of concerns about the independence of its advice and its ability to critique the DST. This is discussed further in Chapter 7. A significant formal change in this regard was that the S&T Laws Amendment Act of 2011 replaced the DG as CEO with external candidates. However, while this was an important change, it essentially represented a tweaking of NACI's institutional design since the Amendment Act did not address the other concern of NACI's reliance on the DST. The 2012 Ministerial Review Committee acknowledged the significance of the change of status of the CEO but noted that it was 'a pity that this necessary and symbolic step [had] not yet been visibly accompanied by attention to the mandate, scope of operations, and more systematic functioning of NACI' (Ministerial Review Committee, 2012: 71). Furthermore, since this change, the CEO of NACI has been in an 'acting' position, essentially weakening the role of the incumbents and, arguably, maintaining the status quo. It appears that the

NACI Chairs have, to some extent, stepped into this void and played a critical role in the management and oversight of NACI in terms of its operations. This, together with the fact that for significant periods of time the post of Head of the Secretariat was vacant, paints a picture of a leadership vacuum and an unclear division of labour between the positions of the Head of the Secretariat, the CEO and the NACI Chair.

NACI has made a number of other informal adjustments over the years. One has been in how to handle the extensive scope of its advisory mandate. As highlighted in section 5.3.1, it is a very long list. As a result, in practice NACI has had to be selective in the issues chosen for advice formulation in accordance with the resources and capacity available to it. It did this primarily by focusing on issues prioritised by the Minister of S&T and were high on the national agenda, as well as those identified by the Council and its advisory committees, and developing these into strategic thrusts. Another example is that although NACI's main approach to advice formulation has been evidence-based, it did, over time, develop what has been referred to as quick response or rapid advice; that is, advice that is developed on the basis of inputs from Council members and produced in a short timeframe. This appears to have been a response to the needs of the Minister and DST for whom the long lead-in time of research-based advice was not always timely or useful. While NACI made this adjustment, it seems there was ongoing discussion and some discomfort about whether this was the route that NACI should take and, for the most part, the organisation appeared to have stuck with its evidence-based approach. There have also been changes in advisory structures over the years – from permanent advisory committees linked to key components of the advice agenda, to project teams and expert panels from 2012 onwards in an attempt to make NACI more flexible, responsive and relevant. Again, this appears to have been an attempt to adjust their approach in order to better meet the needs of the Minister and DST. Finally, there were shifts in representation in the composition of Council membership in terms of stakeholder representation, primarily in response to external reviews.

The external reviews of NACI and of the STI policy and institutional landscape over the years have repeatedly picked up on problematic areas affecting NACI's functioning and its effectiveness as an advisory body. The core themes in this regard are the subject of Chapter 7 and have included NACI's lack of independence from the DST and transparency in its advice formulation process and outputs; the fact that NACI provides advice to the Minister of S&T only; the lack of feedback from the Minister and the DST on whether the advice was utilised or not; and a general perception of a lack of legitimacy and credibility.

This takes us back to the antecedents of NACI's establishment and, in particular, the critiques of the apartheid science advisory body, SAC – notably its lack of transparency and an independent secretariat; a composition skewed towards the narrow interests of the apartheid state and pure science; and its limited oversight capacity of the system. This raises an obvious question: how is it that despite the significant criticisms of the former SAC, despite the warnings raised by members of liberation organisations during the interregnum about replicating advisory arrangements that would work against rather than support the democratic process, and despite alternative proposals at the time, the form that NACI ultimately took was in important respects a replication of the dysfunctional SAC? The participants at the 1992 symposium on the future of research in South Africa (section 5.2.2) had, for example, emphasised that the content of policy discussions should be made available publicly (i.e. be transparent and open to scrutiny), and that research and advice should be produced at arm's length from political interference, primarily so that it could critique policy and the political administration. The Green Paper on S&T had proposed a NACOST that would be essentially an independent, expert body that provides advice to government via Cabinet, the Minister of S&T and the Ministers' Committee on Science and Technology. However, by the time the White Paper was published six months later, the new advisory body (NACI) was envisaged as having an expert and stakeholder-representative Council membership, as providing advice to the Minister of S&T only, and relying on the Department for its budget and administrative support. Why were there these deviations?

In the absence of access to records or documents relating to the internal discussions that took place in government circles, I can only make some speculations, with the aid of one key informant in particular who was involved in institutional and policy development pre- and post-1994. The gist of his theory, which brought together various threads of events and circumstances, was as follows. Firstly, he pointed out that the processes of institutional and policy reform that began immediately post-1994 were running in parallel, which explains to some extent why there were disjunctures and contradictions between earlier recommendations about institutional reform and what ultimately appears in the 1996 White Paper on S&T and the NACI Act. He observed that a reading of the 'official' version of how policy development and institutional reform took place (i.e. by following the dates of certain Acts of Parliament, policy documents and the establishment of new institutional arrangements) paints a picture of a process that unfolded in some kind of 'proper order'. This could be summarised as starting with the introduction of the Reconstruction and Development Programme (RDP) in 1994 – the guiding socio-economic policy framework for the new South Africa

which set out the overarching national imperatives for policy development in other sectors. This was followed by the publication of the Green and White Papers on S&T in 1996, the drafting of the NACI Bill and then the promulgation of the NACI Act in 1997. However, this is not what happened in reality:

> In parallel with the development of the White Paper we began the process of institutionalising certain aspects. I mean it's not what we expected. … If everything had worked according to plan … we could have been sequenced and put things in the right order. The consequence then is we had many reform initiatives initiated before the policies came in, because officially the White Paper, because it is dated 1996, is meant to be the direct consequence of the National Research and Technology Foresight, a competency assessment of the system. That's the official version. But in reading back over those times I don't see things like that; I see a kind of perpetuation of this narrative that things are taking place sequentially in an ordered way. (Key informant)

In the meantime, another process was underway which ultimately disrupted and redirected much policy development at the time. While the RDP had been the official discourse since the ANC election campaign, as a result of the now well-documented informal negotiations between the ANC and big business, a neo-liberal macro-economic policy – the Growth, Employment and Redistribution strategy (GEAR) – had been in development in the background.[84] GEAR was formally adopted in June 1996, replacing the RDP, right in between the publication of the Green Paper on S&T in February 1996 and the White Paper in September. According to this key informant, the adoption of GEAR meant that all hitherto policy development work had to be recast to orientate policy prescripts of the austerity measures of the new strategic perspective:

> On the eve of submission of the final draft version of the White Paper to the Ministerial Committee on Science and Technology, and prior to it being routed to the Cabinet office, the DACST was formally informed of the adoption of GEAR by the government of national unity. This resulted in a need to rewrite the objectives and measurable outcomes away from the RDP targets and to ensure their re-alignment with the conceptual framework of GEAR. (Key informant)

Mouton et al. (2001: 48) echo this idea when they observed that the 'shift in policy emphasis from social reconstruction between 1992 and 1995 to an emphasis on innovation and competitiveness from 1996 onwards [was] reflected in structural tensions within the S&T system', and that the formation of NACI 'may be understood in relation to this shift in emphasis, where the dominant policy rhetoric [had] moved from social and economic reconstruction to economic competitiveness.'

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[84] During the interregnum, alongside the formal negotiations between the ANC and the apartheid government headed by President FW de Klerk, there was a series of 'informal negotiations' between Nelson Mandela, select ANC members and significant local and international private sector players representing proponents of a free market economy. This was most famously described by Sampie Terreblanche in his book *A History of Inequality in South Africa 1652-2002* (Terreblanche, 2002).

In addition to the time constraints imposed by the introduction of GEAR, the key informant pointed out that there were other constraints too, notably directives from the President about the need for fiscal austerity, which had the effect of limiting the choices DACST senior officials could make about the shape and form of new institutions such as NACI. This, together with what the informant described as a general pragmatism in the Department, led to an administrative compromise of sorts which was intended to be an interim measure:

> [DACST officials] were bound by: no new institutions, reduce State expenditure, reduce the headcount staff. So then how do you create an autonomous institution? So that is what I meant. If you have a look at it sympathetically within the context, being critical but being sympathetic within the context – the context is GEAR, the context is austerity, and then how do you take forward creating a new body with a directive from the Head of State that is: reduce expenditure. So let's say that then was the compromise administratively. … We were also cast in a particular department. You had natural scientists and engineers whose sense of the world is pretty linear. So there is a lot of pragmatism. … Part of that pragmatism and then the compression of time that it led to, I think contributed to the form in which: alright we are not going to be able to create it as a fully -- remember this is me being subjective; I can't base it on evidence so it would be hearsay – as opposed to wanting to do the slog of going out and creating NACI as another science council equivalent, legislatively autonomous, let us just spin it as a secretariat provided by DACST as an *interim* measure. Then, as it matures, it can evolve. (Key informant)

Could it be that the arrangement that NACI become part of DACST as an interim measure might explain why it was decided to appoint the DG of DACST as the CEO of NACI? Another key informant had his own explanation for this, suggesting that it was a political compromise between political parties at the time:

> The constellation of forces from the 13 May 1994 is that you have a government of national unity, you have an [Inkatha Freedom Party] Minister over what's left of the old Department of National Education after you have excised education and sports and recreation. Everything else is bundled up as DACST. So there's an IFP Minister and he comes along with his IFP advisors … And now you get this whole discussion about founding and structuring NACI and I am not part of that but what comes out in the wash is that, okay, the Minister is an IFP Minister and he is almost certainly going to appoint his pal as the Chair of the board. The ANC says: no, we have got to have a say. So, you get the DG as the CEO, simple as that. It's the counter balance. It's the IFP versus ANC and it now suits the Department to keep it like that. (Key informant)

These narratives about the roots and genesis of NACI echo some of the themes in the conceptual framework. The first is 'satisficing', where policy development – and in this case institutional reform too – does not proceed in a rational, linear manner but instead is the outcome of compromises that 'satisfy (rather than maximise) organisational goals, and which are acceptable in the face of competing demands' (Stone et al., 2001: 5). The second is the historical institutionalist idea that institutional development and outcomes can be the result of unintended consequences and path dependency – in this case, perhaps particularly in relation to time and austerity constraints and

other pressures at the time, a reversion to the 'model' that was already in place. As will be seen in Chapter 7, the core features of NACI's institutional design, however they came about, would have significant consequences for its future operations and, in particular, questions around its independence, legitimacy and credibility.

I now turn to a closer inspection of NACI-in-action through the lens of one of its key advisory initiatives, namely that relating to women and SET.

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CHAPTER 6: WOMEN AND SCIENCE, ENGINEERING AND TECHNOLOGY ADVISORY INITIATIVE

6.1   Introduction

The central aim of this chapter is to explore NACI's advisory role and process 'in action'. Via this microscopic lens of the women and SET advisory initiative, the data and analysis in this chapter provides further dimension to the bigger picture of NACI's standing and influence as an advisory body vis-à-vis its parent ministry and the DST and more broadly in the sector. As such, the chapter presents a detailed analysis of one of NACI's major advisory initiatives – namely, that relating to the policy issue of women and gender in SET. As highlighted in Chapter 3, this advisory initiative was selected on the basis of reference to it as one of the most successful in both official documents and by key informants. Furthermore, the time-bound nature of the mini case study, which spans the period of the two terms of the committee (2003-2012) – as opposed to a more recently-established and/or ongoing initiative – allows for a longer term view on the effects of the committees' advice.

This case study talks to the two main foci of the broader study; that is, the provision and influence of evidence-based advice to the Minister of S&T. With regard to provision, the case study explores how the work unfolded and manifested in practice – from the institutional arrangements that were put in place for undertaking the advisory activities and the setting of the research and advice agenda, through to the commissioning of research, the formulation of advice, and the communication of this advice to the Minister. In terms of influence, the analysis explores the extent to which and in what ways the ideas and recommendations from the research and advice found their way into policies, strategies and interventions of the Ministry and the DST.

Following the broader conceptual framework for this study, the chapter begins with an overview of the policy context within which NACI's advisory work relating to women and SET took place and to which it responded.

6.2   Background and policy context

6.2.1   The national government's gender equality programme and machinery

The focus on issues relating to women's participation in and benefit from SET forms part of the government's broader transformation programme around gender equity and women's empowerment, which in turn is rooted in the *Constitution of the Republic of South Africa, 1996* and its Bill of Rights (Chapter 2). Together, the Constitution and Bill of Rights set the fundamental framework of equality and protection from discrimination for all groups in society, including that of women. Drawing on the prescripts of the Bill of Rights, the Office on the Status of Women[85] located in the Presidency developed South Africa's *National Policy Framework on Women's Empowerment and Gender Equality* (see OSW, 2000). The Framework elaborated on the principles underpinning the national gender programme and stated that these principles, as well as a focus on gender equity concerns, needed to be mainstreamed; that is, integrated into the policies, practices and programmes of government and other public institutions. The Framework also defined and clarified the roles and structural arrangements for key public and non-profit sector actors involved in facilitating gender mainstreaming in policy-making across government, and made proposals regarding monitoring, evaluation and resource allocation. South Africa's Public Service Commission defines gender mainstreaming as follows (PSC, 2006: 4):

> 'Mainstreaming' is a process that brings what can be seen as marginal into the core business and main decision-making process of an institution. The term mainstreaming is derived from the objective to prioritise gender equality as a development activity. An important element in the mainstreaming strategy is to give attention to gender equality by influencing goals, strategies and resource allocations, and thus bring about real changes in policies, programmes and other activities.

Gender mainstreaming is coordinated at the highest level by the Policy Coordination and Advisory Services unit in the Presidency. According to an ASSAf report: 'The objectives of the co-ordination framework include gender mainstreaming, setting goals and objectives for the national gender programme, establishing clear lines of communication and accountability, and developing a dynamic management information system that facilitates informed implementation' (ASSAf, 2011a: 2).

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[85] Established in 1997, the mandate of the Office was to 'develop a national gender policy framework and later to oversee and coordinate policy development on women at the national level', and to 'align South Africa's transformation agenda with international standards of gender equality' (The Presidency, 2014: 12).

Other public bodies in the national gender machinery have included the Commission for Gender Equality;[86] the Ministry of Women, Children and People with Disabilities (since 2014, the Minister for Women in the Presidency); and two parliamentary bodies – the Joint Monitoring Committee on the Improvement of the Quality of Life and Status of Women, and the Women's Parliamentary Caucus (now the Multi-Party Women's Caucus).

The government also established 'gender desks' or 'gender focal points' within each government department to give effect to the implementation of the national gender equality policy and to facilitate the mainstreaming of gender issues across government. Shortly after its establishment in 2002, the DST created a Science, Gender and Disability Unit which would be responsible for the gender mainstreaming of line function programme delivery within the SET sector, specifically in the realms of human capital development and research agendas.[87] As will be seen in section 6.4, this Unit played a significant role in setting the research, advice and programme/policy intervention agendas which informed NACI's advisory activities in this arena. The Unit was subsequently replaced by a Director of Gender and Special Programmes.

6.2.2 Gender equity and mainstreaming in the NSI

Within the realm of SET, the White Paper on S&T had a strong emphasis on rectifying the race and gender iniquities inherited from the apartheid era. Such redress was framed as both human rights and economic competitiveness issues, where the latter would require the maximisation of 'the utilisation of ideas, creativity, ingenuity and innovation from the entire population' (DACST, 1996a: 39). The White Paper also stressed the importance of redress in terms of access to and benefits from SET by and for women, especially those living in poverty (ibid.: 41). In its first annual report (2002/03), the newly-formed DST articulated its two main objectives with regard to bringing about gender equity in the NSI in terms of these dual imperatives (DST, 2003: 29):

> The first objective is to unlock the potential of South African women to develop into distinguished scientists and thereby stimulate women's interest and entry into traditionally male dominated areas of science. The second objective is to mainstream gender into all research and development planning and execution to ensure that women are viewed as potential end-users and/or beneficiaries, with a resultant improvement in the quality of their lives and thus their communities.

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[86] The Commission on Gender Equality, a Chapter 9 institution via Section 187 of the Constitution, is mandated to 'monitor, evaluate, research and investigate complaints, and to conduct public awareness and education on women's rights and gender equality' (The Presidency, 2014: 14).

[87] Parliamentary Monitoring Group website: http://pmg-assets.s3-website-eu-west-1.amazonaws.com/docs/2003/appendices/031121science.htm, accessed August 2017.

The R&D Strategy (2002) picked up on these key issues and focused its proposals around gender equity on increasing and diversifying women's participation in SET; ensuring that SET benefits women, and especially those from disadvantaged communities; and mainstreaming gender equity in SET-relevant government departments and public institutions. As will be seen, these priority focus areas would be central to the women and SET-related advisory work undertaken by NACI. With regard to increasing women's participation in SET, the R&D Strategy pointed to the so-called 'frozen demographics' within SET – essentially a shrinking, aging and white male-dominated population – and highlighted that the key indicators showed that black and female scientists, technologists and engineers were not entering the academic ranks (DST, 2002: 21). As such, the Strategy called for measures to increase the number of girls taking SET-related subjects at school, and to attract and enable more women to access tertiary education in SET-related fields. With reference to experience in other countries, the R&D Strategy noted that 'the greater involvement of people from previously excluded sectors of the community cannot be left to chance or just market forces' and thus special programmes for the promotion of women in SET would be required (ibid.: 36). The Strategy's guidelines on how to achieve this are outlined in Box 6.1 below.

Box 6.1: R&D Strategy guidelines on how to achieve gender equity in human resources for SET

In order to rectify the gender imbalances in SET, the approach to human resource development for SET would need:

- To have a clearly defined gender perspective
- To include disaggregated statistics on women in the sector
- To attract women to SET via targeted programmes
- Centres of excellence to include strong gender-inclusive policies
- Current policies for women entering science to be consolidated into a programme of empowerment for women
- Policy for the development of women in science not to be punitive in respect of career development

Source: DST (2002: 55)

In relation to the benefits of SET for women, the R&D Strategy noted the continuing challenge of poverty in South Africa and that rural women shouldered much of the burden (ibid.: 42). Given that technology has been shown to play a key role in poverty alleviation, the Strategy observed that in order to bring about sustainable development, 'rural and urban communities should have access to innovations that accelerate development and provide new and more effective solutions than those utilised previously' and that women should play a central role in these processes (ibid.). However, beyond stating that '[i]nnovative technologies need to be harnessed to positively impact on their [women and people with disabilities] daily lives' (ibid.: 44), and outlining key areas for technology

development that would support poverty alleviation (health, education, agriculture and energy), this aspect of SET for women was not further elaborated upon in the Strategy. Furthermore, it is instructive to note that only one of the four domains for technology development outlined in the Strategy focused specifically on poverty reduction ('demonstration and diffusion of technologies to impact quality of life and enhance delivery'), while the other three related to new knowledge-intensive industries, specifically biotechnology and ICTs, advanced manufacturing, and 'leveraging resource-based industries and developing new knowledge based industries from them' (ibid.: 42).

Finally, policy and strategy relating to higher education are also pertinent to broader initiatives relating to gender equity in the NSI. The *Education White Paper 3: A programme for the transformation of higher education* (DoE, 1997) and the *National Plan for Higher Education* (MoE, 2001) both focussed on gender equity among staff and students within HEIs. Gender equity permeates the National Plan, specifically in relation to increasing women's access to higher education and to putting measures in place to redress gender imbalances among higher education staff and students. While DHET's recent *White Paper for Post-School Education and Training* (DHET, 2013) highlights progress made with race and gender equity in the higher education sector, it still retains a focus on the need for improvements in this area.

Women- and gender-related policies and initiatives of the DST specifically are highlighted in section 6.6 as part of the discussion of the use (or otherwise) of the women and SET-related advice.

6.3   Advisory structure: Objectives, composition and operations

Following its formation, one of the DST's first tasks was to establish the Cabinet-approved South African Reference Group on Women in Science and Technology (SARG). The R&D Strategy had indicated that the proposed SARG would consist of 'stakeholders and representatives of organisations with interest in the progress of women in science, to monitor and advise the [DST] on relevant issues' (DST, 2002: 36). Its main aims would be to 'strengthen women-led initiatives in all phases of participation in science and technology, from school to career achievement' (ibid.: 56); to 'determine research priorities and programme interventions that will minimize the gender-biased challenges in the science and technology arena'; and to 'play a lobbying and advocacy role in ensuring that adequate resources are committed to research and development that will have as an

outcome a definite improvement in the quality of life of women' (DACST, 2001: 110-111). The SARG's terms of reference, as articulated in two different sources, are highlighted in Box 6.2 below.

Box 6.2: SARG's terms of reference

- Assist NACI to promote a research agenda, including influencing funding that will improve the quality of life of women
- Assist NACI to promote innovation that will allow women to make a greater contribution to wealth generation in South Africa
- Provide advice on developing mechanisms that will increase the participation and contribution of women in S&T
- Highlight role models that promote women's entry and advancement in S&T
- Play a monitoring role in tracking institutional impact

Source: DST briefing to Parliament's Joint Monitoring Committee on the Improvement of Quality of Life and Status of Women (2003)[88]

- Collaboration with NACI in promoting engendered research agendas and the position and role of women in the NSI
- Advising the Minister of S&T on developing mechanisms that would increase the participation and contribution of women in SET
- Endorsing female role models in SET
- Monitoring progress in gender mainstreaming

Source: NACI (2004: 21)

Reporting to the Minister of S&T, it was envisaged at the time that SARG would 'complement and strengthen the activities of [NACI] with respect to gender issues' in the NSI (DST, 2002: 56). In other words, it was foreseen that the committee would be a standalone structure. However, in February 2003, Cabinet approved the proposal that SARG become a special advisory committee of NACI (NACI, 2003a: 9), and SARG was launched and held its first meeting the following month in Cape Town. With regard to the positioning of the committee in relation to NACI, the NACI annual report for 2003/04 stated the following (NACI, 2004: 12):

> Acknowledging the importance of the reference group required that careful attention be paid to its exact position vis-à-vis the Council. Considerable effort was spent in developing a management structure that would acknowledge the intentions of government to both complement the work of NACI and to optimise the role of SARG as a national advisory group.

When probed on what this meant in practice, a key informant reported:

> This was a polite way of saying that there was no general consensus within NACI on the relationship of SARG to NACI. One view was that SARG would make its own decisions independent of the NACI Council, but reporting to the NACI Council, who would comment on SARG's work but would not intervene in SARG's work. I think the words used to describe the relationship were 'relative autonomy'. The other view was that SARG's work should be formally adopted by NACI as with all other NACI sub-committees.

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[88] http://pmg-assets.s3-website-eu-west-1.amazonaws.com/docs/2003/appendices/031121science.htm, accessed July 2017.

> This led eventually to creating SET4W as a formal NACI sub-committee rather than a parallel structure. I do not recall any formal management structure other than participation of the SET4W Chair on the NACI Executive. (Key informant)

By 2004, SARG had become a permanent sub-committee of NACI and its name was changed to the Science, Engineering and Technology for Women (SET4W) committee. A key informant explains this shift in nomenclature as follows:

> SARG was the name given to the structure by the Department of Science and Technology. During the initial period of its activities, members of the committee observed that the name did not effectively represent the value that it was working to create. The name Science, Engineering and Technology for Women was intended to reflect what may be referred to as the twin foci of 'women in science' (women participating in science and innovation) and 'science for women' (the creation of science and technological artefacts for women's use/benefit). (Key informant)

The objectives of the SET4W committee, as articulated at the time in the 2004/05 NACI annual report, are outlined in Box 6.3 below. These objectives of contributing to gender mainstreaming of SET in the NSI, increasing women's equity and participation in the system and monitoring progress in this regard, and enhancing the benefits of SET for women, persisted throughout the existence of the committee (although to varying degrees, as will be shown). This is also reflected in the focus of SET4W's research and advice over the years (see section 6.5 below).

Box 6.3: Objectives of the SET4W committee

- To advise the Minister on measures to establish engendered research agendas that improve the quality of life for women
- To promote innovation that would allow women to make a greater contribution to wealth generation in South Africa
- To advise on developing mechanisms that would increase the participation and contribution of women in SET
- To encourage the SET sector to develop engendered human resource development plans
- To monitor and evaluate the progress of all R&D institutions in achieving the above objectives, by determining gender-specific key performance indicators

Source: NACI (2005a: 26)

The SET4W committee as the advisory structure would remain in place until 2012, with two terms of office: 2003-2006 and 2007-2012. The first term of office of SET4W expired at the end of 2005 and the last meeting took place in March 2006. In January 2006, the Minister approved a new dispensation whereby SET4W would become a NACI standing committee of 8-10 members (i.e. a reduction in the size of the committee). According to a key informant, in this new arrangement the SET4W committee members would be selected and approved by the NACI Council and not the Minister. In February 2006, NACI put out a call for nominations for suitable committee candidates.

The new committee was appointed in February 2007 (key informants could not recall why there was a delay of a year in the appointment of the new committee). The aims of SET4W from 2007-2012 continued to focus on gender mainstreaming and women's participation in SET. However, by 2010, there was a shift in discourse in official documentation, particularly with respect to reference to both genders (as opposed to women only) and from 'SET' to 'STI'.

The members of the two SET4W committees are listed in Appendix 3. According to the DST's annual report for 2002/03, the members of SARG 'were selected in their personal capacities for their collective experiences, expertise and commitment' and did not represent their respective institutions (DST, 2003: 29). There were some NACI Council members on the SET4W committee. A couple of observations can be made about the composition of these committees. Firstly, in both cases, the committees comprised a majority of women, all of whom occupied senior leadership or management positions in their respective organisations, and they came from a variety of backgrounds. Secondly, there were some differences between the two committees in terms of sectoral representation in the composition of their membership. The first committee comprised a mix of scientists/researchers, university leadership, representatives from the business sector and gender specialists. The organisational mix included three universities (Witwatersrand, Cape Town and Rhodes), a science council (CSIR), the state-owned enterprise Eskom (two members), private firms (five members), the CEO of the government's Office of the Status of Women, representatives from four international science-related organisations or networks, and the NACI Council (five members, including the committee Chair). The composition of the second committee was slightly different. The organisational mix included four universities (Cape Town, Pretoria, Wits and the Cape Peninsula University of Technology), two science councils (CSIR and the Agricultural Research Council), Eskom, and two government bodies – the NRF and a national facility. Once again, NACI Council members were represented, including all four committee Chairs. Only three private firms were represented – one of which had a non-profit component – and there were no representatives from government or international organisations.

As an advisory committee, SET4W operated in the same way as other NACI committees. As such, the committee was chaired by a NACI Council member and accountable to the NACI Executive Committee and the full NACI Council. What was different, however, is that the main secretariat support was provided by two DST employees – one of whom was the head of the Gender and Disability Unit, a gender specialist in her own right (health technology), who played an active role in the initiation and sustaining of the SET4W work. According to key informants, the work of these two

DST employees involved commissioning, setting the terms of reference and handling the contracts for research; and compiling documentation for the committee meetings. The NACI Secretariat provided some support including the liaison requirements of SARG/SET4W, facilitating meetings, and project management of the research. A key informant described the interaction as follows:

> Remember that SET4W had no staff, so the implementation of the work programme of SET4W actually happened through [the two DST employees]. They were the ones that made sure the work happened. And SET4W also had to follow the DST procurement processes and general policy for getting work done. So it was almost like they were the implementing arm in some respects … because they commissioned the work and they were present at our meetings. So it was quite a close relationship. … I think it was a good thing because there was alignment of objectives. So it wasn't as if we were at odds regarding objectives. (Key informant)

The SARG website was launched in June 2003. In the DST's briefing to the Joint Committee on the Improvement of Quality of Life and Status of Women in 2003, the aim and intended uses of the website were described as follows:[89]

> … its main purpose is to inform the public of gender-related developments in SET as well as about the activities of the SARG. The site also serves as a portal for discussion forums. A closed forum allows discussions between SARG members. An open forum allows individuals from the scientific community and the general public to enter into discussion and debates with each other, SARG, DST and NACI on issues relating to gender mainstreaming in SET within the broad themes of Human Capital Development and Research Agendas. The themes and lessons arising out of these forums will be used to inform other gender equity initiatives such as conferences and research endeavours.

It should be noted, however, that at the start of this study (2015), the website was no longer in existence.

In general, the SET4W committee met four times a year during which members would discuss issues pertinent to the research/advice agenda and programmes, as well as consider the research evidence that would underpin the formulation of the advice (see section 6.4 below).

As was highlighted in Chapter 5 (section 5.3.2), in 2012 NACI moved away from the use of permanent or specialist advisory committees and strategic thrust-related sub-committees, to the introduction of projects teams linked to key thematic policy issues agreed to with the Minister. As a result, SET4W as a committee was dissolved but the work continued under the NACI policy thrust 'Gender mainstreaming in the science, technology and innovation environment' from the 2012/13 financial year onwards. This represented a shift in focus to gender more broadly rather than women

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[89] http://pmg-assets.s3-website-eu-west-1.amazonaws.com/docs/2003/appendices/031121science.htm, accessed July 2017.

only. By 2016, race as a dimension had been incorporated into the nomenclature of this policy thrust, which was retitled 'Gender mainstreaming and race inclusion in the STI public sector environment.' While this era of NACI's work relating to women/gender and SET is not included in the analysis for this study, some further remarks about NACI's involvement in this policy issue are made in the conclusion to this chapter.

6.4   The advice formulation process

As can be seen from the discussion in preceding sections, the substantive foci attributed to the government's policy objectives relating to women and SET – starting from the White Paper on S&T and the R&D Strategy, through to the objectives of the SET4W committee – remained consistent, centring on the three core components of SET by women, SET for women, and gender mainstreaming. What this suggests is that the agenda for the areas on which SET4W was to deliver advice, and hence the agenda for the research that would underpin the advice, were informed by and aligned with the policy objectives of the government more broadly, and the Minister of S&T and the DST more specifically. Indeed, in its briefing to Parliament's Joint Monitoring Committee on the Improvement of Quality of Life and Status of Women in 2003,[90] the DST outlined the core foci of its newly-established Science, Gender and Disability Unit as comprising human capital development and engendered research agendas – both as conduits towards gender mainstreaming. According to key informants, the research and advice agendas were set primarily by the SET4W committee, with input from the DST representative and with little to no involvement of NACI itself:

> To my recollection, the group as a whole set those agendas in their meetings. … At a quite early point – I definitely recall between 2004 and 2006 – there was a fair amount of agenda-setting and then actual research conducted. But in terms of who set the agenda, kind of everybody did. I think there was a smaller group; I don't recall the smaller group working that much. But the bigger group certainly was involved in setting the agenda. You will recall that there were a few people outside of South Africa – two women from the US and one from the UK, although she was of Nigerian origin. So the main NACI didn't really get involved. (Key informant)

> The committee itself definitely shaped what was done and the decision-making was with the committee. So all the research that might have been commissioned; there were those annual publications on the status of women – it all came from the committee. In fact, the whole idea of an annual prize for women in science was under SET4W. That's where it started. (Key informant)

> We had one very important philosophy, and it's one that [the DST representative] in particular verbalised, and that was that women are just more than 50% of the population, and therefore women's

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[90] http://pmg-assets.s3-website-eu-west-1.amazonaws.com/docs/2003/appendices/031121science.htm, accessed July 2017.

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contribution to science was really crucial. And then we added the second part of that, was that women in science meant two things: it meant women's participation in science, but it also meant science for women. (Key informant)

The DST representative was, according to a key informant, also involved in agenda-setting as she was in all other aspects of the work: 'She was a participant like everyone else. I don't think we discriminated between the fact that she was sort of more part of the secretariat because she was a very knowledgeable person.' This interviewee described the relationship in this regard as 'cooperative'. This does not mean that there were not tensions and, according to this interviewee, the committee actively pushed back if they disagreed with the DST's perspective or agenda, saying 'the women on that committee were really a stubborn bunch … so there was just no way that that committee – either as individuals or as a group – were going to be somehow dictated to by the DST.'

From the outset, the SET4W committee placed considerable emphasis on commissioning empirical studies and building a systematic body of evidence relating to gender issues in the NSI to inform the formulation of advice. Alongside its research programme, SET4W also hosted a number of consultative events which either formed part of particular research projects directly or more generally informed the formulation of advice. These activities are described in detail in section 6.5 below.

A key informant described the nature of the interactions at committee meetings around the finalisation of advice:

> There was always a robust discussion and it was robust because not everybody had a history of working in gender policy and its implementation. And the people around the table had come in from different perspectives. So you would get somebody who ran a small company and then there were people like myself from the university sector. Then you would have the natural scientists and the social scientists. So it would always be robust discussion around whatever the advice or the issue was going to be. … People who were in charge of organisations often had a view that a recommendation was good in principle but perhaps not in practice in terms of feasibility. So that's when feasibility issues came into the discussion. (Key informant)

According to another Chair, 'the work was then presented and adopted at the NACI Council meeting and where necessary revised in line with relevant guidance from there.'

The final advice would be sent to the Minister with a covering letter. As will be seen, in a number of cases the research produced would constitute the advice given to the Minister and this was referred to by a key informant: 'So there would be a research report. At the end of the research report would be a list of recommendations and that would go off as the advice.' While there were opportunities

for the committee to engage with the Minister around the advice, as well as interaction with the DG and Deputy DGs of the DST, this interaction appears to have been limited. One key informant said: 'There were a few (I recall two) presentations by SET4W to the Minister of S&T.' She added that there was 'no engagement with any other ministries.'

6.5   Key research and advice outputs

Compiling comprehensive and accurate information pertaining to the various research projects commissioned and advice formulated under the auspices of the SARG and SET4W committees has been a challenging task given the absence of a SET4W website, incomplete NACI and DST archives of projects and reports in official documents or on their websites, and problems with gaining permission from the DST to access some of these documents. This is particularly so for the work undertaken by the second SET4W committee (2010 onwards). Nevertheless, I have been able to assemble sufficient information to use as data for this chapter in order to undertake an analysis of the movement (or otherwise) of ideas between research-based evidence, advice formulation and the policy sphere. In doing so, I focus on major advisory outputs (as opposed to smaller, ad hoc ones) for which documentary data is available.

What follows is a chronological narrative of the research projects and advice outputs, periodised along the lines of the two terms of office of the SET4W committee (2003-2006 and 2007-2012) since the work of each committee culminated in major advice outputs (although some aspects of the first committee were continued in the work of the second). Developments relating to SET4W's work which continued after 2012 are also highlighted. The narrative includes succinct summaries of the research projects including their timeframe, the research group(s) involved, the key outputs, and the key recommendations of each project. Each research project is labelled as 'RP' and assigned a number (e.g. RP1, RP2). Similarly, short summaries of the advisory outputs, where available, are presented in order to facilitate an analysis of the ways in which the research was drawn upon in advice formulation. Each of these is labelled 'AO' followed by a number. This labelling and numbering provides a shorthand for reference in the analysis.

6.5.1   SARG and the SET4W Committee (2003-2006)

In the absence of any hard evidence about the nature and extent of women's participation and performance in SET in South Africa, the point of departure for the newly-established SARG was to commission the study 'Women's Participation in Public Sector Science, Engineering and Technology in South Africa' in January 2003 **[RP1]**. The aims of this benchmark project were to develop a gender-disaggregated profile of the human resources for SET in the public science system, and to explore the nature and extent of the contribution of South Africa-based research to understanding the specific needs and problems of women in general, which would talk to the issue of the potential benefits of SET for women (NACI/DST, 2004: 4). Based on secondary analyses of available databases and data collected from HEIs and government SETIs, the profile of women in SET generated by the study incorporated data on postgraduate enrolments and graduations in HEIs, human resources in HEIs and government SETIs (including science councils, national research facilities and selected national laboratories), publication outputs, research funding in HEIs, and the rating of scientists by the NRF.

RP1: Women's Participation in Public Sector Science, Engineering and Technology in South Africa	
Timeframe	2003/04
Research group	CREST, Stellenbosch University
Output	*Women in Science, Engineering and Technology in South Africa: Final report to the Department of Science and Technology* (CREST, 2004)
Recommendations	- Accurate, reliable and comparable sex-disaggregated statistics on public sector SET specifically through surveys conducted by DST and other major studies undertaken by government - Qualitative research into the barriers women face in relation to progression within the SET system and scientific publishing - Programmes to assist aspiring female scientists in improving their publication output - More detailed studies of the distribution of funding grants and scholarships to female scientists, and on the gender perspective of public science - Appropriate and reliable information systems within HEIs on funding allocations to their academic staff - Public funding agencies to incentivise scientists to include an explicit gender perspective in their research, where appropriate - Other interventions to increase the awareness of gender and science issues in the NSI

The key findings of the final research report (CREST, 2004) were published in a booklet, *Facing the Facts: Women's participation in science, engineering and technology* (NACI/DST, 2004) **[AO1]**.[91] The

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[91] Hereafter referred to as *Facing the Facts 2004*.

booklet was launched by the Minister of S&T in November 2004 at an event attended by a number of deputy vice-chancellors of research from universities and executive leaders of science councils. It was disseminated to key stakeholders in the system and made available on the DST and SET4W websites. The findings of the report were also intended to inform the future activities of SET4W (ibid.: 3).

AO1: Facing the Facts: Women's participation in science, engineering and technology (2004)
Policy implications and/or areas for further research • The generation of more consistent and reliable sex-disaggregated statistics on public sector SET • Initiatives that reduce sex-based discipline choices (for men and women) and promote the career advancement of women in academia and public research institutions • Addressing the low publication rates of women in SET, and their academic advancement • Redressing the inequitable distribution of public resources • Promoting 'gender responsive' research in South Africa

Facing the Facts 2004 was followed up, during 2004/05, with a qualitative research study that explored the experiences of and factors impacting on women in SET **[RP2]** in terms of their under-representation in the sector, and probed the reasons why such a small proportion of research output from the SET sector had an explicit gender perspective, and to garner suggestions for improvement in this regard. The research was based on a literature review on facilitating and inhibiting factors relating to women's representation in SET, and interviews with 136 individuals (mostly women) who were either working or had worked in the SET sector (academia, science councils and industry). While the project produced a report, it was subsequently incorporated into a bigger project ('Women in Industrial SET', see below).

RP2: Women in SET: Exploring the facts	
Timeframe	2004/05
Research group	Tara Research and Equity Consultants
Output	Report: *Women in SET: Exploring the facts. A report prepared for the South African Reference Group for Women of The National Advisory Council on Innovation, under the auspices of the Department of Science and Technology* (Tara Research & Equity Consultants, 2005)
Recommended interventions	• In the SET community (gender-sensitising, mainstreaming gender impacts in research, compelling female representation on large-scale research projects) • Entry interventions for growing young female scientists • Sector-wide for incentivising science (relating to grants and bursaries, monetary prizes for achievements in R&D, salaries and benefits, deliberate government funded venture capital programmes for R&D) • Workplace (e.g. accommodating women's lifestyle imperatives, employee retention strategies, professional support and development programmes, systematic career path planning processes)

	• Funding (e.g. preferential bursaries, scholarships, research grants favouring representation of women researchers and/or benefits for women; mainstream gender sensitivity by mandating the consideration of potential gender impacts as a basic funding condition) • In the formulation and implementation of policy (e.g. transformation priorities, targets and monitoring; policy impact assessments)

In 2005, the Chair of the SET4W committee commissioned the design of an M&E framework for women in SET **[RP3]**. The underlying rationale for the project was that given the 'limited regular collection of data on the performance of women in the NSI' it was 'difficult to assess whether South African institutions [were] making progress in relation to stated policy objectives' (such as those set out in the R&D Strategy) (NACI, 2005a: 39). Thus, application of M&E would enable government and institutions to monitor progress over time; to identify strengths, weaknesses and gaps; and to take corrective actions where required (ibid.: 40). It would also inform NACI's advice to the Minister of S&T on system-wide interventions. The study involved identifying indicators, mechanisms and approaches for monitoring and measuring gender impact in the NSI[92] and, drawing on the baseline data and indicators in *Facing the Facts 2004,* developed a set of indicators which reflected broad policy concerns and planning and resourcing implications, proposed possible scenarios for the implementation of a women in SET M&E system, and made recommendations regarding data collection. The development of the framework was also informed by consultative workshops with female scientists and other stakeholders, to whom the draft was also circulated for comments.

RP3: A monitoring and evaluation framework to benchmark the performance of women in the NSI	
Timeframe	2004/05
Research group	CREST, Stellenbosch University
Output	Report: *A Monitoring and Evaluation Framework to Benchmark the Performance of Women in the NSI* (CREST, 2005)
M&E framework	**Core constructs and indicators** • SET potential (leakages in the pipeline, distribution across broad study fields, size and potential of SET and R&D pool) • SET labour force (SET human resource capacity, horizontal distribution across SET occupations, absorption of SET graduates) • R&D workforce (R&D human resource capacity, horizontal distribution across sectors, absorption of SET graduates) • Fairness and success in funding (access to funding, distribution of funds, funding amounts) • Rank and employment (vertical distribution within sectors, permanent appointments and promotions)

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[92] The two sources drawn upon to inform the development of gender-related indicators were *Women and Science Indicators: She Figures 2003* (European Commission) and *Women, Minorities and Persons with Disabilities in Science and Engineering: 2000* (National Science Foundation).

	• Scientific agenda-setting (distribution of executive and senior managers across sectors, representation on scientific boards and councils) • Scientific recognition (recognition by peers, distribution of reviewers for scientific journals and funding agencies, membership profiles of science academies, citation ratings) • Scientific output (authorships and publications) • Scientific collaboration and networking (co-authorships, collaborative research projects, conferences and sabbaticals) **Proposed application scenarios over a six-year cycle** • Scenario A: Annual monitoring of the system for reporting to the Minister of S&T • Scenario B: A three-year cycle of sector monitoring and reporting • Scenario C: International comparison • Scenario D: Six-yearly comprehensive reviews that evaluate the impact of new or ongoing interventions in the system

Following the reorganisation of the DST and the closing down of its Science, Gender and Disability Unit, in 2005 the DST transferred much of its involvement in the theme of women in SET to SET4W, including four comprehensive studies, which were absorbed into new or existing studies, and the drafting of a gender equity policy based on those and other studies (NACI, 2006b: 9). One of the projects inherited from the DST, 'Looking at SET Through Women's Eyes', focused specifically on issues affecting the recruitment, advancement and retention of women in the SET sector, and the ongoing challenge of public research funding issues that required a stronger gender focus. During 2005/06, this project was incorporated into a study on 'Women in Industrial SET' **[RP4]** which, running from 2005-2008, aimed to quantify the number and status of women in industrial SET companies; to determine the experiences and needs of women, the factors contributing to or inhibiting women's participation in the SET sector, as well as successful practices locally and internationally related to attracting women into, and retaining women in, industrial SET-related degrees and careers; and to develop a best practice guideline document on gender equity mainstreaming for relevant technology-intensive state-owned enterprises and private sector companies. Incorporating the in-depth interviews from the 'Women in SET: Exploring the facts' project [RP2], the project also undertook email discussion forums and interviews with successful women in the SET sector (views on human capital development and research agendas), conducted focus group discussions with senior leadership in publicly-funded institutions (on mainstreaming gender perspectives in research and human capital development), and held consultative conferences to elicit an in-depth understanding of the issues from participants. The recommendations of the report related to increasing women's participation in industrial SET and were targeted at industry, national government, educational and research institutions, and funders of entrepreneurial projects.

RP4: Women in industrial SET	
Timeframe	2005-2008
Research groups	Gender and Development Unit, HSRC (project management and coordination, quantitative and qualitative assessment of the participation of women in the industrial SET sector) and Da Vinci Institute of Technology Management (consultative conferences)
Output	Report: *An Assessment of the Participation of Women in SET Industry for Department of Science and Technology* (Moletsane & Reddy, 2008)
Recommendations	- Workplace environment (flexi-time, childcare facilities, work/life balance, innovation, exploring technical instead of management areas only, using technology to facilitate work interface, strategies to retain women) - Funding (monitor and benchmark number of women who win bids, ensure gender equity on decision-making forums, pro-actively encourage applications from women, provide facilities for tertiary students to test innovative ideas, provide public funds that match private funds) - Policy (workplace gender equity, work/life balance, equal pay for equal work, national strategy, revise tax laws) - Research and monitoring (studies on policies and practices, using research to plan and review national policy, monitor progress on recruitment, retention and advancement in industrial SET, investigate women exiting the SET sector, monitor funding for women entrepreneurs in industrial SET, record statistics required by government, benchmark nationally and internationally) - Re-culturing SET as a field of study and sector (debunk masculine image of science and scientists, support initiatives that sell science as socially relevant, especially to the girl child) - Creating networks (alternative workplace networking opportunities, national forums and conferences for women, identify and promote networking opportunities amongst women entrepreneurs, partnerships with schools and tertiary institutions)

In support of the projects underway, during 2005 SET4W hosted a number of events with key stakeholders which were to inform the research and advice formulation processes underway and, in some cases, as opportunities to collect data from participants. These included the following:

- May-June 2005: Three consultative conferences were held in Johannesburg, Durban and Cape Town as part of the 'Women in Industrial SET' project. Here, female scientists 'discussed their experiences of the needs, challenges, opportunities and barriers facing women in SET' (NACI/SET4W, 2006: 2), as well as their perspectives on monitoring and evaluating the performance of women in SET across a range of sectors and occupations (CREST, 2005: 4).

- August 2005, 'Challenges and Successes of Leadership by Women in SET' workshop: The focus of the workshop was on exploring issues and challenges for women in SET leadership, identifying priority issues that should inform policy development in the context of the SET4W mandate, and sharing experiences. Workshop delegates included representatives from government SETIs, HEIs and business.

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- October 2005, consultative workshop in preparation for the drafting of the gender equity in SET policy: The workshop was attended by representatives from National Treasury and the government's Office of the Status of Women; the Departments of Science and Technology, Education, and Foreign Affairs; the Universities of Pretoria, Witwatersrand and Stellenbosch; science councils (HSRC and Agricultural Research Council) and the NRF; Eskom; the Africa Institute of South Africa; and the Da Vinci Institute of Technology Management.

The key advice output of the first SET4W committee was a draft policy framework on gender and race equity in SET, and incorporated the research undertaken thus far. The 2006/07 NACI annual report described the purpose of the framework as follows (NACI, 2007a: 11):

> … a comprehensive and systematic race and gender equity policy framework within which institutions in the South African NSI can implement effective measures for ensuring that South African women participate fully in, and benefit from, innovative SET research, the production of SET products and the provision of SET services. The framework is further intended to ensure that South Africa produces a future SET human resource base that contributes significantly to the growth of national R&D and innovation for competitiveness and social development.

With regard to improving women's participation in SET (which in and of itself was viewed by the DST as contributing to the knowledge base and innovation in the country as a whole) and to enhancing the benefits of SET for women, according to Moletsane and Reddy (2008: 5), the stated goal of the DST was to establish a gender equity policy for the SET sector which would 'inform the sector's initiatives with respect to gender equity mainstreaming.'

The draft policy framework was written up by the Chair of the SET4W committee together with a few other members of the committee as well as the DST representative (key informant). The draft policy covered the period 2006-2020 and a reader-friendly version entitled *Creating the Future: Gender, race and SET sector policies for capacity building and innovation* (NACI/SET4W, 2006) **[AO2]** was published on the NACI website. It aimed at promoting greater participation of women in SET, as well as greater benefits for women (and particularly black women living in poverty) derived from innovative SET research, the production of SET products and the provision of SET services. The draft policy called for the regular collection by institutions within the NSI of gender- and race-disaggregated data on women's participation in and benefit from SET, which should be used to inform all relevant decision-making as well as the monitoring and evaluation of interventions in this regard. Such institutions would include, among others, the DST and other national departments such as Education, Trade and Industry, and Labour; funding bodies such as the NRF; and science councils,

other SETIs and HEIs. The policy recommendations, institutional responsibilities and the M&E framework are summarised in AO2 below.[93]

The draft framework was approved at the final meeting of the first SET4W committee in March 2006 and was submitted to the Minister of S&T in August 2006 together with the background research reports that had been produced. There is direct reference to the studies – their findings or constructs – in providing the context of women and SET and in the development of specific measures. The CREST M&E framework was included as is in terms of indicators, scenarios and calls for improved data collection across the system. As can be seen, the contents of the draft policy framework talk directly to broader DST policy imperatives (e.g. need to increase the participation of women, and especially black women in SET as set out in the R&D Strategy), as well as the terms of reference of the committee itself.

AO2: Creating the Future: Gender, race and SET sector policies for capacity building and innovation

Enhancing women's participation in SET (SET *by* women)

Underlying principles:

- Equity in terms of access, allocations, advancement and rewards
- Non-discriminatory policies or practices with regard to recruitment and promotion, the allocation of resources, career interruptions and re-entry into the sector
- Gender mainstreaming in SET policies and strategies
- Collaboration and cooperation between key actors

Specific measures to increase, sustain, retain and advance women in SET across all levels (students and staff) and SET fields, which should be introduced within government, funding bodies, SETIs and/or HEIs, as appropriate.

- Targets
  - Explicit targets for participation of black women and other under-served populations
  - Funding to increase the number of productive women researchers by 3,000 by 2014
- Additional/earmarked funding
  - Additional funding to provide bursaries and support for (particularly black) women to pursue PhD degrees in SET
  - 'Life-cycle grants' and re-entry programmes that support women whose SET education or training has been interrupted by family obligations.
  - Relevant government departments and other SET-related public institutions to propose and implement special financial measures that will achieve the equitable participation of women, including public funding for mentoring and supervision programmes and investment programmes in developing the research skills base
  - Mechanisms for the allocation of public funding must ensure that all barriers that limit women's access to and utilisation of funding for the study of SET disciplines, conducting SET research, producing SET products, and advancing their careers within the SET sector, are eliminated
  - Equity in the value of public funds allocated for R&D work conducted by women, including dedicated funds for women to be lead or principal investigators in order to enable women to compete in the

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[93] Note: the document and its key policy recommendations are not succinctly laid out and thus the information in the box below is my own thematic summary.

various SET domains
- o The NRF to promote gender mainstreaming and apply the Principle of Fair Discrimination in order to ensure parity in the award of its Professorial Chairs, and to significantly increase the numbers of female postgraduate students studying and/or conducting research under the supervision of the NRF chairs and other grant-holders
- o Public funds to be utilised in both universities and in government research institutes to increase the volume and enhance the quality of scientific output of women
- Support programmes
  - o Public SETIs and HEIs to devise, implement, monitor and report on specific programmes for achieving equitable participation by gender and race
  - o Institutions to establish leadership and mentoring programmes for the SET workforce that include an emphasis on the inclusion of women and black people
  - o The DST and DTI, in consultation with industry, to explore options for establishing a 'Women's SET Trust' to encourage active women scientists to engage in the commercialisation of technologies and promote SET start-ups.
  - o A Science Entrepreneurship Programme to create further opportunities for women to remain in SET across the private sector, science councils and the service industry
  - o Programmes to be established at the DST and within other relevant public institutions that provide appropriate training and support for SET staff on gender awareness and gender mainstreaming implementation
- Recognition and rewards
  - o NRF and other granting institutions to conduct a review of existing mechanisms for awarding researcher ratings and other scientific criteria that would lead to greater participation of women at all levels
  - o Actions to promote women's participation in SET to include measures for the public recognition of successful women scientists
- Actions in which government and institutions in the NSI play an active role in changing the widely held perception that science is a 'white, male profession'
- Participation in decision-making: It is a policy imperative that women participate in all decision-making structures of the NSI
- Strengthening inter-departmental collaboration in SET
  - o The DST, through appropriate structures and mechanisms, to take steps to ensure that government departments achieve greater synergy as regards public funding of the NSI and work together in a more coordinated manner towards attaining the common goal of promoting and enhancing women's participation in all domains of the SET sector
  - o The DST to collaborate with the Department of Education regarding the active promotion of women's participation in SET and mathematics across the education system

Ensuring women benefit from SET (SET *for* women)

- Transforming the lives of women through SET: In order to ensure that SET research benefits women in relation to, among others, access to SET-based services, health effects, the utilisation of SET for social and economic advancement, and that a race and gender lens is applied to SET research, three main actions are required:
  - o Funding mechanisms for SET research and innovation to incorporate an explicit gender and race focus
  - o Institutions within the NSI to ensure that women active in SET and research are equitably represented on committees and panels at all levels of decision-making regarding research activity and SET output
  - o Evaluation and reporting of the results of publicly-funded research must include statements on the impact of such research on transforming the lives of women, in particular on SET for poverty reduction
- Promoting production of SET products and services for women: In order to encourage gender mainstreaming in research and innovation output, the DST in collaboration with the DTI and other government departments will coordinate gender awareness programmes, which highlight perspectives on incorporating women's needs in the production of SET products and in the provision of SET services
- Promoting further research on SET for Women: The DST in collaboration with institutions in the NSI will conduct further research on identifying what constitutes 'SET for Women' across a range of S&T domains,

leading to development of an associated agenda for R&D funding, under the banner of 'New Frontiers in Engendered SET Research'

Gender, race and SET monitoring and evaluation framework

The M&E framework for measuring the extent to which the policy is being implemented across the NSI was based on the following nine constructs: SET potential, SET labour force, R&D workforce, funding issues, rank and employment, scientific agenda-setting, scientific recognition, scientific output, and scientific collaboration and networking.

The framework proposes four application scenarios that take into account the purpose of the monitoring exercise, the audience, and the cost and time implications of data collection and reporting. The application scenarios represent complimentary schemes in a six-year cycle of M&E activities:

- Annual monitoring at the national level of the R&D system for reporting to the Minister, based on routinely collected data in the system
- Three-year cycle of SET sector monitoring and reporting in order to inform sector-level policies and interventions
- Three-year cycle of international benchmarking in which indicator categories are selected on the basis of currently available international data
- Six-yearly comprehensive review that evaluates the impact of new or ongoing interventions in the system, incorporating two three-year cycles of sector reports and international comparisons, which will be used to inform all stakeholders in the system of all aspects of the NSI

Data relating to both the framework constructs and reporting cycles were to be incorporated, as appropriate, into the National Research and Development Survey, the Innovation Survey, DST-led institutional review processes, and the National Census.

Tasks were assigned to specific bodies within the NSI:

- The DST to disseminate, on a regular basis, the disaggregated gender and race data it collected on the scientific and technical workforce, in order to track the participation of all populations and the value generated by women in SET. On the basis of the evaluation reports generated, the DST would prepare an annual publication, *Gender and SET at a Glance*.
- Publicly-funded institutions should include a section on the 'State of Gender in SET' in their annual reports, making reference to the broad constructs set out in the framework. In addition, they should conduct regular reviews of their institutional M&E mechanisms established for SET-related programmes – mechanisms that should enable institutions to test the impact of these programmes on (especially black) women.

In order to implement this M&E approach, and to produce sufficiently rich datasets to inform future decision-making on SET by Women and SET for Women, capacity for data gathering and analysis should be increased and funded in the relevant agencies and institutions.

6.5.2   SET4W Committee (2007-2012)

The second SET4W Committee continued work on women's participation in and benefit from SET, as well as the M&E framework.

During 2007, the new SET4W committee commissioned a qualitative study to further investigate issues pertaining to the attraction to and retention of women in SET-related studies and careers in

the SET industry **[RP5]**. Based on experience elsewhere, the rationale for the project was the idea that 'increased visibility on women's achievements and contribution to the SET sector would encourage other women, particularly young women and girls, to pursue careers in SET' (Maree et al., 2008: 3). The purpose of the study was 'to generate advice on what the government needs to do in order to support and possibly fast track the growth and development of women in the SET sector' (ibid.). Through the documentation of the career histories of 19 female role models (i.e. in high profile SET careers) in the SET sector, the study aimed to identify the factors that contributed to the success of these women in their careers; the obstacles and challenges with which they were confronted in their workplaces and/or academia; and ways to effectively enhance the participation of women in the SET sector. In 2008, SET4W hosted a symposium, the aim of which was 'to discuss and solicit input from representatives of the government, higher education, science councils, industry and private sector' on the findings of the study.[94]

RP5: Changing perceptions of women in SET	
Timeframe	2007/08
Research group	Institute for Women and Gender Studies, University of Pretoria
Output	Report: *Changing Perceptions of Women in the Science, Engineering and Technology Industry: Evaluating the career histories of role models in South Africa* (Maree et al., 2008)
Recommendations	• Gender equality with regard to the participation of women and men in SET needs to be targeted from as early as the primary school level • Continued focus on programmes and campaigns to promote the visibility of role models • The viability of induction programmes aimed at assisting women to make the transition from tertiary studies to the workplace should be explored

In 2008, recognising the 'the continued significant gender imbalances in the SET sector coupled with little evidence of strategies to address these', the SET4W Committee commissioned a follow-up study to *Facing the Facts 2004*. The existing (2006) M&E framework was populated for the first time using available data for the period 2000-2005 **[RP6]**, the analysis of which culminated in the updated *Facing the Facts: Women's participation in science, engineering and technology 2009* (NACI/DST, 2009) **[AO3]**. The report highlighted trends in women's participation in SET – both those areas that had shown marked improvement, as well as those that still warranted immediate interventions in order to fast-track gender equity goals – and made recommendations in this regard. The booklet was intended to inform planners and policy-makers within government, HEIs and SETIs of initiatives for women in the SET sector, and to inform the ongoing activities of the SET4W Committee. The key

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[94] http://saasta.ac.za/set4w/set4w_symposium.pdf, accessed June 2019.

recommendations of the report included many of those made in *Facing the Facts 2004.* Interestingly, the dimension of SET *for* women, as articulated in the CREST (2004) report and in *Facing the Facts 2004* as the benefits of SET for (especially black) women living in poverty, did not feature in the 2009 version. Possible reasons for this are discussed in section 6.6.

AO3: Facing the Facts: Women's participation in science, engineering and technology 2009

Key findings

- While there had been a steady increase in the number of female postgraduate students in SET, women were still in the minority, especially at the masters and doctoral levels
- The number of enrolments and graduations among black women had continued to increase but still constituted a minority (43%) compared to their white counterparts
- While the number of professional female R&D personnel had increased in the SET business sector, HEIs and science councils, most of these women were employed in the public sector and at the lower employment ranks, and their representation in the engineering sciences and applied technologies in HEIs was also limited
- Female publishing scientists had only contributed a quarter of all outputs produced in South Africa over the period
- There had been improvements in funding for women enrolling in upper postgraduate degrees and in research grants to female researchers, with the majority of scholarships and grants awarded in SET-related fields
- While the proportion of female rated scientists had increased slightly, the majority of rated scientists were still men

Recommendations

- Generate consistent and reliable gender-disaggregated statistics on the public SET sector
- Undertake initiatives that reduce gender-based discipline choices and promote the career advancement of women in academia and public research institutions
- Address the low publication rates of women in SET and their academic advancement
- Redress the unequal distribution of public resources
- Promote 'gender responsiveness' research in South Africa
- Continue to fast-track female enrolments and graduates, particularly at the masters and doctoral levels
- Improve existing gender policies and implement these to ensure that an equitable number of women (especially black women) participate at the higher academic levels and employment ranks

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In January 2009, SET4W produced wide-ranging advice to the Minister of S&T **[AO4]** based on prior research undertaken, the outcome of a symposium on factors contributing to the success of women in SET careers (June 2008), previous work of the committee, as well as local and international best practice. The advice constituted a comprehensive set of recommendations with respect to factors that contribute to or inhibit women's participation in the SET sector. In addition, a draft set of 'good practice guidelines' **[AO5]** was developed to encourage gender equality in the SET industry.

AO4: Ministerial advice based on various prior work and activities (2009)

- The good practice guidelines be further developed in partnership with relevant ministers, including the ministers of Trade and Industry, and Education, and submitted for adoption by Cabinet
- The development of a national strategy on gender equality be initiated with the aim of mainstreaming

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gender equity in all spheres and at all levels of SET
- The DST and DTI jointly develop a scientific communication strategy to popularise science as a viable and attractive career choice for women, and disseminate this message through strategic partnerships with community-based organisations, NGOs, schools, HEIs and others
- A national forum to coordinate existing public understanding of SET activities be established to reduce duplication of effort between organisations with similar objectives and to improve the quality and extent of the reach of the work
- Appropriate funding instruments be implemented for initiatives to support women in SET careers, including those that return to the SET sector after a career break of several years
- The higher education curriculum be broadened to include compulsory courses in business skills for all undergraduate SET students
- The school curriculum be revised through the selection of appropriate case studies so as to be equally attractive to both boys and girls
- The need for the introduction or enhancement of existing mentorship schemes in the HE and vocational sectors be investigated
- The DST, together with the South African Agency for Science and Technology Advancement, to prepare effective career guidance documents and training packs for teachers and counsellors to ensure that learners receive accurate advice
- The full reports, policy briefs and the good practice guidelines generated from the studies be made accessible to the general public to increase public awareness and stimulate further debate on issues regarding gender equality within the SET sector
- Existing awards and prizes that recognise achievement in SET fields and create publicity for women in SET be maintained

Drawing on the publication of the research report *Changing Perceptions of Women in SET* [RP5], two other outputs were developed by the SET4W committee during 2009 that were intended for use in broader society. The first was a glossy booklet showcasing the career histories of the role models (NACI/SET4W, 2009a) **[AO6]**, the profiles for which were compiled by the South African Agency for Science and Technological Advancement, accompanied by a media campaign to disseminate the lessons learned to targeted audiences. The second was a brochure **[AO7]** aimed at encouraging girls to consider careers in science via a series of life stories of successful women in SET with a view to challenging the negative perceptions of women in these disciplines.

Also during 2009, SET4W launched the study 'An Assessment of Incentives for Employing Women in Corporate Environments' **[RP7]** which would run until 2012. The research aimed 'to investigate how incentives (with special emphasis to financial incentives) could be used to benefit companies for employing more women with reference to local and international best practices at organisational and government levels; and to identify re-entry strategies for women who take extended career breaks for family reasons' (Institute for Women's and Gender Studies, 2010: 12-13). Two research reports were published as part of this project.

RP7: Incentives for employing women in the corporate environment	
Timeframe	2009-2012
Research group	Institute for Women's and Gender Studies, University of Pretoria
Output	Report: *Policy Analysis: Incentives for Employing Women in the Corporate Environment* (2011/12)

SET4W also continued work on the gender policy and M&E framework, publishing a second document in 2009 entitled *Creating the Future South African National System of Innovation: Gender, race and SET sector issues* (NACI/SET4W, 2009b) **[AO8]**. Linked to the various *Facing the Facts* reports, the framework talked to the continuing problems being experienced with regard to women's participation in SET. In terms of its goals and the measures to achieve these, the 2009 framework drew substantially on the 2006 version; that is, they both focus on improving the status of women in SET as well as SET for women, and encouraging institutions in the NSI to collect gender- and race-disaggregated data in order to enhance decision-making. Furthermore, as with the 2006 version, the 2009 M&E framework drew on the nine constructs of indicators as well as the four application scenarios developed and proposed in the original 2005 CREST report for implementation of the framework, although these were slightly elaborated upon. Like the 2006 version, the 2009 framework suggested that the proposed measures be implemented by a combination of government departments and other key institutions in the NSI. The 2009 policy framework is not presented here in detail as it very closely resembles the draft version and the reader is referred to [AO2] above in this regard. There are some minor adjustments in terms of targets and target dates. There are two differences that are, however, worth noting. The first is that, in contrast to the draft version (2006), the 2009 document referred to itself as 'a framework proposing collaborative actions' and emphasised that it is not prescriptive (ibid.: 2):

> This framework is not a policy document, nor is it a guide that institutions should follow. The approach rather is that institutions in the NSI are invited to explore the ideas contained in the framework and consider how they might use any of the ideas and mechanisms listed, to advance the participation of women of all races, in the national project to build the South African science system and promote its contribution to development.

The shift from prescriptive to guidelines/proposed actions is evident in slight changes in language. The second feature that is discernible is the shift in a number of places from the responsibility for certain actions attributed to the DST to other institutions. Examples from a comparative analysis of the two documents are highlighted in Box 6.4 below.

Box 6.4: Shifts between the 2006 and 2009 versions of the proposed gender framework	
Shifts in language from prescriptive to guidelines/proposals	
2006	2009
'It is a policy imperative that institutions in the National System of Innovation undertake the measures and actions proposed here' [p4]	'It is a societal development imperative that institutions in the NSI undertake many or all of the measures and actions proposed here' [p5]
'… all institutions in the South African NSI are required to devise, implement, monitor and report …' [p4]	'… it is recommended that all institutions in the South African NSI devise, implement, monitor and report …' [p5]
'In order to achieve this objective … a number of actions, strategies and support measures must be put in place' [p4]	'In order to achieve this objective … a number of actions, strategies and support measures may be put in place' [p6]
'Among other things, institutions are required to ensure that women scientists are not discriminated against …' [p6]	'Among other things, institutions could ensure that women scientists are not discriminated against …' [p7]
'In order to ensure that SET research benefits women … three main actions are required' [p7]	'In order to ensure that SET research benefits women … three main actions should be considered' [p7]
'The *Gender, Race and SET Monitoring and Evaluation Framework* will utilize the following nine constructs to measure the extent to which this policy is being implemented across the national system of innovation and to identify areas for future intervention …' [p22]	'The *Gender, Race and SET Monitoring and Evaluation Framework* proposes the following nine constructs to measure the extent to which change is occurring across the NSI and to identify areas for future intervention …' [p17]
Shifts in responsibility from the DST to SETIs	
2006	2009
'Training programs should be established at DST, at NRF and other granting institutions, at CSIR and other public research institutions …' [p5]	'Training programmes should be established at institutions, including the NRF and other granting institutions, all performing science councils and other public research institutions.' [p6]
'The Department of Science and Technology will, through appropriate structures and mechanisms, take steps to ensure that government departments achieve greater synergy as regards public funding of the national system of innovation and work together in a more coordinated manner towards attaining the common goal of promoting and enhancing women's participation in all domains of the SET sector.' [p6]	'The South African government should, through appropriate structures and mechanisms, take steps to ensure that government departments achieve greater synergy …' [p7]
'… the Department of Science and Technology will develop a Code of Good Practice on Women's Participation in SET. This will be done in collaboration with the Department of Labour and the Department of Trade and Industry, and in consultation with those departments who have associated science councils, research institutes and state owned enterprises. The code will require institutions to implement effective strategies …' [p6]	'… it is recommended that a Code of Good Practice on Women's Participation in SET be developed jointly by the DST, DoL and the dti, in consultation with departments that have associated science councils, research institutes and state-owned enterprises. The code could require institutions to implement effective strategies …' [p7]

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These shifts between the draft and final versions suggest that discussions must have taken place within the DST and between the DST and SET4W, although key informants could not recall the specifics. Whatever the case, I interpret these changes as reflecting that the DST itself cannot be prescriptive about what SETIs do or do not do but can only make recommendations or proposals, and that the responsibility for implementing these initiatives would lie with the institutions themselves. This talks to the two larger issues of DST's oversight and coordination role in the system, as well as the provision of NACI's advice to the Minister of S&T only which, as raised in Chapter 7, are factors impacting on the real and potential influence of NACI's advice. In the NACI annual report for 2010/11 (NACI, 2011: 39) it was noted that planning for 2011/12 would include further exploration of the SET gender policy.

A key advice-related output of the second SET4W Committee was the publication, in 2010, of *Enhancing the Participation of Women in the SET Sector: Principles and good practice guidelines* (NACI/SET4W, 2010) **[AO9]**. As suggested by the title, the report provides guidelines for both public and private institutions in the NSI in relation to the development of internal policies to enhance women's participation in SET. The proposal for the DST to develop such guidelines was outlined in the 2006 gender and race equity policy framework for SET as follows (NACI/SET4W, 2006: 5):

> In order to attract and retain women in the SET workforce, the Department of Science and Technology will develop a *Code of Good Practice on Women's Participation in SET*. This will be done in collaboration with the Department of Labour and the Department of Trade and Industry, and in consultation with those departments who have associated science councils, research institutes and state owned enterprises. The code will require institutions to implement effective strategies for, inter alia: provision of a SET working environment that is conducive for women to contribute high quality output; the participation of women scientists in high-level decision-making processes at the SET workplace; programmes to ensure career continuity during child-bearing years including funding remote access and/or child-rearing grants; establishing and implementing programmes for women to re-enter careers in research/SET; training programmes to promote gender sensitivity in SET production; preventing sexual harassment of women in SET workplaces; and offering effective mentoring programmes.

AO9: Principles and good practice guidelines for enhancing the participation of women in the SET sector (2010)[95]

Sectoral policy guidelines

- Equal opportunity policies: These should be implemented and reviewed annually to mainstream gender in SET workplaces and academia. Senior management should be trained in, and seen as the champions of these policies. In turn female employees should take responsibility for accessing their rights and participating in available opportunities.
- Commitment and transparency: All organisational procedures, including performance assessments,

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[95] Source: Brochure https://words-worth.co.za/words-worth/downloads/portfolio/brochures/NACI%20brochure.pdf, accessed April 2017.

recruitment and promotion should be transparent and fair, and women should be included in decision-making committees at all levels. Diversity and equality issues should be integrated into reporting mechanisms.

- Sexual harassment policy: A policy of zero tolerance of sexual harassment should be instituted and strictly observed.
- Needs and priorities: Gender-sensitive policies and practices should be regularly reviewed and amended to cater for the diverse needs and priorities of women from different backgrounds, age groups and SET institutions.
- Health and safety: Working environments should meet women's specific needs, for example, in terms of sensitivity to pregnant women in hazardous environments, the design of safety equipment and clothing, and the provision of appropriate bathroom facilities.

Workplace guidelines

- More flexibility: This should include flexible working arrangements to allow women to balance the demands of work, study and family; subsidised quality childcare and related facilities on site; tax incentives to promote the participation of women in SET sector; and the lifting of age restrictions by funding agencies to accommodate women whose studies or careers are interrupted due to family responsibilities.
- Remuneration: Besides improving the sector-wide salaries to make them attractive to potential employees, men and women should receive the same salary package for the same work, based on a clear stipulation of the relationship between remuneration and performance.
- Mentors, role models and networking: Industry and academia should have a dedicated budget for programmes that would help young women and men challenge stereotyping and traditional career choices, and more easily deal with workplace demands and stress. This could include job-specific training; the creation of mentorship access networks or databases of female mentors; and the introduction of formal mentoring and role model schemes at professional societies, academia and private sector employers.
- Communication: Many women enter the SET workplace from what they experience as a disadvantaged position. To avoid this, organisations should, from the start of a woman's employment, explain the provisions they have made to cater for women's needs, as well as the challenges that she might face. They should also develop explicit career paths so that it is clear from the outset that women's gender will not hinder their upward mobility in the organisation.

Re-entry into the SET environment after a break

Traditional role expectations often cause women to interrupt their studies or careers to start families. Strategies to address this could include:

- Implementing structured re-entry programmes (tailor-made courses to help women catch up with developments during their absence)
- Supporting potential re-entrants (e.g. by establishing a trust scheme to finance fellowships for those returning to the industry)
- Remaining in contact during career breaks (encouraging SETIs to remain in contact with their employees during career breaks and keep them informed of new developments)

The good practice guidelines were launched by then Minister of S&T, Naledi Pandor, at the NACI/SET4W one-day symposium on 'Enhancing the Leadership Roles of Women in Science, Technology and Innovation' held in August 2010. Approximately 100 people attended the symposium from a wide range of institutions including universities, science councils and other SETIs, Eskom, ASSAf, the NRF, the DST and other government departments, NACI, and private sector SET-related companies. The aim of the symposium was 'to advance policy thinking and strategies for women to enter and excel in areas of [STI]' and had the following objectives: to advance policy

thinking and to find ways for women to exist and excel in leadership in STI; to share information on the status of women as managers and leaders of scientific output in South Africa; to take stock of what had been achieved in policy terms with regard to advancing the status of women in STI, based on the work of SET4W as a policy advisory committee of NACI; and to recommend strategies, mechanisms and programmes for implementation to improve women's contributions to science in practical terms (NACI, 2010c: 1). The tone of Minister Pandor's opening address at the symposium regarding the good practice guidelines was one of urging stakeholders in the NSI to adopt the guidelines in their own institutions and practice. Two examples include: 'You as leaders and senior managers in the STI environment should become champions of gender equity policies in your respective spheres of influence'; and 'Through these guidelines, I would like to see a change in the psyche and culture of the STI system' (ibid.: 3).

During 2010, SET4W initiated three new projects. The first was 'Facing the Facts: Causes for trends' **[RP8]** which was an analysis of trends based on the facts and figures provided by the first two studies. The report was published during 2011/12: *Policy analysis: Review of Facing the Facts and Causes for Trends: A pipeline illustrating the overall participation of women in SET*. The second project was on 'Tertiary Education Costs and Other Barriers Affecting Entry by Female Students to SET Fields' **[RP9]** which aimed to examine the obstacles and disincentives faced by young women intending to enter SET fields of study, in order to inform strategies in this regard. The project was completed during 2011/12. The third project focused specifically on the agricultural sector **[RP10]** which investigated the participation of women across the agricultural value-chain. This project resulted in a research report, *The Role of Women in Key Economic Sectors Underpinned by SET: The case of agricultural and agro-processing sector* (Hart et al., 2010) and, during 2011/12, the proceedings of a symposium on 'SET Gender Policy and Agriculture' and a position paper entitled *Systematic Improvements and Policies to Enhance the Position of Women in Agriculture* **[AO10]**. In February 2012, SET4W hosted the 'SET Gender Policy and Agriculture Workshop' which aimed to encourage discussion and input to the SET gender policy, as the basis for advice planned during that year (NACI, 2012: 20). The above-mentioned research projects and workshop formed the basis of advice delivered to the Minister in 2012 entitled 'Addressing Barriers for Women in SET' **[AO11]**.

AO11: Addressing Barriers for Women in SET (2012)[96]

Recommendations

- A rigorous implementation of agricultural transformative policy in order to enhance the land ownership status of women
- An increase in the employment of women as R&D workers, particularly in areas of pronounced scarcity such as engineering and applied sciences
- Mechanisms to increase enrolments of female students, particularly Africans, at upper postgraduate level
- A transformative change in recruitment strategies of corporate organisations in order to bring about impactful transformation
- Stronger sanctions for violations of the Women Empowerment and Gender Equality (future) Act in order to put in place an effective redress regime, including compensation to be dispensed through the Equality Courts
- A healthy balance between welfare approaches that seek to remedy the imbalances of the past and nanny state approaches that will result in loss of self-reliance amongst citizens and ultimately poor economic participation

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In October 2012, the NACI Chair and SET4W committee held a workshop with the Minister on the SET gender policy framework **[AO12]**.

6.5.3   Developments post-2012

As was highlighted in section 6.3 above, with NACI's move away from advisory committees to the use of projects teams (2013/14) and expert panels (2014/15),[97] in 2012 SET4W as a committee was dissolved but the work continued under the NACI policy thrust of gender mainstreaming in the (public) STI environment. There were two outputs during 2013/14. The first was the development of a policy discussion document, *Benchmarking the Policy Environment for Gender Mainstreaming in the STI: Mitigating gender disparities,* which compared South Africa's academic and research environment to those of India and Brazil (NACI, 2014a: 19). The second output was the publication of a booklet, *Understanding Mainstreaming: A practical guide toward mainstreaming gender and disability* (see NACI, 2014b) **[AO13]**. As can be seen from the title, the guide addresses both gender and disability. For the purposes of the summary below, I make reference to gender only, although both gender and disability are discussed together in every aspect of the document.

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[96] Source: NACI (2013: 22).
[97] The size of the membership of the gender mainstreaming project team (2013/14) and expert panel (2014/15) was significantly smaller than the SET4W committee with seven and three members, respectively.

AO13: Understanding Mainstreaming: A practical guide toward mainstreaming gender and disability

The stated aims of the guide are to 'create an understanding of gender, disability and mainstreaming' and to 'provide practical tools for immediate implementation' (NACI, 2014b: 1). It is targeted at the entire STI sector as well as NACI itself (at the levels of Council, Executive Committee, Secretariat and advisory committees). The guide describes mainstreaming as a broad strategy for (ibid.: 7):

> … the integration of gender and disability concerns into an organisation's analysis, planning, performance, policy, legislation, monitoring and assessment. … It involves ensuring that a gender and disability perspective and gender and disability inclusion become central to all activities: policy development, research, advocacy, dialogue, advice, legislation, resource allocation, planning, implementation and monitoring of programmes and projects.

Almost 40 pages in length, the guide is reader-friendly and practical in nature. It provides background to the meaning of gender mainstreaming and what this means in the context of the STI sector, as well as the goals of gender mainstreaming, why it is important, and what an enabling environment for gender mainstreaming would look like.

The guide operates at the level of organisations, projects/programmes, and policy and strategy. It provides various 'mainstreaming tools' for organisations to use, which operate at the level of organisations, projects/programmes, and policy/legislation/strategy.

- The **Broad-based Gender and Disability Assessment** tool focuses on: access to and control over resources, influencing factors (opportunities and constraints for women), practical needs vs. strategic interests, differential impacts, and stakeholder participation.
- The **Empowerment Assessment** tool 'indicates what empowerment and equality mean in practice, and to what extent a project/process supports empowerment and equality' (ibid.: 23) and focuses on conscientisation, control, equal participation, access and welfare.
- The **Gender and Disability Sensitive Evaluation Framework** focuses on inclusion in evaluation processes.
- The **Gender and Disability Sensitive Policy/Legislative/Strategy Checklist** 'outlines key questions that should provide a good indication of the extent to which gender and disability concerns are integrated into the common aspects of a typical policy, legislation or strategy process' (ibid.: 26). These include, among others, whether gender has been taken into account in defining the context and nature of the problem(s) to be addressed, as well as the methodology, scope and impacts of the planned actions.
- The **Gender and Disability Sensitive Project Cycle Checklist** includes questions relating to the project cycle (i.e. conceptualisation, planning, design, implementation and evaluation) in order to identify the extent to which gender concerns are integrated into the project.

During 2013/14, NACI held a workshop 'Infusing Gender and Disability in the focus areas of NACI', and developed an 'E-Learning Platform to assist the NACI Secretariat in mainstreaming gender and disability issues in all focus areas of Council' (NACI, 2014a: 20).

There are echoes of all of the work of the SARG and SET4W committees' in the *Understanding Mainstreaming* guide – from the focus on the gender impacts on women's participation and progression in their careers (e.g. involvement in decision-making; appointments, promotion and funding; child-bearing and family responsibilities), and the cultural obstacles to girls and young women entering STI-related fields and careers, to addressing the gender bias (or blindness) inherent in much research. With regard to the latter, the guide describes gender bias as 'a systematically erroneous, gender-dependent approach related to a social construct which incorrectly regards women and men as similar and/or different', which is most often 'found in the context of discovery

(development of hypotheses), but it is also present in the context of justification (methodological process and publication)' (NACI, 2014b: 4). The guide points to the need for analysis of the differential impacts of the research or project goals and effects on and for women and men. This reflects one of the three main themes of SARG/SET4W's advisory work, namely, SET for women. Finally, the work relating to agriculture highlighted in section 6.5.2 above – the only subsector-specific focus of SARG/SET4W's advice – is also reflected in the guide, primarily through examples given (for instance, in relation to gender impacts on access to resources or on the strategic interests of women in agriculture). This also reflects SET for women and especially for disadvantaged women.

But if NACI's annual reports are anything to go by, since the 2014/15 financial year the gender-related focus and activities seem to have waned. The only gender-related initiatives mentioned in the 2014/15 and 2015/16 NACI annual reports were the initiation and completion of the 'Diagnostic Assessment of the Availability of High-End Science, Engineering and Technology Skills in the Public Sector' study which 'set out to establish the extent of gender-mainstreaming and racial inclusion in the public sector portion of the [SET] workplace' (NACI, 2016: 9), and an 'Advice letter/presentation on benchmarking the policy environment for gender mainstreaming in the science, technology and innovation system' (NACI, 2015: 23). Subsequently, only passing reference is made to NACI activities relating to gender in the 2015/16 financial year, and no mention at all in the 2017/18 annual report. The 2016/17 annual report did, however, make reference to the fact that Council had 'synthesised previous work done on women and SET in order to inform drafting of the new white Paper on STI' (NACI, 2017: 24). The proposed interventions related to increasing the number of women in SET fields of study and workplaces; targeted funding mechanisms; existing mechanisms and criteria relating to awarding researcher ratings and career progression; institutional programmes for leadership within SETIs; and 'earmarked funding for programmes to develop disadvantaged groups in the country (e.g. women, people with disabilities, people living in conditions of abject poverty)' in line with the 'idea of science for social impact' (ibid.: 25). Finally, NACI has through its indicators reference group continued to track women's participation in its South African S&T Indicators reports.

In recent years, ASSAf in particular has taken up the gender and STI mantle and has been quite active in this regard. Examples of publications include a comprehensive report on women in STI: *Participation of women and girls in the national STI system in South Africa based on the Gender Equality-Knowledge Society Framework* (ASSAf, 2011a); a report entitled *GenderInSITE: Research on the perspectives of decision makers and stakeholders* (ASSAf, 2011b); and one of ASSAf's

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'policymakers' booklets' entitled *Increasing Participation of Girls in Science in sub-Saharan Africa* (2011).[98] ASSAf has also been involved in the hosting of events. In 2014, ASSAf successfully won the bid to host the Southern African focal point for the global Gender in Science, Innovation, Technology and Engineering (GenderInSITE) campaign (DST, 2015: 32-33), which works 'to raise the awareness of decision-makers on the gender and SITE dimensions of development, aimed at both men and women.'[99] In 2016, ASSAf co-hosted (with the DST, GenderInSITE and others) the 7th Annual Young Scientists' Conference. The conference theme was on human rights and had 'a special focus on the rights of women' (DST, 2017: 32). In 2017, ASSAf (as focal point for GenderInSITE) hosted the 'Gender and Innovation: Implications for Sustainable Development' international workshop which aimed 'to explore the role of gender in innovation as a key issue for developing countries and to identify the most promising practices and their impact in the lives of both men and women.'[100] Also in 2017, ASSAf co-hosted a regional (South African Development Community) workshop on 'Gender Monitoring in Science'. ASSAf reports often cite the work undertaken by NACI (including that of SARG/SET4W).

6.5.4   Synopsis

Based on the information provided above, it is fair to conclude that during the time of its existence, the SET4W committee was highly productive in terms of research and the development of some key advisory outputs. Taken together, the research and its associated advice outputs have focused on the following key and interrelated dimensions, all of which reflect national gender-related policy imperatives as well as those of the DST (as articulated in the White Paper on S&T and the R&D Strategy):

- Women's participation, performance and progression within the NSI, particularly within public and private SETIs;
- Issues and barriers to the recruitment, advancement and retention of women in SET careers, including in leadership positions in public HEIs and SETIs;
- The impact and benefits of SET for women, especially rural and urban black women living in poverty;

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[98] https://www.assaf.org.za/index.php/publications/policy-makers-booklets, accessed June 2019.
[99] https://www.owsdsa.org.za/index.php/genderinsite, accessed June 2019.
[100] https://www.assaf.org.za/index.php/events/62-gender-innovation-and-the-sdgs-a-gis-workshop, accessed June 2019.

- Mainstreaming gender and SET policies and practices across relevant government departments and within SETIs and HEIs; and
- Monitoring and evaluation of intervention programmes on the part of government departments, public SETIs and HEIs.

As can be seen, the research and advisory outputs reflected the three main focal areas of SARG/SET4W's work; namely, SET by women, SET for women, and gender mainstreaming, although to very different degrees, with perhaps most attention paid to women's participation in SET. (The relative lack of focus on SET for women is discussed in section 6.7 below.)

The research comprised both quantitative and qualitative research designs, and sometimes a combination of the two, as well as one review/synthesis study. Research was commissioned to external service providers – a notably small group consisting of CREST, two research groups at the HSRC, Tara Research and Equity Consultants, the Institute for Women's and Gender Studies at the University of Pretoria, and the Da Vinci Institute of Technology Management. A key informant noted that the available capacity in the system to undertake the research 'was very confined': 'There were just a few people working on those issues. And we had to follow DST procurement processes, so if it was a one-person operation and they couldn't meet whatever the criteria would be, they wouldn't get the contract.' Another informant commented there was a 'major failure of some of the research projects because of the incapacity of the service providers.'[101]

The production of evidence and the formulation of advice were cumulative in nature, and there was a web-like interaction and interrelationship between research projects and advice outputs. Thus, some research projects built on earlier ones, while others were undertaken in order to explore certain aspects more closely or to update existing data and trend analyses. A key informant reflected on the progressive nature of the process over time:

> In the first phase the focus was heavily on women's participation – you know, access. And now we see that women's participation has improved quite significantly, but not across all the disciplines and professions. So in the later phase of SET4W there was more of a focus on women in mining, engineering and IT as I remember. So it became from looking at the whole landscape – as women progressed and we saw the numbers going up, we then started focusing on specific sectors of the economy … because we could see that women's participation was increasing but not in all sectors at the same pace. (Key informant)

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[101] At least one project was transferred to another research group as a result.

Some projects were incorporated into others and thus discontinued in their original form, while others appear to have simply come to a dead end. While some of the projects formed part of longer-term research programmes with sub-components, others were shorter-term, once-off projects. In terms of advice formulation, one piece of research could be used to inform multiple instances of advice, and advice could draw on evidence and ideas from a range of research projects.

By way of concluding this part of the analysis, Figure 6.1 below highlights the major research projects and advice outputs and the interrelationships between them.

In the next section, I explore what evidence there is of the uptake of SET4W's advice by the DST.

Figure 6.1: Overview of the interrelationships between SET4W's major research and advice outputs (2004-2014)
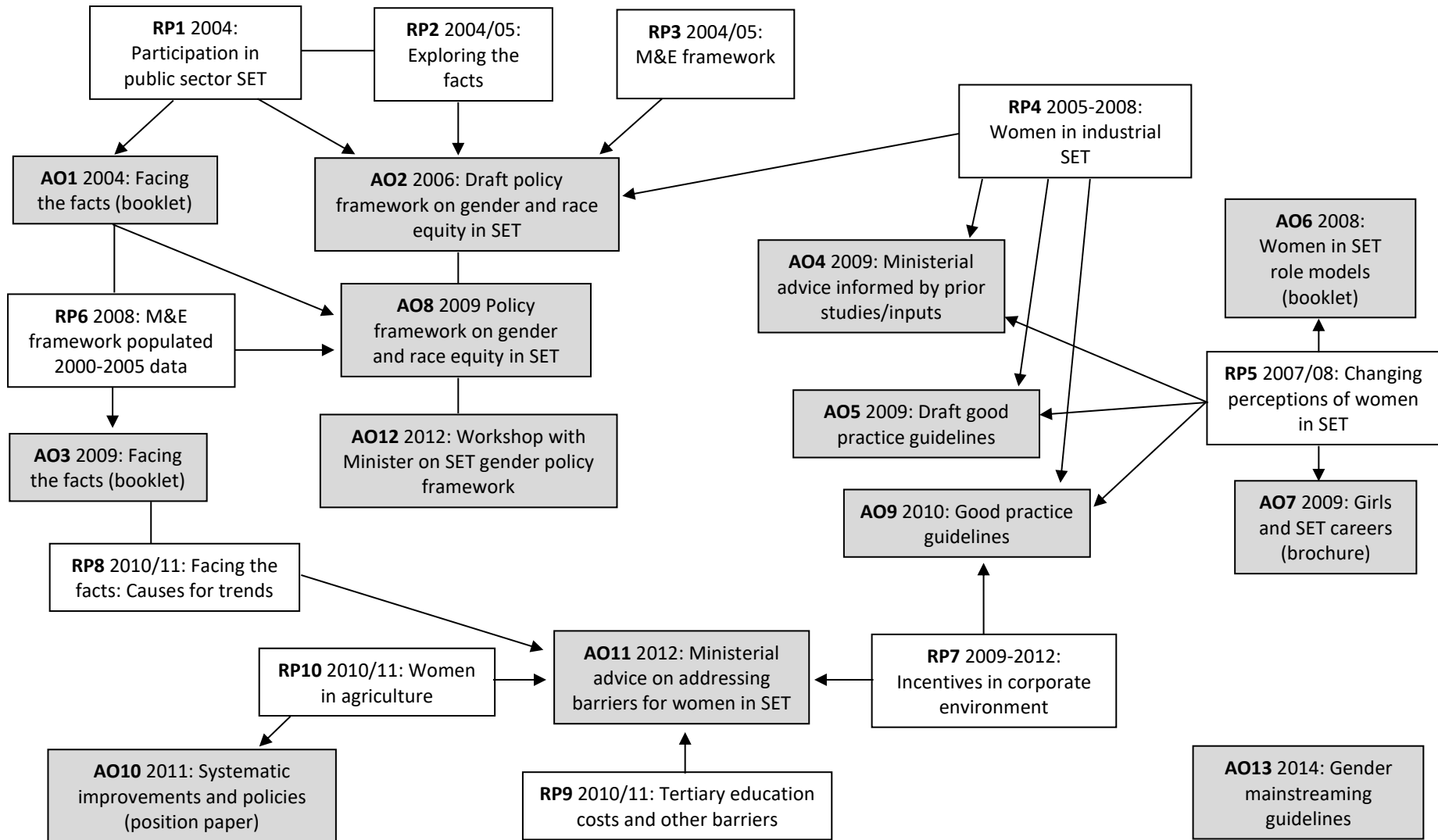
6.6   Evidence of uptake of SET4W's advice?

As noted in Chapter 3, it was beyond the scope of this study to undertake a fine-grained analysis of the nature and extent of the uptake of SET4W's advice by the DST or in the system more widely. Nevertheless, it has been possible to seek out evidence of uptake (or not) in a broad sense.

To begin with, I consider the major advisory output of the policy framework for gender in the NSI. As far as I can tell – on the basis of reviews of the DST annual reports and website, general internet searches, and interviews with key informants – at the time of completing this study (2019) there was no gender-related strategy for the STI sector as a whole produced by the DST. This was raised by Botlhale Tema at the August 2010 NACI symposium 'Enhancing the Leadership Roles of Women in Science, Technology and Innovation', where she noted the lack of a DST policy directed at women's empowerment and gender equality at that time (Tema, 2010: 7). She highlighted in this regard that the National Policy Framework on Women's Empowerment and Gender Equality 'calls upon all national Departments to develop sectoral gender policy guidelines to translate the national imperatives for women's empowerment and gender equality into their sector policies, programmes and activities' (ibid.: 3). Tema went on to outline the implications of the absence of a sectoral policy, including the fact that the DST was unable to 'enforce gender equity and the representation of women in S&T decision-making bodies because it has no enforceable standards enshrined in a gender policy'; was 'not accountable to an S&T women's constituency because it [had] not created a platform for communication with it through a gender policy'; and that the appointment of women to leadership positions would be 'a matter of luck rather than a result of policy imperative' (ibid.: 8). Importantly, Tema (ibid.) noted that the 'role of NACI in monitoring and advising the Ministry would be easier and much more authentic if it was guided by policy.' During the final reflections of the symposium it is reported in the proceedings that 'Minister Pandor stressed that not everything required political intervention' to which Dr Tema responded that 'an enabling policy environment would contribute greatly to the enhancement of women leaders in STI' (NACI, 2010c: 17).

The absence of an overarching gender policy for the NSI does not mean, however, that there is no evidence of women-/gender-related strategies, initiatives and improvements in the system – although, of course, no causal inference can be made between these and SET4W's advice. For instance, the requirement that gender equity issues are mainstreamed across government departments has seen the development of gender-related policies, strategies and programmes in a number of SET-related ministries and national departments. Examples include the Department of

Water Affairs' *Mainstreaming Gender into the Water Services Sector: National Implementation Strategy and Action Plan 2006-2010*, the DTI's *Towards an Enabling Environment for Women Economic Empowerment in South Africa* (2011), and the Department of Environmental Affairs' *Strategy Toward Gender Mainstreaming in the Environment Sector 2016-2021*. Other government departments have also set up initiatives to address women and SET-related issues. An example is the DTI's Technology for Women in Business initiative which, established in 1998, aims 'to help advance women in business, with a particular emphasis on the application of science and technology to achieve business growth in women-led enterprises, particularly small, medium and macro enterprises.'[102] The initiative also focuses on promoting interest among girls to pursue SET-related careers. In 2012, the DST too produced its own *Human Resources Gender and Disability Transformation Strategy*, aimed at creating a gender- and disability-friendly environment within the Department (DST, 2013: 19). The DST annual reports have also consistently reported on the gender profile of staff in the various agencies and SETIs which report to the Department. Furthermore, a key informant pointed to two possible areas of DST's work that could be the result of SET4W's advice in this regard, namely attention paid to gender representation in the composition of committees and workshops and, perhaps more importantly, the introduction of gender-disaggregated data at the national level:

> What I think has really been embedded is the issue of supporting women in science. So whatever you'll see coming out of the DST, they do pay deliberate attention. When they appoint committees they pay deliberate attention to the composition of the committees; when there's a workshop or a kind of conference, a public programme – I've certainly seen that. And if we look now at the NACI indicators reports – we must remember going back in time there wasn't even national data. So we now know what the national status quo is; in the past we didn't. And we know it by race and gender. And that took quite a lot of convincing. There was no national data. I worked on, with three other women, we had a task team. We worked on looking at what data is necessary. The then Department of Education didn't keep data on race and gender. So, I think today we just take it as given. (Key informant)

A quick scan of the annual reports of various public sector institutions such as the NRF and the science councils shows that gender-disaggregated data are presented on a consistent basis now, as is the case in NACI's annual STI indicators reports. However, these data are very limited in scope.[103]

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[102] https://www.westerncape.gov.za/service/technology-women-business, accessed June 2019.

[103] For instance, NACI's *South African Science, Technology and Innovation Indicators* report for 2017 (the latest available on its website) includes gender-disaggregated data pertaining to SET graduations, doctoral degrees awarded, Total Early-stage Entrepreneurial Activity and established business ownership rates, the Human Development Index, and health indicators (life expectancy at birth, percentage distribution of deaths and causes of deaths) (http://www.naci.org.za/wp-content/uploads/2018/07/South_African_Science_Technology_And_Innovation_Indicators_Report_2017.pdf, accessed September 2019).

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In order to get a sense of the extent to which women and gender have been incorporated into the other sector-level and subsector-specific policies and strategies produced by the DST over the years, I searched these for reference to 'women', 'gender', 'female(s)' and 'girl(s)'. The results of this survey are enlightening.

Strikingly, the DST's Ten-Year Plan makes only one reference to women, noting the 'crucial need to expand the numbers of black and women scientists' (DST, 2008: 5), while the word 'gender' does not appear in the document at all, and there are no specific plans or targets relating to women's participation in STI. Almost a decade later, the DST's *Human Capital Development Strategy for Research, Innovation and Scholarship* (DST, 2016) highlights the continued low proportions of women – and especially black women – in terms of enrolment and graduation rates at the upper postgraduate levels (particularly in engineering), at senior academic levels in universities and in terms of publication outputs. As such, strategic interventions are proposed to enhance the recruitment, support and retention of black and female South Africans into research degrees and careers. However, no specific targets are set for women, and there is only one gender-related output indicator, namely the percentage of female South African postgraduate (honours, masters and doctoral) students supported through DST or NRF bursaries (ibid.: 34). Encouragingly, the new (2019) *White Paper on Science, Technology and Innovation* continues the focus on addressing iniquities among female postgraduate students, and emerging and established researchers in the NSI. Specifically with regard to creating a more inclusive NSI, the White Paper states: 'Specific measures will be introduced to address the equality and empowerment of women, and to increase cooperation between relevant stakeholders, particularly involving the Department of Women and civil society' (DST, 2019: 24). These are to include improving gender representation in NSI institutions; ensuring gender-sensitive research agendas; providing targeted support to women researchers and techno-entrepreneurs; developing gender-sensitive M&E mechanisms; and putting in place mechanisms to unearth bias against women in the NSI and to develop appropriate responses (ibid.). Notably, all of these refer back directly to the substantive focus of SET4W's research and advice agenda from the start, suggesting that, overall, not much progress has been made in these respects.

With regard to the DST's subsector-specific strategies, in a number of instances there is no mention of any of these gender-related keywords at all – specifically in the *National Biotechnology Strategy* (2001), the *Advanced Manufacturing Technology Strategy* (2002), the *National Space Strategy* (2010), the *Bio-Economy Strategy* (2013), and the *South African Additive Manufacturing Strategy*

(2016). Other strategies do make reference to women or gender although this is generally in passing in relation to the under-representation of women in the sector and the need to address equity and gender imbalances as part of human capital development and transformation. Examples in this regard include the *National Nanotechnology Strategy* (2005), the *Youth Into Science Strategy* (2006), the *National Strategy for Multi-Wavelength Astronomy* (2015), and the *Basic Sciences Development Support Framework* (2016). There is a whole (albeit short) section on women in the *Indigenous Knowledge Systems Policy* (2004) which highlights the important role of women in indigenous knowledge systems and the need for their participation and empowerment (DST, 2005: 20). The *ICT Research and Development and Innovation Strategy* (2007) makes more explicit reference to initiatives to improve the participation and representation of women in ICT, including 'specific measures needed to encourage women researchers to pursue research careers and higher degrees' (DST, 2007: 50), and women as one of the target groups for support for postgraduate studies through bursaries and internships (ibid.: 51). The Strategy also notes that human resource development indicators with regard to ICT researchers will be disaggregated by race and gender 'to measure the progress of transformation in the ICT R&D workforce' (ibid.: 65). It is worth remembering here that ICT was one of the subsectors that SET4W focused on specifically. A key informant noted the opportunity missed in including a gender dimension of some kind in strategies such as the *Additive Manufacturing Strategy*:

> … because additive manufacturing is such a simple technology. You know there are very, very complex technologies – space and so on – and what I mean by complex is obviously not that it's too difficult for women. What I mean is that it takes decades to develop your capacity in that field. So like space or high energy physics. Whereas additive manufacturing – it's not simple, but in the space of a year you can develop a reasonable capacity, and that makes those fields relatively more accessible to anybody, irrespective of gender, income even, I would argue, irrespective of your previous educational background. If you don't have a strong mathematics educational background it doesn't exclude you from possibly pursuing a career in additive manufacturing. My question is: why is gender not prominent in all the strategies, particularly the ones where the field is so accessible? (Key informant)

The DST appears to have been far more active in terms of specific interventions and activities relating to women and gender. The year 2000 is the first time, in the official documentation, that any formal initiatives relating to women and/or gender and SET are mentioned. DACST (through its Science and Technology Directorate) appears to have centred its focus on issues pertaining to gender and SET on the promotion of SET to girls and women under its public understanding of SET activities. Following the formation of the DST and the publication of the R&D Strategy in 2002, there was quite a flurry of activity over the next few years. An overview of key women- and/or gender-

related SET initiatives of DACST/DST from 2000-2015[104] is provided in Box 6.5 below. Broadly speaking, these initiatives have centred on the promotion of SET to girls and women; support for the access and advancement of girls and women in SET studies and careers; and the recognition and raising the profile of female scientists as role models. As can be seen, DACST/DST was most active in launching such initiatives between 2000 and 2003.

Box 6.5: DACST and DST initiatives relating to women and gender in SET (2000-2015)

2000	• Women were one of the groups targeted in DACST's National Science, Engineering and Technology Week 2000, the theme of which was 'Taking Science, Engineering and Technology to our People' • Launch of the first National Science and Technology Camps for Girls, the aim of which was to motivate and influence the girls before they reached the critical point of career selection, and were held in three centres around the country (the themes around which the Camp activities were organised included minerals and energy, the gender dimensions of SET, HIV/Aids, careers in SET, and role modelling) • Initiated various processes to establish the reference group for women in SET
2002	• Conducted a baseline audit of science councils with respect to the nature and extent of their response to addressing equity issues • Established the Science, Gender and Disability Unit of the DST • Established a Poverty Relief Programme for people living in rural and peri-urban areas that focused on agro-processing and that aimed to benefit primarily women, the disabled and the youth • Hosted the Science and Technology Programme for Young Women in Cape Town and Durban, with activities relating to astronomy, ICTs, biotechnology, HIV/AIDS and indigenous knowledge systems
2003	• Following the audit conducted in 2002, held human capital development workshops with the human resources executives of science councils who were responsible for initiatives relating to gender and disability equity issues, which produced a set of agreed-upon key performance indicators which science councils would be required to report on from the 2004/05 financial year onwards • Launched the South African Reference Group on Women in SET (SARG) • Launched the annual South African Women in Science Awards which were created to address representation, to emphasise the important role of women in SET, to celebrate their achievements, and to profile successful women in SET as role models for younger women[105] • Supported the Dinaledi Schools programme of the Department of Education (now Basic Education), the aim of which was to increase the number of matriculants with university-entrance mathematics and science passes, with a three-year project with a special focus on the development of girls in the schools
2004	• Launched SET4W's *Facing the Facts: Women's participation in science, engineering and technology*
2005	• With the South African Institute of Physics, launched Women in Physics in South Africa (funded by the DST) the principal aim of which is to address issues relating to the under-representation of girls and women in physics specifically[106]

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[104] No new initiatives are mentioned in DST annual reports during 2016 and 2017.

[105] The first awards were presented at the launch of SARG in September 2003.

2006	• Via LIFElab, one of the Biotechnology Regional Innovation Centres, supported research on microbicide gels that have the potential to be far more effective than condoms in preventing HIV infection in women
2007	• Funded a six-part television series, 'Women in Science', as part of the national broadcaster's career-related programming, which focused on women working in cutting-edge fields such as space science, synthetic biology and palaeoanthropology[107]
2008	• Launched the DST-NRF Thuthuka programme – the main funding instrument dedicated to supporting emerging black and female researchers
2012	• Co-hosted the Women in Science Bi-annual Conference 2013 with the Institute for Interdisciplinary Gender Research and Diversity at University of Applied Sciences Kiel (Germany)
2013	• Minister of S&T approved a set of equity-based guidelines for bursaries and scholarships
2014	• Introduced 20 new chairs targeted at women researchers specifically, under the South African Research Chairs Initiative (SARChI)
2015	• Introduced 42 new research chairs for women under SARChI • Began working with the DHET on the New Generation of Academics Programme which involves the recruitment of highly capable scholars as new academics, against carefully designed and balanced equity considerations, including a focus on women[108] • Launched a new Centre of Excellence for HIV and AIDS prevention aimed at understanding and ameliorating the high risk of HIV in women, especially young women, in South Africa • Co-hosted a conference on Women in Science, Technology, Engineering and Mathematics with Howard University in the United States

Sources: Compiled from DACST/DST annual reports (2000/01-2017/18) and from websites

Of these initiatives, the most sustained and institutionalised have been the Women in Science Awards, the funding provided through the Thuthuka Programme, and the SARChI chairs – all of which are currently still in operation. According to a media release on the DST website,[109] since its establishment in 2008, the Thuthuka programme has provided more than R200 million worth of financial support in the form of research grants to emerging black and women researchers, trebling the average value of the grants for individual researchers. SARChI was established in 2006 by the DST and NRF and aims 'to attract and retain excellence in research and innovation at South African public universities.'[110] The introduction of new research chairs for women is often cited as an important contribution to the women and SET agenda. All three of these initiatives are consistently

[106] http://wipisa.saip.org.za/, accessed April 2017.

[107] http://www.sabccareerguide.co.za/About.aspx, accessed April 2017.

[108] http://www.dst.gov.za/index.php/media-room/communiques/1864-women-in-science-awards, accessed February 2017.

[109] http://www.dst.gov.za/index.php/media-room/communiques/1864-women-in-science-awards, accessed February 2017.

[110] https://www.nrf.ac.za/division/rcce/instruments/research-chairs, accessed June 2019.

cited in Ministers' speeches as constituting the key elements of the DST's response to the women/gender and STI policy focus. However, it can be noted that they all focus on the participation and progression aspect (SET by women). Furthermore, the awards and research chairs in particular are targeted at the upper echelon of the system (even though they are assumed to be a contribution to providing female role models for girls and young women). And, arguably, the awards are quite elitist events. A key informant expressed similar reservations in this regard:

> There were the annual Women in Science Awards, but I don't regard that as part of or a serious representation of women in science policy. That's just an annual event. I mean everybody's always having annual events and awards. And my problem also with that particular event is it was recognising the top women in science – always. And where did they come from? From Wits, from Rhodes, from Stellenbosch. How is that women in science? (Key informant)

However, another key informant, who noted that the Women in Science Awards had been idea of SET4W, felt that it has been a successful intervention:

> Women in science have a much higher profile now. You'll see in newspapers, talking in media about whatever they do. And a lot of the women who are now renowned in their fields were fairly young and emerging at that point. And I think the Women in Science Awards also had a contribution … and the DST invests in it. And then they go on these speaking tours. So I think it's got an impact – young girls see that women are in science. (Key informant)

In contrast to these initiatives relating to SET *by* women, after scouring the DST annual reports and website and conducting general internet searches, I could find little evidence of DST initiatives that address the benefits of SET *for* women and particularly poor and disadvantaged women. A few initiatives are highlighted in Box 6.5 above, including the establishment in 2002 of a poverty relief programme around agro-processing aimed at benefiting women, and a couple of programmes relating to HIV/AIDS. The only other reference I found relating to SET for women was that the 2012 Women in Science Awards had a category 'Awards for the development of rural women' which was described in a newspaper article as follows:[111]

> These awards will be made to women scientists or researchers for the contribution and empowerment of rural women through the efforts and/or outputs of their research activities (in any field). The criteria for these awards are the impact of the research on the social and economic development and empowerment of rural women; recent research outputs and their environmental impact; the role and participation of rural women communities in research or exploitability of the research outputs to the development of rural women (for example the possibility of using the research results to develop or improve products, processes and services).

I noted in section 6.5.2 that one of the most notable aspects of the SET4W agenda is that the SET for women focus (i.e. where women are the beneficiaries of SET products and services and where

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[111] *Mail & Guardian,* special supplement on Women in Science, August 24 to 30, 2012.

research projects take a gendered approach) lost steam as the years went by.[112] A partial explanation for this could be that the DST and the NSI as a whole were struggling with the social dimension of innovation (as opposed to initiatives related to moving the country towards a knowledge-based economy). For instance, the OECD Review (2007: 15) had noted that major initiatives that had been identified as priorities in the R&D Strategy – including technology and innovation for poverty reduction – had not been effectively implemented. The 2012 Ministerial Review later reported that this same key mission had not been transformed into one of the 'Grand Challenges' of the DST's Ten-Year Plan (Ministerial Review Committee, 2012: 69). A key informant reflected on the challenges the SET4W committee, and NACI more broadly, had faced with regard to the social aspects of innovation:

> My recollection is that we tried but we didn't really get our teeth into it. We didn't sink our teeth into it. That was, I think, going to be really interesting. But I feel we were really novices. Now one of the things that happened was in about 2008, in addition to the SET4W committee, … when the indicators committee was set up there was also a committee to look at social innovation. And I can tell you, we were lost! We didn't understand it. We had some initial conversations about it, but we were really trying to understand, trying to orient ourselves to the meaning of innovation or social development or social innovation. Obviously we know much more about it today but, at that stage, we were really finding our feet. And so I think we never really got to grips with science for women. (Key informant)

Finally, it is worth noting here that there is no mention of SET4W in the DST annual reports for the years 2005/06,[113] 2009/10, 2010/11, 2011/12 and 2012/13 (these last four financial years cover the term of the second SET4W committee). None of the key informants interviewed had any idea why this would be the case. One key informant remarked that 'this is truly inexplicable', while another surmised that 'it might just be an outcome of whoever was given the task of doing the annual reports.' According to this informant, there was no breakdown in the relationship between SET4W and the DST over this period that she was aware of.

6.6.1 Reflections on limited uptake of SET4W's advice

As highlighted in Chapter 3, the work of the SET4W committee was selected as the mini case study because, among others, it was regarded as one of the most successful of NACI's advisory initiatives.

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[112] For example, I highlighted that while the 2004 *Facing the Facts* booklet had included the dual focus of SET by and for women, the latter aspect did not appear in the 2009 version.

[113] Although the same annual report describes studies that the HSRC's Gender and Development research unit was involved in at the time, which were in fact studies under the auspices of SET4W. However, no mention is made of the link with SET4W (see DST, 2006b: 78-79).

Indeed, the 2008 external review of NACI had reported that while NACI and its work were largely invisible in the broader system, this view had 'its counterpoint in the very positive attitude to the SET4W work, which was characterised by early publication and the resultant lively debate around it' (Havenstein et al., 2008: 5). Similarly, a former NACI Chair spoke very positively about the work of SET4W:

> [SET4W] did excellent work which was very well received. It never got quite as far as I would have liked it to get but as far as coming up with data that was used by DST in support of its programmes – some very pragmatic advice on how to make life easier for technical [?] women in the higher education sector and science councils, that kind of thing. Very, very pragmatic stuff. … The outputs were very solid, very credible and high profile and they were always very well-received. It was a hardworking group – very passionate, very committed people. (Key informant)

The question remains then as to why there appears to have been so little uptake of the committee's advice, aside from initiatives such the awards and research chairs, in terms of substantive policies or strategies on the part of the DST.

It was very telling that the key informants interviewed had no real idea as to why there was such limited uptake of SET4W's advice – especially major outputs like the policy framework. Key informants alluded to the lack of feedback from the Minister or the DST in this regard:

> A major problem we encountered was that very little of the advice prepared and presented was adopted in any deeply meaningful way as a means to systemic change. There was an ongoing dissonance between NACI and the DST, with limited engagement, and limited real attention to taking on board the advice given and making it the DST's own. In other words, the DST need not have taken the advice as it was given, but could have interpreted the advice in its own way. From my perspective, it was never clear whether advice was taken, mulled over, considered for implementation, dismissed, or ignored. There was limited if any feedback on what happened to the advice once submitted to the DST. (Key informant)

> [The advice outputs] were all sent to the Minister's office on the assumption that it would be implemented. … We had interactions with the various Ministers and each Minister that I worked with was very passionate about it. And the idea was – certainly in the monitoring and evaluation, and why I mentioned the Office on the Status of Women in the Presidency – the idea was to link it to the broader general project on gender mainstreaming. So, ultimately that was the destination. So I suppose you could ask the question: what happened to the [national] framework on gender mainstreaming? Because there was a whole landscape in that framework about having gender desks in each department and all of that. (Key informant)

In the absence of interviews with former or current DST officials involved in gender-related work, I can only speculate about why the SET4W's gender policy framework was never implemented by the DST. The main clue, I think, is in the differences between the 2006 and 2009 versions of the SET4W policy frameworks (see Box 6.4 above), which suggest that despite the DST's coordination and oversight role, it is unable to be prescriptive and enforce policy imperatives (of this kind at least) in

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public sector institutions in the NSI. A former NACI Chair confirmed that the gender and race policy framework had never been formally adopted and reported that the 'reason for that is we were requested then to rather take that as input into the newly-created [Department of Women, Children and People with Disabilities].' I followed this up to see whether I could find evidence of advice uptake in any form. Both the NACI and DST annual reports for 2012/13 make reference to this: the NACI report refers to NACI having made inputs into the Women Empowerment and Gender Equality Bill of 2013 and the Department of Social Development's *White Paper on Families in South Africa* (2013) (NACI, 2013: 22); and the DST report states that 'the work of [NACI's] Gender Mainstreaming Project Team which – in collaborating with the Department of Women, Children and People with Disabilities – made important contributions to the national Women Empowerment and Gender Equality Bill' (DST, 2013: 57). However, there is no direct mention of science, engineering, technology, innovation, NACI or the DST in either the White Paper or the Bill and thus it is not evident what contribution NACI made. Referring to the advice provided to the Minister during the SET4W's first term, a key informant recounted the Minister's response, which not only highlights the extent of the feedback received but also that part of the problem with lack of uptake might have to do with a lack of capacity in the Department:

> I recall us presenting to the Minister of Science and Technology at least twice, once being I think August or September 2006. By this time we had done not one but many pieces of research. And we presented this to the Minister and he said: oh, thank you very much but I'm not sure that my Department has the capacity to do anything with this. Those were almost the exact words that he used. I was still very young at the time so I wasn't as disturbed as I would be if somebody said that to me today. But it signalled to me the complete and abject failure of government to really tackle the challenges of the science system. (Key informant)

Another clue about why there has been such limited uptake by the DST has to do with SET4W's 'logical' audience. As highlighted in Chapter 5, while the NACI Act requires NACI to advise the Minister of S&T, it is at the Minister's discretion as to whether to share the advice with other relevant government departments or stakeholders. However, what has become clear through the analysis of SARG/SET4W's work is that, in both intention and reality, the target audience for its focus and outputs was key stakeholders in the broader STI system, and particularly other government departments, SETIs and universities. Linked to this is the fact that, as highlighted earlier, while the DST has an oversight and coordination role in the NSI, it does not have jurisdiction over all the public sector institutions involved. The quotes from key informants below reflect these issues.

> It is important to note that the advice was intended for the Minister and DST, but also for the institutional stakeholders and women in SET institutions, hence placing all publications on the NACI/SET4W website. The advice was certainly intended for the Minister and DST, but it was

understood that these institutions could not change the entire system and its structural inadequacies and that institutions themselves needed to be seized with long-term structural change. (Key informant)

You know, the work that was widely used was those [*Facing the Facts*] booklets. I remember all organisations including universities referring to it. [Question: What do you think they were using them for?] To create awareness and to use as a basis for lobbying for change within their institutions. (Key informant)

There were two types of activities if you like. The one was the research itself, and that research would be shared broadly across the institutions in the sector and would influence decision-making in those institutions. That is the reason why very early on – I mean, one of the first outputs was publication rather than advice [i.e. the *Facing the Facts* 2004 booklet]. So that was saying: well, this is the state of women in science; here is some of the data that we're aware of. And I suppose we had made the assumption that decision-makers would read it, look at it and say: well, how do our institutional statistics compare to this broader view? There was also a very strong focus on women – the whole enrolments and graduations pipeline to deal with the concern that: where were women going to come from to participate in science, engineering and technology? So it was *definitely* not *only* intended for the Ministry and the Department because they're not really in a position to change the actual dynamic in the national system of innovation. What they can do is they can create a policy environment but they can't change the shape of women's participation in the system. So in a sense, what we were trying to do was to kind of line up with the Department's objectives and try to give perhaps more depth to promoting women's participation in science, and providing the data that would enable policy-making and decision-making. (Key informant)

This idea that the committee's work was intended for a broader audience is echoed in Minister Naledi Pandor's address at the launch of *Facing the Facts 2009*: 'The updated *Facing the Facts* booklet is an important contribution to our efforts to mainstream women in the SET sector. I recommend that the public makes use of this booklet to inform strategic decisions in respective academia and workplaces.'[114] As a key informant remarked: 'And who knows if anyone from the NRF picks it up and says: we really need to change our approach to funding. I mean, that was the intention.' A key informant reported that part of the committee's thinking had been that engagement with stakeholders in workshops would serve as a mechanism for disseminating SET4W's research and advice: 'We had workshops and in the sector-specific workshops, like women and gender in IT, there we would have industry representatives. So I would make a distinction between formal written advice that went to the Minister and those workshops as platforms for raising recommendations with people in the sector.'

Finally, a key informant pointed to the gender bias inherent in the NSI as a possible contributing factor to the apparent lack of focus on women in STI:

Whether we like it or not, in reality, if there were more women in leadership in the science system, the probability that there would be marginally more attention to science for women I think is realistic. I'm

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[114] South African government website: http://www.gov.za/address-minister-naledi-pandor-launch-national-advisory-council-innovation%E2%80%99s-naci-updated-facing, accessed March 2017.

not saying women would now, if there was women leadership, in some romantic endeavour, we'd all be doing women in science – not by any means, because the system dynamics are enormous. I mean the system dynamics are global. What gets researched is what gets funded; what gets discovered is what gets funded – mostly. And what gets funded is not science for women. It's sort of science for everybody but with a kind of a gender bias against women. In some cases that gender bias is not particularly relevant because it doesn't disadvantage women or advantage men in any particular relation to each other. And in other cases it does make an enormous difference to that advantage/disadvantage. But that is the precise reason why a committee like NACI is very important in shifting thinking and shifting the attention, because government bureaucracy – they're not about shifting attention. (Key informant)

6.7   Conclusion

Arguably, the SET4W committee embodied and gave full expression to NACI's mandate, purpose and institutional form as highlighted in Chapter 5. It was structured according to requirements insofar as it had NACI Council members as committee Chairs and an expert and stakeholder-representative committee composition; met quarterly over and above smaller group meetings; had an advice agenda that was based on the collective knowledge and wisdom of committee members and was closely aligned with national and DST objectives; commissioned a number of research projects to produce evidence to inform advice; engaged quite extensively with key external stakeholders; and provided some not-inconsequential advisory outputs to the various Ministers of S&T.

There was a certain logic to the unfolding of research projects, with quantitative studies being followed up with qualitative studies to dig underneath the figures, and national-level studies being complemented by studies in specific sectors. Furthermore, some of the major studies built on earlier versions thereby providing a longitudinal view of women and SET issues. While in some cases the research output was the advice output, in others the advice formulated drew on multiple sources of evidence. The advisory outputs themselves took on a variety of forms. The most substantial of these were the policy framework for gender equity in SET which included an M&E framework. The committee also put out documents for wider distribution across the NSI, including the glossy booklets of facts and figures on women's participation in SET, and brochures promoting and encouraging girls and young women to consider entering SET-related careers. Other forms of advice – which are not available in the public domain but are referred to in NACI annual reports – included ministerial advice in the form of recommendations covering a range of issues raised through research and consultation, as well as input into draft bills and policy documents. Following the disestablishment of the SET4W committee, the NACI project team on gender continued with the

work relating to gender mainstreaming and produced a booklet of good practice guidelines for enhancing women's participation in the SET sector targeted at public sector institutions.

The committee had a close working relationship with the DST employees involved in the project and, indeed, depended entirely on them for the secretariat function. This embeddedness in the DST's administrative system – as has been the case with NACI in general – did create some impediments to the committee's work, such as slowing down the research commissioning process and possibly limiting the pool of potential researchers owing to the DST's recruitment rules. However, this does not seem to have been a major issue. Perhaps a more important point here was the reported limited interaction with the various Ministers of S&T, the almost non-existent feedback provided on advice and, significantly, the reported response of the Minister to taking receipt of the 2006 advice that the Department was unlikely to be able to act upon it.

On this note, this study has not focused on an assessment of the DST. As a key informant remarked: 'We would have to study actual system change to understand the impact of the advice.' Nevertheless, looking in the obvious places – the DST's policies, strategies and programmes – it is apparent that some of the major outputs of SET4W's work (such as the gender policy and M&E framework) were not formally adopted (or even adapted) by the DST; neither were gender dimensions incorporated into the Department's own Ten-Year Plan or most of its other subsector policies and strategies. Having said this, the DST has put in place some important initiatives which address women's participation in SET, notably the Women in Science Awards (which was an idea put forward by SET4W) and the DST-NRF Thuthuka Programme (funding for black and female emerging researchers), and over the years has increased the number of SARChI chairs for women.[115] However, as argued above, these initiatives address a small albeit important dimension of the problem. It is also worth noting that it has become standard practice in government departments and agencies (including the DST and NACI), SETIs and universities to provide gender-disaggregated data relating to staff profiles in their annual reports and human resource development. But again, this is not necessarily an outcome of SET4W's advice. DST initiatives relating to the benefits of SET for women and to promoting engendered research are even less visible.

The consideration of the extent of uptake by the DST in this chapter has raised far more questions than it has answered. Is it about internal Departmental capacity? Is it because the advice was not

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[115] At the time of writing, approximately 40% of SARChI chairs were held by women (personal communication, Johann Mouton, September 2019).

useful? Would it have made a difference if SET4W's advice had been officially targeted at ministries and government departments beyond the Minister and the DST, and to public sector institutions in the NSI more broadly? Would the DST have been able to adopt and implement SET4W's advice (such as the policy and M&E framework) if it had some kind of regulatory control over SETIs? Or, on a more cynical note, and in spite of the possibility of real commitment and intention to address inequities in the system among Departmental officials, was the SARG/SET4W committee established merely as a vehicle for producing evidence and advice to back an existing agenda and not as a body that would, over time, continue to provide advice that would be seriously taken into account? As I mentioned in Chapter 3, I was involved in one of the very first studies undertaken for the SET4W committee on the participation of women in SET (see CREST, 2004). The DST commissioned us directly and it was evident that the issue of gender equity in the system was already on their agenda. The point I mean to make is that the need for gender equity was not the idea of the committee; it was in fact its raison d'être. Rather, the facts and figures produced by the research provided backing in the form of evidence for the DST's intention to address inequities in the system – which would require lobbying of sorts among other government departments and public sector institutions. To the extent that this is even a partial picture, it does imply a kind of strategic or symbolic use – of the advice output itself and of the committee too. A comment made by a key informant resonates with this thinking:

> But the more interesting question is: what on earth was going on? Well, governments do this a lot: they set up some institution or committee to do something as a sop to some particular group; in other words, something of no great value, or done as a concession to appease someone whose main concerns or demands are not being met. (Key informant)

I turn now to the final empirical chapter which explores the various factors impacting on the real or potential influence that NACI's advice has on policy thinking and decision-making, and sheds some light on these questions.

CHAPTER 7: FACTORS AFFECTING THE INFLUENCE OF NACI AND ITS ADVICE

7.1   Introduction

The conceptual framework for this study (Chapter 2) outlined three major dimensions that have a bearing on the provision and influence of NACI's advice on policy-making. These include the broader political and policy context within which NACI operates, NACI's institutional and organisational design, and the relationship between NACI, its parent body and the broader STI policy sphere. The three preceding chapters presented data and analysis of these dimensions in some depth. In this chapter, I hone in one of the central questions of the study, namely, what factors are seen to impact on NACI's influence in the system? Based largely on interview data, the discussion in this chapter explores the central themes in the conceptual framework and also highlights additional factors, emphases and nuances brought to the fore. As such, the chapter addresses the nature of NACI's advice formulation process and its advisory outputs; capacity and skill-sets within NACI; the real and perceived lack of independence and credibility of NACI on the part of external stakeholders; and the nature and complexity of the wider political and policy context.

7.2   Nature of the advice formulation process and advisory outputs

As was highlighted in Chapter 2, a commonly cited barrier to the use of research evidence or advice in policy-making has to with the nature of the processes involved. One of these in the NACI case has to do with timing. For instance, it has been reported that the provision of advice has been delayed when the consultations with key stakeholders took longer than anticipated (NACI, 2004: 18), or where there was a significant time lag 'between the identification of a priority and the rendering of advice' owing to 'the time required for gathering high quality information' through commissioned research (NACI, 2006b: 6). As one key informant noted, many of the issues on NACI's advice agenda were long-term in nature: 'It takes a while to get the evidence and sift through the reports and all those sort of things. It wasn't all, you know, overnight type of issue comes up and tomorrow we give an answer.' Furthermore, the process of finalising and communicating advice is slowed down by the fact that the Council plenary sessions only happen once a quarter. The time factor was also

influenced by the nature of the relationship between NACI and the DST. For instance, in his review of the provision of science advice in South Africa, Pistorius (2008: 67-68) reported that poor communication between the DST and NACI can leave insufficient time for NACI to produce advice for policy development in progress: 'It can happen that NACI is not alerted by the DST to the fact that a particular issue is under discussion in the DST, and often only at a late stage when advice that could have been generated is too late to influence policy significantly.' He noted that while NACI is mandated to advise the Minister of S&T and not the DST *per se*, NACI requires early warning by the DST and other relevant government departments 'on which policy issues that fall within its scope, are being considered' (ibid.: 67). Another example highlighted by a key informant pointed to the impact of NACI's dependence on the DST for certain of its operations on the pace at which it can get things done: 'The problem for NACI is that NACI's getting work done is reliant on the DST people, because if you want a project done you've got to go through their procurement procedures' (e.g. with regard to commissioning research). Drawing on existing data (such as that provided by the R&D Survey) rather than commissioning new research, and formulating quick advice based on the consolidated opinion of the Council, are ways in which NACI has attempted to deal with time constraints.

The survey of DST officials on the usefulness of NACI's advice outlined in Chapter 5 (section 5.4)[116] offered further, although limited, insights. One of these had to do with critiques of the nature of NACI's advice outputs. For instance, DST officials regarded some of the recommendations as 'flimsy and superficial with limited scope of what could practically be implemented by the Department' (Netshiluvhi & Adons, 2014: 6). Furthermore, DST officials reported that the 'majority of the membership of the Council and some project teams [had] led to the development of advice premised only on academic issues' (ibid.: 7). A former NACI member conceded the academic orientation of much of NACI's advice:

> All the research commissioned by NACI was very thoroughly peer-reviewed, and we tried – within government policy – to translate and convert them into recommendations and advice, and the Department had to write a politically-acceptable policy. But the advice outputs had, in terms of the themes of the topics, somewhat of an academic ring to them. (Key informant)

The DST officials surveyed suggested that 'NACI's advice or policy recommendations should be well argued, relevant and specific rather than general. This could ensure that NACI delivers high standard advice to the Department' (ibid.: 8). On a related issue, the Ministerial Review Committee (2012: 93) report questioned whether in its advice formulation NACI was adequately adding value to the

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[116] Based on advice given during the 2012/13-2013/14 financial years.

information it collected, noting that while 'NACI collates existing information into the S&T Indicator series [it] adds very little in the way of further analysis.' The survey also reported that DST officials had stated that NACI's advice letters 'should be underpinned by strong evidence-based studies' and highlighted the Department's preference for what it termed 'baseline studies' – that is, comprehensive reviews of the existing body of knowledge – arguing that this would 'assist NACI to make informed recommendations which will guarantee an up-to-date policy advice relevant to DST's work' (Netshiluvhi & Adons, 2014: 8). Significantly, the report notes that DST officials stated that 'the Department would prefer to use baseline studies on which to draw its own recommendations' (ibid.: 5) – a statement which calls into question the need for NACI's evidence-based approach at all. As the authors of the survey report note: 'It is however unfortunate that this preference (baseline studies) cannot at all be catered for by NACI as its mandate is to deliver only on innovation policy advice' (ibid.).

A further critique by the DST officials surveyed had to do with the lack of alignment of NACI's advice agenda with the needs of the Department. The survey report is somewhat contradictory on this matter. On the one hand, it notes in its executive summary that the 'overall findings suggested that the recommendations presented in NACI's policy advice were important and pertinent to the work of the [DST]' (ibid.: 2). On the other hand, the report notes: 'The agenda intended to inform NACI's policy advice was said to be misaligned with the needs and politics of the DST and its sister departments (as a result of NACI's agenda setting not informed by all relevant stakeholders including the DST and other government departments)' (ibid.: 7). The DST officials surveyed stated that 'NACI should undertake an inclusive agenda setting for its advisory services to ensure that its advice is useful and relevant to all stakeholders including DST' which, they suggested, could be achieved via: ensuring that its policy advice agenda is informed by 'both the Minister and programmes of the DST to ensure alignment and proper timing of the advice'; planning sessions between NACI and DST programmes/sub-programmes in order to identify relevant topics and to 'enable robust engagement between NACI and the DST officials in order [to] easily facilitate the uptake of policy advice'; and NACI's advice outputs demonstrating their relevance 'to specific parts of the DST's policies and strategies … in order to create synergies' (ibid.: 8-9). Given the frequent reference (in both official NACI documents and key informant interviews) to the development of NACI's advice agenda in consultation with the Minister and with an eye on national and sectoral imperatives and objectives, one wonders how such a misalignment can occur. It also raises questions about the DST's response to the self-initiated priorities for advice identified and pursued by NACI. As part of NACI's response to the survey results (in the report itself), the authors note that while NACI can 'intensify its

engagements with relevant stakeholders for inputs or comments' to better align its advice agenda, this should not 'change the coverage or course of the agenda' (ibid.: 10), and that such consultation 'should however be carefully thought through so as to ensure credibility and independence of NACI's advice' (ibid.: 7). Another issue highlighted by the survey was that some of the advice presented by NACI fell outside the purview of the DST and was, instead, more relevant to sister departments (ibid.: 6). The issue of NACI being constrained by having to advise the Minister of S&T only, and the effect of this inhibiting NACI's potential reach and value, is highlighted again in section 7.5 below.

Finally, the survey pointed to an internal system problem with regard to DST officials' access to NACI's advice. Specifically, officials reported that 'certain DST's programmes could not easily access NACI's policy advice letters' and that advice letters were not always accompanied by the relevant supporting documentation (ibid.: 6). This problem of access was attributed to the lack of an enabling internal system, whereby it falls to the Minister to ensure that NACI's advice is disseminated internally to the relevant DST programmes.

7.3   Capacity and skill-sets within NACI

A recurrent theme since its inception has been the challenges faced by NACI in terms of a lack of capacity in the Secretariat. Problems with a high staff turnover, vacancies not being filled and a general lack of necessary human resources persisted for many years. As a key informant remarked, one would be hard-pressed to find a government department or agency that does not bemoan a shortage of human resources. Nevertheless, in NACI's case, capacity challenges were frequently cited as the reason for underspending on the budget in NACI's annual reports and for delays in the provision of advice (see Chapter 5). The Secretariat staff (including the Head) were on short-term contracts for many years, which the 2002 external review panel noted could 'create problems of institutional memory, coherence and continuity' (Gevers et al., 2002: 29). Another capacity issue within NACI has been the position of the CEO. As highlighted in Chapter 5, following the S&T Laws Amendment Act of 2011 which replaced the requirement that the DG of the DST is the CEO of NACI, a contract-based post of CEO was created by the DST. However, in addition to having difficulties filling the position for a few years, the post has remained as 'Acting CEO' since 2012. Two key informants raised this issue and pointed to the effect it had on weakening NACI's position and voice in the system. One argued that it effectively silences the CEO: 'If you have somebody as an acting CEO for years you're basically saying: shut up; you can have that position and we'll pay you but just

don't say anything.' This informant remarked that they had seen this happen in many other government institutions too. The other informant noted that the leadership of the Council cannot rest with the Council Chairs, who are busy people with other jobs, but requires a capable CEO with a permanent post: 'that person then becomes the point of continuity and also a very important voice in the landscape.'

There have also been challenges in finding Secretariat personnel with the requisite skills for carrying out NACI's mandate effectively. From a substantive point of view, the lack of policy research and analysis skills in South Africa was highlighted by the IDRC review in the early 1990s (IDRC, 1995: 65). The 2002 external review of NACI raised this problem when it reported that policy analysts appropriately skilled in undertaking analysis for policy were scarce, and that NACI should thus 'pay attention to developing its internal capacities' and to 'developing such skills in the NSI in general' (Gevers et al., 2002: 30). A key informant reported that the problem had been exacerbated by the lack of internal planning for staff development. These issues were picked up again in the 2008 external review which recommended that consideration 'should be given to creating specific tertiary institutional capacity; designing the organisation so as to provide career paths; and seconding, employing or contracting offshore innovation policy specialists' (Havenstein et al., 2008: 5). According to Pistorius (2008: 61), the 'shortage of capable policy analysts in the country puts an additional and unrealistic burden on the NACI Councillors themselves and may also result in inadequate policy advice.' External review reports and official NACI documents have highlighted a range of skills and competencies required by NACI, and particularly its Secretariat.[117] These include technical-analytical skills (e.g. understanding the policy process; identifying key policy issues for further investigation and analysing their contextual relevance; relevant theoretical and methodological competence; and converting research outputs into relevant policy advice), and project management skills (e.g. formulating terms of reference for commissioned research; identifying and selecting capable providers/consultants; managing contracts and finances relating to projects; supervising and monitoring the quality of the investigations; writing and speaking, including for non-specialist audiences; reviewing the methodology employed, the analysis and arguments presented, and the policy options and recommendations; and overall management and coordination of the studies).

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[117] See e.g. Gevers et al. (2002: 29-30), Havenstein et al. (2008: 5), and NACI (2005b: 17).

7.4   Independence and credibility

The issue of NACI's lack of independence has been a repeated theme over the years in the NACI annual reports and external reviews. As was highlighted in Chapter 2, the independence of advisory bodies has been identified as an important contributing factor to their potential influence on policy-making. In that chapter, the notion of independence was defined in terms of two interrelated dimensions: the formulation of advice at arm's length from political interference, and as discretionary power or autonomy in terms of operations. For the purposes of this analysis, I was interested in uncovering what threats there have been to NACI's independence and how these have affected its functioning and potential for influencing policy, and in exploring people's ideas about why independence is important (or not), in whose eyes and to what end.

The backbone of the issues around NACI's independence (or more specifically, lack thereof) has to do with its relationship with, and position vis-à-vis, the DST. There are two main components to this which were referred to in Chapter 5. The first is that NACI does not have discretionary power given that the NACI Act does not establish NACI as a juristic person; in other words, as a legal entity with recognised duties and rights and a distinct identity. Furthermore, NACI is integrated into the DST's administrative and budgetary systems. This means that it is dependent on the DST for its budget and information technology infrastructure, and on the DST's procurement and recruitment processes, and its Secretariat staff are employees of and report to the DST. NACI was even located in the same premises as the DST up until 2009.[118] As early as 1999, the CEO reported in the NACI annual report that the Minister had requested an amendment to the NACI Act which would 'give the NACI secretariat full independence from Government' (NACI, 1999: 3). According to a key informant, the intention was to create a structure comparable to the CHE which the Higher Education Act 101 of 1997 (Section 4) had explicitly established as a juristic person. The informant reported that this intention had not come to fruition because of the 'political cost', as well as apparent resistance by some Cabinet members to the potential proliferation of these kinds of bodies and the associated financial implications. A couple of years later, the 2002 external review stressed that 'as a relatively new organisation with important national tasks and responsibilities, NACI should be protected from having to spend enormous amounts of time confronting and eroding perceptions of a lack of

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[118] A key informant recalled making an argument in the early 2000s for NACI to move to its own premises but that the suggestion was 'categorically rejected'. It was only in 2009 that NACI finally relocated to its own premises in Persequor Technopark, and in 2012 to the Innovation Hub in Pretoria. An internal NACI report remarked at the time that NACI welcomed 'the opportunity to relocate its offices to premises outside of the DST building' (NACI, 2009c: 15).

independence from the [DST]' (Gevers et al., 2002: 28). Both the 2002 and 2008 external reviews made recommendations relating to the need for NACI to have independent control over its budget. The 2008 external review argued that the DST's control over NACI's budget 'leads to de facto control of NACI, which strengthens the general perception of DST control within the minds of the NACI Secretariat', and that NACI's budget should rather be 'reflected as a one line item in the DST budget and financial accounts' (Havenstein et al., 2008: 5). As highlighted in Chapter 5, this never happened. NACI's lack of independence from the DST was highlighted again in the 2012 Ministerial Review which observed that the nature of the relationship 'had a number of counterproductive effects, including widespread perceptions of a lack of autonomy, limited capacity to influence national-level strategy and planning for the NSI, a relative lack of resourcing and the low profile of its work' (Ministerial Review Committee, 2012: 75).

According to a key informant, NACI's dependence on the DST's administrative system posed a 'logistical constraint' and had the practical consequence of impeding the flow of NACI's work: 'The frustrations would be DST's processes. NACI would be slowed down considerably and that was always problematic. So it would take so much longer because all the contracts had to be placed and the Secretariat would get incredibly frustrated around that.' Similar issues were highlighted in Chapter 5 in relation to problems with filling vacancies owing to the DST's recruitment process, and in Chapter 6 in relation to limitations imposed by the Department's procurement process on the contracting of researchers. Another informant reported that the embeddedness of NACI's finances in the DST system gave the DST a measure of control over NACI activities:

> Part of the budget issue is you need to interpret what it means to say: you have control of your budget. The first thing is: do you have control over how much money you get? Then the next thing is: what do you do with the money? So a major part of NACI's expenses was paying the salaries of the Secretariat staff. … The other bit is to say: how much money do we need to fund the research? A lot of the research is outsourced, on the projects for the advice that we are working on. … How much money do we have and can we decide how to fund the research projects? Because if the DST didn't want NACI to do something, the money wouldn't be allocated and the research can't be funded. (Key informant)

The second component of the independence issue is the requirement in the NACI Act that the DG of the DST is the CEO of NACI, further entrenching the perception that NACI was merely an extension of the Department. Key informants had much to say about this issue and gave various examples of how it had manifested. One had to do with the blurring of the boundaries and roles between NACI and the DST, and between the Head of the Secretariat and the DG and between the DG and the Minister. It also called into question the potential conflicts of interest surrounding the DG. For instance, a key

informant described how the DG would delegate to the Head of the Secretariat which raised concerns about the independence of NACI:

> In the early days of NACI when the DG was CEO, NACI was like a sub-department of the DST and that was seen as problematic. Obviously the DG doesn't have time to act as a full-time CEO because he's already running a Department. So the DG would delegate a whole bunch of things and through no fault of his own – I have always held [that DG] in high regard and still do – he would delegate, and it was always very difficult and NACI was always very concerned about whether NACI was truly an independent advisory body. (Key informant)

This was echoed in the 2008 external review which, noting stakeholders' views that the arrangement was problematic, reported that the DST had 'given the Head of the Secretariat most of the tasks normally given the CEO to get around this problem', but that this had not necessarily achieved the desired effects in practice (Havenstein et al., 2008: 4). Another informant said that having the DG as CEO 'introduced complexities' in terms of the DG's relationship with NACI and with the Minister:

> A lot of it depends on how the DG views this whole process. Without going into personalities, a lot of the work I had was with [a particular DG], and his view as I recall was very much that NACI should be an independent body giving advice, rather than being a subsection of his Department. Because ultimately the Chief Executive doesn't employ the Council members, but he does employ the Secretariat, and the Secretariat supports NACI as a Council. But the broader issue is the distinction between the Department and the Minister. The Minister lived in the same building as the Department; the DG is his Chief Operating Officer, and a lot of times the Minister would ask for views from the Department and the DG would be the person to speak with. So I can imagine it creates complexities for the DG as well – being the CEO of NACI and the DG at the same time. Then if you juxtapose the CEO versus the Head of the Secretariat, that becomes even more complex! (Key informant)

The role confusion between who was responsible for what was also highlighted by key informants. For instance, one informant said: 'There was some tension between NACI and the Department. I don't think it was very serious, you know, it wasn't ugly. But there was a kind of: but are you supposed to be doing this, isn't that our job?' She gave as an example the development of the *Advanced Manufacturing Technology Strategy* (2002), which NACI had done: 'And there was from the Department kind of: but, were you guys supposed to do that or were we? But it was handled in a very professional and proper way.' Another example is that in 2004, the coordination and management of the R&D Survey was transferred from DST to NACI. In the 2004/05 NACI annual report, the CEO stated (NACI, 2005a: 6-7):

> What is especially important about the survey and its data, is the fact that the entire programme is becoming a cornerstone of the government's commitment to data-based monitoring of progress in STI policy and strategy implementation. In this regard, the indicators unit in NACI played an indispensable role, further validating the decision to transfer the unit from DST to NACI. I foresee that NACI will increasingly utilise this information source in developing ministerial advice.

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However, during 2006/07 this responsibility was transferred back to the DST because, according to Pistorius (2008: 59), it was soon realised that this was not 'an appropriate arrangement'. The role confusion between NACI and the DST appears to have persisted as another key informant referred to similar dynamics arising with regard to the drafting of the new White Paper in 2018:

> Often what seems to happen is that the Minister apparently approaches NACI and NACI then starts commissioning work or doing work and the next thing, now the Department's doing it. So the [recent draft] White Paper was a case in point. The Minister apparently approaches NACI and says: I want NACI to draft the White Paper. Well, unsurprisingly, the Department says: well, actually that's our job. And so now you have two processes, parallel processes, and this seems to take place again and again. It's almost like lines are crossed, there are mixed messages and you don't really know who is driving the show. (Key informant)

It is worth noting here that over the years, there were questions about the nature and extent of NACI's mandate with regard to duplication, overlap and role confusion between NACI, the DST and other stakeholder bodies in the NSI. For instance, the 2002 external review noted that in 'an increasingly crowded NSI policy environment, it is vital … that the role of NACI is clearly defined and fully understood, by NACI itself, by other organisations and institutions, and by various constituencies and stakeholders' (Gevers et al., 2002: 20). In 2006, NACI's position, role and functioning in the NSI in general, and its relationship to the DST in particular, became the subject of debate within both NACI and the DST. These debates were triggered by various developments, including the internal restructuring of the DST which had raised the issue of the NACI Secretariat within the DST; confusion over the actual position of NACI within government owing to the DG in the position of CEO; the notion that some DST officials regard the Department as relatively closed and self-sufficient, thus making external inputs difficult to accommodate; and significant changes in the national and international STI policy domain (NACI, 2008: 16; key informants). As stated in a NACI annual report (NACI, 2007a: 13-14): 'NACI has been in existence for almost ten years. This is an appropriate time to consider what changes to NACI and its mandate are required within a broader science advice system, so that NACI is in a position to serve the nation even better in the future.' Thus, the Council initiated a project that would undertake a 'strategic analysis of NACI's mandate, structure and functioning as well as its position and role in the NSI' (NACI, 2008: 16). Advice based on the findings and recommendations of this study was presented to the Minister in October 2006, and was aimed 'at improving the function of NACI in the short term, and at establishing a more robust and effective system to provide advice on science, technology and innovation to the government in the longer term' (ibid.). Following this advice, NACI initiated another study that would look at the national science advice system and its roleplayers more broadly. The report, *Optimising*

the South African System of Science Advice to Government, was presented as advice to the Minister during 2008/09 (NACI, 2009c: 16).[119] It is unclear what became of these efforts.

Another manifestation of this entanglement and confusion over roles was in relation to the movement of requests for advice and advice outputs between NACI and the Minister via the DST. For instance, a former NACI Chair described how for many years the DST played the role of conduit:

> A lot of the communication from the Minister, including requests for advice, came via the DST, particularly since the DG was the Chief Executive of NACI. And there was a period when, as I recall, the advice that went to the Minister technically went from the NACI through the DG, which is the CEO, and then to the Minister. At some point it changed, it went directly from NACI to the Minister. (Key informant)

In a similar vein, another informant reported that there were instances where NACI would present a report to the Minister with the DG present 'and the Minister would then say: okay, pass this on now to the DG for the Department to advise – advise in the sense of: what is the way forward politically? I must qualify that. It's a kind of a circular thing.' A former NACI Chair noted that since, in practice, the DG was the primary link between NACI and the Department, the DG could effectively block NACI's access to the Minister:

> It is an inherent weakness and it does make NACI vulnerable. I mean if you don't have someone as stubborn as myself as a Chair who is not prepared to -- quite frankly it does come down to the ability of the Chair to deal with that risk and to make sure that NACI's voice is heard … for example, the Department *can* control access to the Minister. If you don't have a strong Chair that has a good relationship with the DG then no matter what the Minister says you are going to battle to get the access. (Key informant)

A key informant observed that there was always a general lack of clarity about how the process was supposed to work: 'Where the system has broken down is that there was never exact clarity on how this advice should be communicated and what to do with the advice. There was no systematic experience of doing this – within the system as a whole, between NACI, the system and the Department.' When I commented that the NACI Act was very vague on this matter, the informant remarked:

> Ja. That could've been by design or it could've been by default. I don't know; I wasn't involved in formulating the NACI Act. If it's by design it's because you want to leave open exactly how this system organises itself, because different DGs and different Ministers and different Chairs of NACI will reach different accommodations. So if you legislate this, you may force them into a system that doesn't work for them. But it could be by default because nobody bothered to think through the details. (Key informant)

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[119] Unfortunately, I was unable to gain access to this report.

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A second theme in the external reviews of NACI as well as in interviews with key informants was the importance of NACI being able to provide independent advice, which was variously interpreted as advice that is formulated without political interference, is non-partisan (i.e. not favouring or advancing particular vested interests in government or the system more broadly), and/or is able to include critical comment of the DST. The placement of the DG as CEO of NACI was reported by some interview respondents as having had potential or real effects of interference in NACI's advisory work. As Marais and Pienaar (2010: 89) have argued, such an arrangement has the effect of 'limiting, if not diluting, the organisational and critical functions of the Council.' Key informants were reluctant to give concrete examples of interference by the DG or DST, and when they did it was on request that the specifics were marked as 'off the record'. One key informant offered an example of an instance when the DG interfered in the Council's self-initiated advice agenda. He noted that since the DG was the CEO of NACI, it stood to reason that the DG was required to approve the agenda and minutes of Council meetings, drafted by the NACI Secretariat, before such documents could be mailed to Council members. The informant recalled one case where the DG insisted that an item on the draft agenda be deleted, although he was told that some Councillors had requested that the item be discussed at the next Council meeting. In the discussion that followed between the DG and the Secretariat, the DG said that the Secretariat should follow his instructions, since he was the CEO and the Secretariat formed part of his staff.

So why is NACI's independence important? Three themes emerged in this regard. The first had to do with the need for an independent advisory body because other advisory sources to the Minister are not independent and/or have strongly vested interests. A key informant described this in relation to the Minister's personal advisors and the DST:

> The Department of course acts as an advisor to the Minister. Then you have generally within the Ministry two or three individuals, who are the Minister's own personal advisors, and who may or may not know much about the portfolio that the Minister is in charge of. And their role would be to provide technical advice and support to the Minister inasmuch as they are competent to do that, but principally to provide political advice to the Minister. [In other words], what the implications of particular policies are: this thing that the Department is suggesting to the Minister won't go down well with this and this department, so in Cabinet you're going to have a problem with this. That sort of stuff. So you have two sources of influence over the executive authority – the advisors and the Department. But neither of them can be said to be independent. The Department is dependent on the largesse of the Minister. If the Minister starts taking a dislike to the Department it can make your life hell. The Minister's advisors can be fired at whim. So if they say something to the executive authority that he or she doesn't like, theoretically they're at risk. So you don't have any real independence in that system. (Key informant)

The 2008 external review stressed the importance of NACI being able to provide a 'third party', non-partisan perspective – as opposed to the advice provided by the likes of science councils (Havenstein et al., 2008: 2):

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> … it is necessary to have an advisory body that is independent and sufficiently high-powered to provide third-party advice and reality checks based on knowledge-based overviews, as well as expert inputs by the advisory panel members themselves. … Third-party advice is crucial to provide an independent, holistic and knowledge-based oversight of the system and how the parts work together. While there are a number of other institutions that will contribute to the development of broad-based innovation policies, these will often be perceived as representatives of interests in the system. This applies to the research institutions as well as other institutions that provide expertise on the inputs on policy development and funding within the innovation system, for instance, the academies.

A second motivation for NACI's independence from the DST was expressed in terms of its ability to critique the DST (its policies, strategies and performance), and the inherent value of being able to do so. In this latter regard, a key informant's remarks suggested that the DST could benefit from having a mirror held up to it:

> I think in principle it is important to have a capacity like this, because what you've got is you have a government department that, even all things going well, is operating according to a plan, moving in a direction a bit like an oil tanker – not easy to turn around if you need to turn it around, and it might not know that it needs to turn around, because it can't see that little fishing boat that's just in its path. (Key informant)

The 2002 external review recognised that NACI should align its activities and foci to those of the principles and policy objectives of government as contained in White Papers and other policy and strategy documents. However, it also stressed that NACI should adopt a more critical stance towards these and 'subject (where necessary) these goals and the proposed instruments and strategies to critical scrutiny, and question their appropriateness in relation to the fiscal environment, the capacities of institutions, and the available human and financial resources' (Gevers et al., 2002: 18-19). To borrow the words of an interview respondent, such an orientation effectively makes the DST itself 'an object on which advice could be given.' However, as another key informant remarked, in the context of NACI's dependence on (funding, staffing) and reporting to the DST, how do you criticise your 'paymaster'? Put another way: given NACI's dependence on the DST, how likely is it to challenge the status quo?

A former Chair spoke (hypothetically) about the effect on NACI's ability to be critical of the DST of having the DG as CEO as a channel of advice to the Minister, emphasising though that this was countered by the independent-mindedness of Council members. This was echoed by another former Chair who argued that having independently-minded people on the Council served to circumvent the potential problems associated with dependence and the DG as CEO.

> In theory that would make it difficult for NACI to be critical of the DST, if that was the way it was – specifically since the Chief Executive sat on the Council and the DST is not accountable to NACI.

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> However I think the people, the NACI Councillors, were people of their own minds; they would speak their minds even if it was a confidential discussion, if that was the case. (Key informant)

> The issue of the independence of advice comes from who you put around the table. You need people who have some knowledge of the NSI and you need people who are informed and keep themselves up-to-date. You need people who are independently-minded. So I think people confuse having an independent organisation with its own little structure, with independently-minded people. … [Having the DG as the CEO] didn't stop us from being critical. NACI has written quite a lot of criticism about what the DST has done and failed to do and that's because the people around the table are independently-minded in their own right. (Key informant)

A third former Chair talked about the role that he had played in navigating the choppy waters of NACI taking a critical stance towards the DST, pointing to an informal, one-on-one approach to negotiating independence (and the potential fall-out):

> That's where the Chair's diplomacy skills have to be exercised to the limit, and this is where we would occasionally have clashes between the Secretariat and DST because the Secretariat would be preparing information that may be critical of the DST, yet DST is holding the purse strings and making appointments, etc. That is where it was up to the Chair to navigate that particular territory. That is definitely the strongest case to be made for NACI to be truly independent. I always got a sympathetic hearing from the Ministers when we spoke about NACI as a truly independent entity, but never with sufficient appetite to actually implement that. I think part of that is because we used to make it work. You had a DG who – I don't think anyone ever likes criticism and they were always very sensitive to it – but the DG would listen to NACI and would take it seriously. And, as I say, as Chair I would just navigate those particular territories. And the way that we would do that was if we were critical of DST, it was always in a positive sense. We would say: the DST wasn't able to achieve this, and this is why they weren't able to achieve this, and this is what we suggest you do to remedy the situation. [Comment: Because personalities aside, having the DG as the CEO means that there is the potential for influence as to what gets looked at.] That was always seen as a fundamental conflict of interests, and that is why when I took over the Chair, [the DG] and I had that discussion and he recognised that and so he effectively stepped back. (Key informant)

Out of curiosity, I took a look at the NACI annual reports through the lens of the extent to which they adopted a critical stance – in relation to the DST as well as the broader system of institutions. It was for the first time in the 2004/05 annual report that NACI provided a detailed overview of key indicators of the NSI, as well as policy and other developments relating to the DST, DTI and the higher education sector.[120] However, this and the following two annual reports were not critical *per se* insofar as they simply presented overviews. From the 2007/08 NACI annual report onwards there appears to be a shift towards greater critical engagement with, and assessment of, the broader environment within which NACI was working, including that of its parent Ministry and the DST. For instance, both the 2007/08 and 2008/09 annual reports presented data on a range of aspects – such as present and future human resource capacity, high school and higher education graduates, imported know-how, technology balance of payments, and technical progress – drawing the

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[120] Prior to this, the focus of the annual reports was entirely on reporting on NACI activities.

conclusion that 'given the government's broad socio-economic mandate, it can be questioned whether enough is being done to create conditions conducive to innovation' (NACI, 2008: 31). The 2009/10 annual report undertook a very detailed analysis of key indicators with the specific aim of assessing 'progress towards achieving the targets set by the DST's Ten-year Innovation Plan … combined with commentary on the NSI that was developed by NACI during its Council meeting in April 2010' (NACI, 2010a: 11). In this, the report also raised questions about the relevance and value of the indicators themselves. While by no means a systematic analysis, one does get the impression that over time NACI has found its voice (however faint) as a more critical commentator in the public domain on the trends and challenges in the system.

Despite these concerns about constraints on NACI's independence, there was recognition of the importance of a functional and cooperative relationship between the Minister/DST and NACI in order to provide relevant and useful advice. For instance, the 2008 external review referred to the need for NACI to balance 'political independence' with 'political usability' (Havenstein et al., 2008: 3):

> All advisory committees and councils will face the difficulty of balancing their political independence with political usability. The Council is appointed by the Minister in order to give advice to the Minister, and the independence and leeway given to the Council therefore depends on the clear understanding that the advice given is expected to be knowledge-based and autonomous.

In terms of the discretionary power of a body like NACI in being able to manage its own budget, a key informant explained how it works in government in general and the underlying principles, emphasising that autonomy needs to be balanced with accountability:

> Once you've been given a budget, if you don't have authority over your own budget you're not independent. You're being directed in how to deploy that budget by somebody else. So the greater the authority of a body outside of the institution that owns that budget, the greater the authority of that person over the deployment of that budget, the less independence there is. Now, it's a philosophical question only, I think it's a moot point, if there is such a thing as real independence or not. Because there isn't really; everybody in the public sector gets their money from the Treasury ultimately. So everybody ultimately is dependent on the Treasury. But in practice, once funds have been given by the Treasury to the departments, there's a high degree of independence. That degree of independence I have seen reduce over the years a little, as the financial crunch has given the Treasury more authority to recall funds. But that's a fairly marginal phenomenon at this stage still; it's not like the Treasury essentially tells you how to spend your budget. So in our parliamentary system, once funds have been allocated to an institution, the institution is fairly autonomous – I would not say completely autonomous because there is always a balance that has to be managed between autonomy and accountability. And whether that is managed around a small entity like NACI or a large entity like Eskom it doesn't really matter – it's still a balance that has to be struck. You cannot reduce the autonomy of this institution beyond a certain point, nor does the accountability of the institution decrease beyond a certain point. But you can't define those points. You can only manage that tension and that balance. So NACI will always be dependent on some conduit for its funds, and it's ultimately in how the interface between whatever NACI will be and the body it is meant to advise, depends on how that interface is managed. If there's neglect of that interface, if there's an over attempt to influence – from either side – that's ultimately what it boils down to. (Key informant)

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The third theme contains two interrelated ideas: while NACI is mandated to advise the Minister of S&T, given that the scope of its advice is on innovation (of which S&T is only part), its advice needs to be taken seriously by other relevant government departments and external stakeholders; and, in order for NACI's advice to be taken seriously, it needs to be perceived as independent. The following three quotes touch on this theme:

> The second part [of the independence issue] – which maybe is not as obvious – is the shifting of the system away from an S&T to an innovation system, and in an innovation systems context, innovation is much bigger than any of the line functions. In other words, the innovation advisory function should speak across government and across interests. (Key informant)

> [NACI] was seen as being very, very close to the DST, whereas the intention of NACI all along was for NACI – and I must admit we battled to achieve this throughout my tenure as Chair – is for NACI to be an advisory body to *ministers* as opposed to just the Minister of Science and Technology, [the underlying rationale] being that if you look at the NACI Act it says that NACI advises the Minister of Science and Technology and through the Minister of Science and Technology other ministers *on* -- and remember the national system of innovation is a *national* system; it's not a DST system. So when we looked at the priorities of NACI, the work scope of NACI, they would cut across departments like Education, Health, Water, Environment. And if NACI is seen as just an element of DST, it was very difficult then to get access to other ministers because those other departments would generally say: what's it got to do with us? It is a DST thing. (Key informant)

> The downside [of the DG being CEO] is there's a potential – I'm not sure if 'conflict of interest' is the right word – but there's a potential problem because if NACI is an independent body, then you need to make sure that its independence is protected and that it is *seen* to be independent. And part of the problem is that if the DG is the CEO, people, for whatever reasons, can sort of hint at the fact that: well, maybe it's not that independent. And the fact that it can be seen not to be independent, even if that's not the case, that itself can create a problem. (Key informant)

NACI's *de facto* and perceived independence (or lack thereof) is interwoven with another set of interrelated factors – including its profile, relevance and transparency – all of which talk to NACI's perceived legitimacy and credibility on the part of both the Minister of S&T and the DST, as well as key external stakeholders in the system. As a key informant remarked: 'You must take note of the perceptions out there – perceptions are reality.' These factors are seen to play a potentially significant role in the influence or impact of NACI's advice on policy development. Indeed, it is telling that following the NACI Council's self-assessment exercise in May 2004, the 2004/05 NACI annual report referred to the need for NACI's advice to be 'respected, valued and differentiated from other quarters in the NSI' and to prove itself 'as relevant and able to have an impact on the NSI' (NACI, 2005a: 14). Similarly, some five years later, NACI initiated a study on how to optimise the South African system of science advice to government, in which it also considered its own role. One of the recommendations to the Minister from the project report was that 'NACI should command a

position of stature in the NSI and it therefore recommended that NACI's marketing and communication efforts be directed towards enhancing its stature and visibility among the executive and legislative branches of government, the public and private sectors, the higher education and non-profit sectors, the diplomatic corps and the international community' (NACI 2009a: 16).

The importance of the relevance and credibility of NACI's advice and as an advisory body on the part of the Minister of S&T is perhaps intuitively obvious. It is not a great leap to assume that if the Minister or the DST found NACI's advice to be irrelevant to their agenda, or questionable in its formulation or quality, the advice would simply not be taken into account.[121] It could also lead to NACI being bypassed by the Minister (although this could, of course, also be the result of political reasons). And, as a key informant remarked: 'If the Minister is not happy with NACI's profile then he can change whoever it is and replace the Councillors.' However, external reviews and other commentators have also stressed the importance of NACI's legitimacy and credibility among a wider range of stakeholders in relation to the potential influence or impact of NACI's advice, as well as its role and contribution more broadly within the NSI. Various arguments have been put forward as to why the views and perceptions of external stakeholders count and why the benefits of NACI's work to stakeholders beyond the Minister and DST should be considered.

One line of argument articulated by a key informant was that since NACI is a public body, its credibility also reflects on the credibility of the Minister and even the system as a whole:

> Why it's important to raise the profile of NACI is because … if NACI gives advice to the Minister, somebody will ask the Minister: where did you get this advice? And the Minister needs to refer to NACI. Plus NACI is a statutory body, so you need to make sure that NACI in itself has credibility. Credibility comes in part from the individual Council members. I would think that the credibility often would come from the quality of the advice. There were a lot of credibility issues. You need to raise the profile of the country as such: who knows and believes in NACI, and these are the people on it, and this is what it does and so on. … From a national viewpoint, the Minister, NACI is a public body, so there's a bit of a public accountability, if you will, as well in the sense that the Act says there must be a NACI, so there must be one. People must be sure that it's there, that it's functioning. Specifically, if there might be an issue to say: well, it's embedded in some way or another in DST, then it's important for people to know that it acts; even though there might be some organisational complexities, the decision-making is credible. (Key informant)

Key informants also pointed out that in its advice formulation, NACI depends on the inputs of external stakeholders, and that if such stakeholders do not regard NACI as legitimate or credible, they will not make themselves available. In turn, stakeholder input into the advice formulation process can improve the relevance and thus possibly the acceptability of the advice.

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[121] This was one of the key findings of the survey of DST officials on the usefulness of NACI's advice highlighted in section 7.2 above.

We started this process of engaging quite widely with external stakeholders. We would have business meetings with organised businesses, with Higher Education South Africa, with the heads of science councils and those kinds of things, and NACI had to be credible to get the access in the first place. Chief Executives are not going to talk to us if they considered us to be a Mickey Mouse organisation that just did the bidding of the DST. (Key informant)

[NACI's credibility and legitimacy is important] in all stakeholders' eyes. The science community needs to feel that its interests are promoted by NACI because the science community is a key stakeholder in evidence-based policy. So the science community must feel that NACI is a meaningful representative of science and technology issues. Because if you do have a NACI Council, those people don't go into a meeting without having drawn on intelligence and knowledge outside of those ten people or whatever. And where are those people going to be sitting? The source of that knowledge is not going to be the administrative staff within the NACI infrastructure, it's going to be people in the national science system, most of them in the public sector institutions – universities and science councils. There might be some in the private sector, there might be some in the NGO sector, but the vast majority of them are going to be government employees of some sort or another. And if they feel that this NACI body has no idea of the real state of science and technology in the country, then NACI's ability to get useful input to help formulate advice and perspective is going to be withered away. So I think that's an important stakeholder. It's not that NACI represents them – well, NACI does represent them in a sense, but it doesn't defend their interests. I think the science community will understand that the job of NACI is not to represent their interests, but to represent the interests of science, and the science community I think can make a distinction between that, in my experience. And that's an important distinction to be made, it's a politically important distinction. Then of course, in general, other government departments: if the intention is to create some system that makes NACI outputs relevant and serious to other government departments, then those other government departments also need to have a sense of NACI being a credible body. The DST of course needs to have that sense as does the Minister. So pretty much everybody has a finger in this pie. (Key informant)

One of the reasons cited for NACI's lack of credibility was its perceived lack of independence, as discussed earlier. Another has been the perception of the general 'invisibility' of NACI and its work as an advisory body in the NSI. For instance, based on interviews with a range of key stakeholders, the 2008 external review noted stakeholders' perception at the time that NACI seemed to be 'something of a "black hole" into which their contributions disappear without seeing the effect' (Havenstein et al., 2008: 5). The review also reported that there had been 'consistent criticism from all these quarters that they do not know what NACI is doing or how the work they had been involved in had been taken further or had influenced policy' (ibid.: 7). This was reflected in the comments of a senior DST official when asked about his experience with NACI's advice outputs: 'I suppose the content of some NACI reports might be good and useful. … I'm not sure what else they do or what else they're supposed to do.'

Over the years, NACI has made various attempts to increase its profile and visibility. In the early years, aside from launching its website, these included the introduction of a NACI newsletter and the

NACI Innovation Awards.[122] However, the newsletter and awards were soon scrapped since they were regarded as NACI straying into an operational role (which the White Paper on S&T stressed was not to be part of its mandate). As a key informant noted: 'It was about outreach, it was about NACI's image and credibility. But it was reined in because it was seen as going beyond NACI'S mandate. NACI was starting to be seen as another science council-type thing as opposed to an advisory body.' Since then, other approaches have been proposed and/or adopted. For instance, a former NACI Council member pointed to efforts to increase NACI's profile by widening the composition of the Council to make it more broadly relevant:

> By this time I was still involved here and there in various activities in the science and technology system, and from time to time I would participate in different events and so on – but I found that NACI became less and less visible. And when I left [the Council], my assumption was that NACI would become more and more visible. And the whole thing was, the group that was appointed [as the third NACI Council in 2009] were supposed to be -- because the first two NACI Councils were very academic. There were industry people but they didn't participate strongly. So a few industry people were appointed but, you know, academics are supposedly more vocal, maybe more articulate, I don't know, but that was certainly the case in the first ten years. And then in the third NACI Council there appeared to be an effort to appoint more articulate people from industry. So I suppose my assumption had been that NACI would become more visible, more vocal, more influential, but it didn't! And I don't know now, but I get the impression that NACI is even more in the background than it was then. Last year I participated briefly in a gathering – I think it was one of the gatherings in preparation for the [new draft] White Paper [and] my little internal alarm was that: but where is NACI in all of this? Because the conversation there kept being: well, DST's doing this and NACI's doing that, but NACI wasn't visible there. (Key informant)

According to a former Chair, another approach was to publish the background research that informed NACI's advice:

> The Chair of NACI always puts their own personality onto NACI's as well. That was [an earlier Chair's] way of dealing with the issue of NACI's outreach and the issues of reputation and credibility. NACI needs to be seen to be out there – hence the awards, hence the newsletter. I dealt with it differently and my approach was probably a more academic approach where I said: well, let's just make sure we can make NACI's outputs available to researchers and other people, and I got the approval, I think it was Minister Mangena, that once advice had been approved, as part of every advice letter we would say: unless you disagree we will include the background research to this advice on the NACI website. (Key informant)

Another key informant also referred to the need to publish at least certain aspects of NACI's outputs in the public domain and added to this the need for NACI to take on an advocacy role in order to raise its profile and be taken more seriously:

> It's not just about the legitimacy of NACI, it's also about the influential-ness because look, there are always two sides to this: the policy-maker and the advisor. The policy-maker decides: well, I've set up an advisory body, but quite frankly I'm just going to ignore them. Then, I suppose, it doesn't matter how

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[122] Examples of innovation awards included the NACI Postgraduate Innovation Award and the TT 100 NACI Innovation Award which were established during 2002/03. The 2002/03 NACI annual report refers to these awards being introduced as part of NACI's function of the 'promotion of innovation' (NACI 2003a: 10).

hard you try, there's very little you can do. But I actually don't believe that. I've always believed that if the policy-maker establishes an advisory body and ignores it, then the advisory body must deploy tactics so that it cannot be ignored. … One of the tactics is to publish and NACI certainly has done that over many, many years. But the point is to publish but also to advocate. So you put more effort and attention into advocacy. Just for example, there's nothing that stops NACI being more influential through the public media on the subject of innovation. This is in parallel to rendering advice. It is theoretically a very powerful body that should be saying: this is what we think, this is what we think. And it's not saying that! So how would anybody know what NACI thinks? (Key informant)

It occurred to me that the potential for visibility and profile is there because of the composition of the Council – both in terms of it being cross-sectoral and because the NACI Chairs and many other Council members are high status individuals. I put this to a key informant in an interview, who responded saying that the NACI Chairs had not necessarily used their positions to increase the visibility and profile of NACI because as individuals they were not particularly outwardly-orientated, and that they were first and foremost accountable to their own organisations:

> Sadly none of them had a really strong public orientation. They're all oriented to their own institutions. … So they had operated in quite a closed sphere, and they didn't really have experience and knowledge of – I don't want to call it publicity, but public outreach. None of those individuals were really adept at public outreach. … If you are a vice-chancellor of a university or the head of strategy at Eskom, you are highly unlikely to start making career-limiting statements or being publicly forceful in NACI. Not simply because – I mean, you know, as a vice-chancellor you're completely independent and government can't touch you, but your [university] council will start saying to you: but hold on, why are you so vocal? You're actually *our* full-time employee. (Key informant)

It could also be argued that given their positions in their own institutions, the NACI Chairs are extremely busy people, making it difficult for them to dedicate their time, and that promoting NACI in order to raise its profile would be better placed with the CEO.

The lack of transparency of NACI's operations and outputs has also been linked to its credibility. The 2008 external review, for instance, argued that a perceived lack of transparency – specifically in terms of the availability of its research reports in the public domain – was 'one of the main reasons for the apparent lack of profile of NACI' (Havenstein et al., 2008: 5). The review proposed that in order to increase its relevance and visibility within the broader NSI, NACI increase its focus on developing 'a national learning arena for innovation policy development' in which its 'knowledge-based analysis [could] enrich the public debate on the role of innovation in the economic and social development of the country' (ibid.: 6). Interview respondents also pointed to the value of key stakeholders (both inside and outside of government) having access to the information and research that underpins NACI's work, as well as analysis of the sector(s) within which they operate, as a way of contributing to general STI policy knowledge in the system. A former NACI Chair reflected on this as follows:

> One of the things we started fairly early on in my term was for NACI to be seen as a – I don't think we ever quite got this right – but for NACI to be seen as a repository for national system of innovation policy knowledge and a database kind of thing. Therefore it was important that NACI was seen as a credible source of information for future researchers, because one would use then the existing knowledge base to build a future knowledge base, and if that existing knowledge base doesn't have credibility then the future one won't have credibility either. (Key informant)

Over the years, NACI has given consideration to increasing the transparency of its operations in general, and of its research studies and advice outputs in particular. For instance, in 2003 a decision was taken to make NACI's corporate business plans available in the public domain in order to allow key stakeholders in the NSI to scrutinise NACI's strategic plan; to increase NACI's visibility within the NSI since it 'relies heavily on the cooperation of all stakeholders in the national innovation endeavour'; and to help in clarifying role definitions among the statutory and other bodies and individuals, who form part of the intermediary layer of the innovation sphere (NACI, 2003b: 3). Further moves towards greater transparency included the publication of details of NACI studies on the NACI website, and greater detail of the advice provided to the Minister in its annual reports (which becomes more evident from the 2008/09 annual report onwards).

However, as described in Chapter 3, my own attempts at gaining access to documents such as research reports and advice outputs were frustrated at every turn. Firstly, the publications section of the NACI website was poorly populated, even of research reports. Secondly, when I requested the documents I needed to undertake the analysis for the SET4W mini case study (Chapter 6) from NACI, I was redirected to putting in a request for permission to the DG of the DST (to which I never got a response). At a point in the study prior to this, when it seemed that the problem with access was simply the result of disorganisation in NACI's administrative system, I decided to approach the researchers who had written a research report I was looking for. One researcher whom I emailed replied saying that he would email a contact of his at the DST to find out whether it would be okay for him to share the report with me. In his email to the DST contact he wrote: 'Do you think it is possible that I can share a copy with her as this is not restricted and it seems the problem is getting it from the DST or NACI servers?' Following consultation with relevant departmental staff, the DST contact replied: 'I am sorry to inform you that the report has not yet been sanctioned by NACI for distribution to the public. Distributing the report before NACI's approval may be deemed information leak.' Over the next week, the email correspondence and discussion continued, with additional people from the original research team and the organisation getting involved. I reproduce verbatim but anonymised extracts below of the interaction that took place as it reveals some of the

issues underlying the lack of transparency – even of the research commissioned by NACI. The researcher I had contacted in the first place is referred to as 'Researcher 1'.

Researcher 1 to the DST contact	Any idea when this will take place as it is now 7 years since the report was compiled and presented to NACI. It was publicly presented to stakeholders during the course of that year. I have always been under the impression that public funded research reports entered the public domain after 5 years from date of submission and acceptance by a state department/entity.
Me	It is also interesting to note that while some of the DST-commissioned and funded research conducted under the auspices of NACI and its advisory sub-committees are available on the NACI website, others (such as this one) are not. [DST contact], do you have any idea why that would be?
DST contact	All the reports you have seen on the website were approved before uploading. It is policy that any report not yet approved by NACI cannot be uploaded, and that is the reason you do not see this report there. It is however unfortunate that this report, even after 7 years since its completion, is still not approved by NACI for public consumption.
Researcher 1 to Researcher 2	Does the following denial of access make sense to you? The report was submitted in [year] and was presented to 'stakeholders' later that year by NACI. Now they reckon this student cannot get access to it. Please advise. It's a strong indication of how our hard work just sits on the shelf and wastes away without being used to at least contribute to the body of scientific knowledge.
Researcher 2 to Researcher 1	Wow, it is indeed a pity that the report seems to be available, but not accessible. Especially from a body such as NACI – it would have been so nice if they were willing to make the report available for study purposes, even if it is perhaps still awaiting formal release. Once again, it is easy to agree on principles, but in the end, unfortunately, we'll be bound by the specifics of the contractual agreement that had been entered into between [the organisation] and NACI. I also don't know whether the contractual agreement might have allowed [the organisation] to have access to the data or the research or the reports after some reasonable time had lapsed. That is why I am copying our good and knowledgeable colleague, [administrative person], for her advice on the matter. As an aside: I wouldn't be surprised if there had been some turnover in management positions in NACI since your report was originally submitted and discussed. In other words, they might not have enough background information / institutional knowledge on some of the older reports and just feel hesitant to release them to the public. In such a case, it may be useful to engage with NACI at a higher level to discuss principles and approach, around making research reports available for at least bona fide research purposes.
Administrative person to Researchers 1 and 2	The reason provided by NACI is precisely why an Act like the [Intellectual Property Rights] Act came into being – to take IP (research outputs) away from being owned solely by government because more often than not they end up on a shelf collecting dust. It seems odd that they are not willing to make the report available for educational purposes. Going forward we need to try and ensure that we reserve the right to use the IP for research, development and educational purposes in instances where the funder wants ownership of the IP. We will be bound by the contractual agreement that was entered into. I have requested [name] to provide me with a copy of the contract and will look into it and provide you with a response.
Researcher 1 to Researcher 3	I look forward to your response but I have a sneaky feeling that we agreed we could not distribute the report.
Administrative person	I've taken a look at the Agreement that was signed between the Department of Science and Technology (represented by the Acting Head of NACI Secretariat) and the

[organisation]. The Agreement (particularly the intellectual property clause) is silent on ownership of the reports or any rights/access that the [organisation] may have to them. The only reference made to intellectual property is to IP rights of material relevant to the Service, which remain vested in the Supplier. To me this speaks to background IP. In the absence of clarity, we have to look at the provisions of the Copyright Act. Due to the fact that the work was commissioned by the Department of Science and Technology, it was therefore made under the direction of the state. [Quotes from Section 5(2) of the Copyright Act] This unfortunately means that ownership of the progress and final reports and the associated IP rights are owned by the Department of Science and Technology (NACI) and as such may refuse any access to them. We don't have the right to distribute the report either. It's baffling why a report that was submitted and presented to stakeholders 7 years ago still hasn't been sanctioned for release to the public!

Researcher 1 to administrative person	One final question, does this interpretation of the IP law mean that we cannot publish any of the information? If we wanted to would we have to seek permission from NACI?
Administrative person	That is correct. You will have to obtain permission because anything you wish to publish will be based on information NACI owns.
Researcher 1 to me	I am really sorry that we could not get this resolved satisfactorily. NACI's procedures are a real disappointment as there was nothing sensitive in the report.

Perhaps even more pertinently than my own example above is that the 2012 Ministerial Review Committee – which had been commissioned by the then Minister of S&T – reported having had difficulty obtaining access to a particular document because of confidentiality, as highlighted in the quote below (Ministerial Review Committee, 2012: 68):

The Committee learned of the production of a Cabinet Minute in relation to the OECD Review, which was not available because of the confidentiality surrounding such documents, but was said not to constitute a formal DST response to the report. A departmental six-page summary of DST responses to the 2007 OECD Peer Review of the South African National System of Innovation was subsequently received, which proved extremely useful in systematically addressing the DST response to the OECD recommendations.

There are reasonable arguments to be made about why access to documents such as the minutes of Council meetings on advice formulation or the advice outputs themselves might not necessarily be available to the public, and where transparency gives way to discretion and confidentiality. This would certainly be the case in matters that are highly sensitive or politicised. For instance, the 2008 review report proposed that (Havenstein et al., 2008: 7):

… the NACI-sponsored research reports should be publicly released within a short time period, for instance, one month after completion by the research entity. They should all include a standard disclaimer indicating that they do not represent NACI positions. … This recommendation would leave the final advice to the Minister as a confidential note and would leave it to the discretion of the Minister to decide upon publication and due process for the advice *per se*.

Furthermore, making such information public – especially during the process of policy decision-making – can compromise the Minister. In his report on the provision of science advice to government, Pistorius (2008: 70) described some of the internal political dynamics any Minister of S&T is faced with in engaging with the advice given by NACI and other advisory sources, which require a level of confidentiality, but also emphasising the need for a balance between confidentiality and transparency in the public interest:

> A relationship of trust must necessarily include an element of confidentiality. This encourages robust debate. It also allows the Minister the opportunity to consider the advice in his/her own time, to consider other advices as well and then decide what the next course of action should be. The Minister can accept the advice as is, reject it in toto, partially accept the advice or refer it back to the advisor or advisory body for further work. No Minister is bound to the principle of being advised by only one person or body, statutory as they may be. Hence the Minister may also want to test the advice against other sources or combine various pieces of advice from various sources. It may also happen that the Minister has access to information that may not have been available to the advisor, and that such advice may influence the Minister's decision. That is the Minister's prerogative and also the nature of the process of giving advice to government. Ultimately the Minister is responsible for the political decision that is taken. At the same time, it is also important to remember that Ministers remain accountable to Parliament and the public, and that the advisory bodies, particularly statutory ones, are funded with public funds. As such, the public also has a right to know what the issues are that are being considered. Clearly a balance between confidentiality and public transparency is called for.

Nevertheless, the restrictions on access to research reports is difficult to understand. A former NACI Chair put it down to problems of record-keeping and the slow, bureaucratic process of requesting permission:

> The issue is this: the Minister has to give permission to make public both the reports and the advice. In principle, the former Minister was fine with that. But there's always the bureaucracy of getting the permission in writing. So that has been I think part of the issue. … It's just a combination of factors. The one is poor record-keeping. The second one is the process of getting permission – it takes long! … And NACI doesn't have anybody looking after the website, because there's nobody there. Someone like Minister Pandor, we would hear in a speech saying: NACI has advised me on X, Y and Z. So there she was making it public. She writes that in her speeches. And that's why I say to you I don't think there was any intentionality around not publishing. (Key informant)

Lack of public access is one thing; the lack of feedback from the Minister on the advice provided by NACI – which has been raised as an issue over many years – is another dimension of the lack of transparency altogether. As highlighted in Chapter 5, the NACI Act does not require the Minister to provide feedback on whether he or she has accepted or utilised NACI's advice, which implies that the advice is non-binding. This in and of itself is not uncommon when compared to similar institutions in other countries. Nevertheless, the point to be made here is that not receiving feedback on the use or otherwise of NACI's advice has implications for NACI, as well as external stakeholders, in being able to evaluate the usefulness of its advice which, in the bigger scheme of things, impacts on NACI's ability to make adjustments in order to improve the value of its advice. The

issue of the lack of feedback was raised in the 2002 external review which observed that the 'process of giving advice will also become pointless if NACI is not kept informed on the outcome of its advice, or is not in a position to assess whether adopted policy is having the desired impact' (Gevers et al., 2002: 25). Pistorius (2008: 70) similarly argued that 'it seems appropriate that the Minister should inform the advisory council what he/she has done with the advice delivered to him or her and what the path forward is. This can of course also be done in confidence, and will also allow the advisory body to keep track of the usefulness of its advice and shape its agendas for the future.' A decade later, the problem of the lack of feedback was still an issue. The 2012/13 NACI annual report highlighted that the DST was not proactive in providing feedback to NACI on the advice provided or whether it was utilised, and attributed this primarily to the fact that 'most senior officials who are responsible for implementing advice do not have access to it' (NACI, 2013: 11). A key informant referred to the lack of feedback as a 'dysfunction' and 'a serious, debilitating factor'. Another informant made the argument that in the absence of a requirement that the Minister provide feedback of some kind, ultimately no-one is held accountable for the use or non-use of advice or for taking NACI and its advice seriously.

It is worth noting that although the advice provided by the CHE is also non-binding, the Higher Education Act compels a response from the Minister. In particular, that Act states that the Minister 'must consider the advice of the CHE' and 'provide reasons in writing to the CHE if the Minister does not accept the advice' (Section 5(3)); that the Minister 'may act without the advice of the CHE if the matter is urgent' or 'if the CHE has failed to provide the advice within a reasonable time' (Section 5(4)); and that should the Minister act with the advice of the CHE, the Minister must 'notify the CHE of such action' and 'provide reasons in writing to the CHE for such action' (Section 5(5)). Two key informants, based on their experience of being CHE Council members, explained that these legal requirements do not necessarily translate into constructive responses:

> [The CHE] has a more formal arrangement. But in fact you can get a letter from the Minister saying: I've received your advice and it's under consideration, and that's it. Well then the Minister doesn't have to take the advice. There's nothing requiring the Minister to take the advice. (Key informant)

> I think that it is a problematic issue in the sense that if there is an expectation that the Department must respond to everything that comes from NACI, then that's problematic because it can end up distracting the Department. … I sat on the CHE board for about five years or so, and it is entirely possible that if you have this requirement of a formal response, that the response becomes formalised. You get a procedural response. It's empty. Because the civil service is under *such* pressure. Now there's another thing from the CHE that the Minister [responsible for higher education] has to provide a response for. So you quickly put something together and give it to them. You know, try and keep this thing at your door for as long as possible. That would be the general instinct of the civil service. And so I think that if the Minister is not allowed discretion on how to deal with this piece of advice, you will be guaranteed to get, in many instances, a bureaucratic response, whereas if the Minister has the

prerogative to decide how to deal with this, then it's up to the Minister whether you get a meaningful response or not. And if you've got good Ministers you will; if you've got bad Ministers you won't. But even if you enshrine in your legislation that you must get a response, if you've got a bad Minister you'll get a bureaucratic response or none at all. Those are the options. So if I was pushed I would not want to over-legislate this. What I would want to be clear about is how to structure the independence and clarify the roles [between the Minister, DST and NACI]. That I would be clear about. Not how they must *procedurally* interact with each other, but their roles in terms of producing meaningful content. (Key informant)

Finally, a former NACI Chair, who had pushed for regular feedback from the Minister and/or the DST, described resistance to this idea as well as the fact that the implementation of an annual survey of DST officials (such as the one discussed in section 7.2 above) was not popular with the Department:

I had regular discussions on that with a variety of Ministers over the years, suggesting exactly the same thing [i.e. the CHE model]. I guess for obvious reasons that was advice they were never too keen to adopt. So what I did instead was I adopted – as a NACI performance measure – the implementation of NACI advice, and we would do an annual survey with the Department, and we would give them all of the recommendations that were made in that year and would say to them: please would you tell us which of these have been implemented? It wasn't very popular with the Department because we would then feed that back to the Minister and the Minister would turn around and say: I agreed to this, why hasn't it happened? … When we would send [the survey] to DST there would be a flurry of activity, because it would be a subject of discussion between myself and [the DG], and there would be a flurry of activity in the Department to try and either implement very quickly or to explain why not, which was exactly what we wanted to achieve. Look, it was not a perfect process. I wanted it as a regular performance indicator, it was in the annual performance plan, I think we put it into one of the annual reports, we would feed back to the Portfolio Committee on it, but it was never institutionalised which is what I wanted. (Key informant)

7.5   Political and policy culture and realities

The conceptual framework for this study points to the importance of taking the political and policy culture within which the advisory body operates into account in the nature and extent of the uptake and influence of the advice on the policy-making process. I explored these various dimensions with key informants in the interviews. As such, I asked questions about the culture of policy-making in the Ministry of S&T and the DST, with a specific focus on understanding how inputs (such as consultation and evidence/advice) are incorporated. Digging deeper into how and why (or why not) the Minister and the DST utilise NACI's advice, key informants provided valuable insights into the realities of policy-making and the complexities of the policy sphere and the workings of government, shedding light on how these may pertain to NACI's advisory role.

To begin with, it seems that in line with the general orientation in government towards consultative policy-making (i.e. involving participation by other relevant government departments/bodies and external stakeholders), the Minister and DST do adopt a consultative approach – although, as the following key informant noted, it is not always that effective:

> In general, there's a practice of consultation. There is an understanding that there is a need to consult. Sometimes perhaps the net isn't cast broad enough, but there's always a net cast. Sometimes the way the net is cast is inefficient or ineffective; people don't really understand what the other parties are saying. Sometimes they don't want to hear what the other parties are saying, but at least they go through the motions. I think that in general the extent of consultation is commensurate to the level at which the document is being drafted. (Key informant)

One key informant gave as an example the development of the 1996 White Paper on S&T and its preceding Green Paper: 'There was extensive consultation with government departments. Written and verbal extensive consultation. It doesn't mean you always get useful feedback. It doesn't mean you get feedback at all.' Another key informant suggested that the Department had been much more consultative in the early years:

> So you've got the IDRC process, the ANC process, the mass democratic movement, participation in the Green Paper process, participation in the White Paper, and basically after that the main participation was through the [National Research and Technology Foresight Project] which was a very important activity over its effectively four years' existence. From that point on, participation largely dies around DST. So the [R&D Strategy] is engineered entirely behind closed doors, and the same is true of the Ten-Year Plan. Whether the subsequent plans to implement were more consultative – I think it probably is true, but the very strong sense in the community of practice was: they do their own thing. And one could almost understand that. Here's a new Department, DST, in 2002 and it wants to make its mark, so it's going to demonstrate its professionalism by driving the whole thing. But the consequence is that you leave people behind. That was very much the case with the Foresight. The Foresight died – literally the day it was presented to President Mbeki – the Foresight died. (Key informant)

When asked whether he would attribute this development to the broader culture within government or the ruling party, as opposed to individual actors within the Department, the respondent replied: 'The clever answer is a bit of both, but within the Department are very powerful figures, strongly-minded with their own interest group around them. … people individually with very strong views and strong personalities, forceful. And basically this is how it's done – top-down.' This idea that there was a tendency in the Ministry/Department to resist intervention from other government bodies and agencies was raised by other sources. For instance, a key informant noted: 'There was really great apprehension in the old DACST when it came into being, for any opposition and for any instruments or bodies or advices that might interfere with their relationship with the Minister [as well as a] sensitivity to the inputs by statutory councils.' More broadly speaking, Gevers et al. (2002: 9) characterised the new government as keeping a 'tight rein' on all its new institutions:

> Because of the extensive acceptance of the contents of the [1996] White Paper on Science and Technology throughout the NSI, expectations concerning the new institutions [the Ministry, NRF,

> Innovation Fund, NACI etc.] were high. There was a fear in some quarters, nevertheless that these various institutions could pull in different directions and this was associated with approaches aimed at maintaining a tight rein on all of them.

With regard to the extent to which the Minister and the DST engage in EBP, there is certainly evidence of commitment at the level of rhetoric, as highlighted by remarks by previous Ministers of S&T at various events. For instance, in his opening address at the 'Double Symposium on Evidence-Based Advice' hosted by the Academy of Science of South Africa (ASSAf) in 2006, then Minister Mosibudi Mangena made the following remarks about the importance of evidence-based information in relation to science policy, noting too the challenges associated with its implementation:[123]

> Science and technology has much to offer towards the development of South Africa and the continent. All of us are called upon to contribute to the realisation of this promise through whatever means possible. The significance and contribution of evidence-based information in the policy-making discourse is not difficult to understand. However, given the complex relationship between research and policy, the culture of academia and the funding practices of commissioners of research, the current ethos of evidence-informed public policy poses many technical, methodological and epistemological challenges.

Similarly, former Minister Naledi Pandor, in her speech at the Africa Evidence Network conference in Pretoria in 2016, stated that 'evidence-based advice is important to sustaining science-based development in Africa', making reference to challenges in the realms of public health, research and innovation, and economic and social development.[124] The first mention of 'evidence-based advice for government' in the DST's annual reports is in the 2005/06 edition. Interestingly, such mention is made specifically with regard to ASSAf (rather than NACI) – in particular, in relation to ASSAf receiving funding from the US National Academies 'for building its capacity to generate evidence-based advice for the government and the nation' (DST, 2006b: 82).

But what about in practice? Key informants had quite a lot to say on this matter. The general sense was that while there are those in policy-making circles who support the idea of and would like to embrace EBP, there is little evidence of it in practice. Interviewees pointed to various reasons for the lack of implementation of EBP within the Ministry and DST, including pragmatic constraints such as the associated financial costs and the requisite skills and expertise, and the fact that it is not really integrated into the systems and procedures of DST. These issues are highlighted in the quotations below.

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[123] Opening address: http://www.gov.za/st/mmangenaevidencebasedadvicesymposium, accessed May 2015.
[124] South African government website: http://www.gov.za/speeches/minister-naledi-pandor-africa-evidence-network-conference-2016-20-sep-2016-0000, accessed February 2017.

I think [EBP] is very expensive to do and we don't have the expertise. Such expertise is hard to come by. So the capacity to manage such a process in government I think is pretty limited. I think a number of factors come together and we just don't have it. What we have is very crude systemic-type measures [e.g. exports, trade balance of payments, scientific publications]. I think they're important but a lot of people disagree over those measures themselves. So at an individual policy level, or if you ask me: is government getting bang for its buck when it spends money in the CSIR? Well, I don't think anyone will be able to answer that question with any evidence-based knowledge. (Key informant)

I think, historically, this was probably a poorly developed field, a poorly developed practice, even in the DST. That does not mean that there might not have been individuals who consciously or unconsciously in fact mined evidence and knowledge in order to inform policy. So I suppose that did happen in the Department, but I don't think the Department had a well-established systemic, methodological approach that systematised the concept of evidence-based policy-making. I think that is changing. I think there are more and more people who understand the imperative and understand the potential. (Key informant)

It has been largely rhetorical. I think people think it's a good idea, it should be done. The only mechanism that was genuinely proposed and implemented were some kind of reviews of the science councils, the OECD coming to look at the system as a whole. But if you ask at the programme level, the DST at the programme level, it is generally monitoring and evaluation programmes. But other than that, up until this point, almost nothing. … I think that the external reviews of the science councils, which only have been important in the sense that they do help to set direction – but that's essentially done by a team of white men, going around the projects, talking and thinking and coming up with suggestions about how things might be done differently or whatever. … Take the R&D incentive, for example, someone is supposed to have gone and done an evaluation of that, gone and seen how does it work. … I don't think evidence-based policy-making happens and certainly not at the NACI level. When I sat on NACI – and I was on NACI for a number of years – I haven't seen any evidence of it. (Key informant)

According to a key informant, one of the reasons why EBP remains at the level of rhetoric is because it is difficult to generate evidence on the NSI since it is a complex arena and there is not always consensus on what the indicators or measures should be:

Firstly, I think it is enormously difficult. Evidence in this area I think is hard. It's much harder than in most other areas. You've got various performance indicators and you say: what are the output measures and the impact measures? This is enormously difficult, everywhere. So in South Africa and in other countries there isn't a lot of evidence-based stuff because it is very difficult. The most difficult thing that you've got … is the impact that [policy] has on businesses and on competitiveness and exports and so on. The problem that you've got is that everything we do, the amounts of money committed are so small, that there's nothing sensitive enough that allows you to measure that impact, in my view. One is then thwarted by the complexity of it. Not just because there are so many factors which could influence, which is a big part of it, but also because what we've got is very little bits of money here and there impacting. The changes are very marginal and so it's very difficult. (Key informant)

A key informant pointed to the relationship between the lack of expertise in the DST (and other government departments in general) with regard to medium- and long-term planning and the use of evidence, and suggested that as a result the DST is more likely to use evidence to justify short-term policy decisions.

I think that by and large it would be true to say that the evidence is used more to justify what the Department is already doing and has been doing than to inform the medium- to long-term future. I

think it does sometimes inform the short-term future, but the medium- to long-term future is probably more happenstance because I think that, by and large, government departments, including the DST, really fail, or really struggle with medium- to long-term planning. I'm talking about five- to fifteen-year planning, because government administrations only last five years. Government budgets used to be fairly well-defined over three-year periods and nowadays are really only well-defined over one-year periods – and even the risk in that is increasing. So I think that the general conditions for medium- to long-term planning are not well understood in government, or well-controlled, and I suspect that is as true of the DST as it is of all other government departments. It's perhaps in the DST a little less true because science by its nature has a long lead time, and I think that's understood, sometimes with resentment, but it's understood by most people – both in the Department and outside of the Department. So, from that point of view, the Department generally I think is assumed to be thinking in longer-term periods than other government departments are, but I think in practice there are still the same kinds of difficulties that there are in other government departments. (Key informant)

Another informant argued that the absence of an EBP approach in the Department is apparent to the extent that it does not use its own evidence: 'It's all very well to say – and I'll take a case from the DST – that we've introduced an indicator-based strategy or an indicator-based Ten-Year Plan. That is there in writing. But later on when it comes to looking back you completely ignore your own indicators and targets. They don't enter into your current thinking at all.'

Key informants described various aspects of the ethos and culture within the Department which they regarded as constraining factors on the use and influence of NACI and its advice. One of these is that the DST is not a unified or homogenous entity and so it is misleading to conceive of NACI's advice 'landing' in a cohesive environment. In other words, internal dynamics could inhibit the uptake of NACI's advice. For instance, a key informant observed: 'One sometimes gets the impression that there is – and I think that applies to all organisations – a competition between directorates in the Department.' On this topic, and in relation to the *Advanced Manufacturing Technology Strategy* which had been one of NACI's outputs, a key informant described how different directorates within the Department could work in separate silos on related issues:

At the time that the AMTS was launched, the DTI, the Department of Minerals and Energy and a few other departments were also engaged in advanced manufacturing initiatives. When the AMTS was being reviewed a few years later, while it was still an active – if relatively unsuccessful – programme, DST, the owner of AMTS, launched a couple of other projects in the manufacturing sector, but with the emphasis on technology and the inputs of science. So even within one department there is sometimes an uncomfortable overlap, if not duplication, between directorates. (Key informant)

The quote above also points to the involvement of other government departments and I return to this issue below.

DST officials could reportedly also be quite defensive if they regarded NACI's advice as being critical of them. A key informant gave the following example:

NACI launched a project evaluating the implementation of the White Paper. I thought it was a very good evaluation of the implementation. I can distinctly remember the day when we presented the report to the senior officials of DACST that there was one finding that read something like: it would be necessary to kind of rationalise the formulation of new policies, the development of new policies, since there were not enough human resources to implement all the policies or operationalise the policies. So I can still remember how the Deputy Director General and the Director General kind of flew up: you say we haven't got the skills to do it! While the message was: there are not enough hands; not: you guys can't do it. In that sense there was a tremendous shortage in the Department itself. (Key informant)

Talking in more general terms, an informant said that the ethos of a government department would determine to some extent whether it responded defensively to advice:

Any department would see [advice] as a valuable contribution depending on the way that department is managed. If that department is managed essentially along defensive lines, potentially every piece of advice is going to be viewed defensively: this is going to interfere with my departmental decision-making authority. So whether the ethos in the department allows that information, that input, to be interrogated in an open manner or not is a key determinant. (Key informant)

He went on to make the point that to a large extent engagement with and uptake of advice depends on individuals and their particular orientations, and that it is not something that can easily be institutionalised:

So again you'll have a situation where some of them would be open to such stuff and others would not. Those who are open to it are already doing it. There are people in Environmental Affairs who are utilising institutes under the DST – the South African Institute for Aquatic Biodiversity, for example, is utilised by people in Fisheries; the South African Earth Observation Networks is used by people in Environmental Affairs – both involved in Southern Ocean and Antarctic work as well as people involved in terrestrial land management issues. So there are individual officials who already see the merit and purpose of this in various government departments and that utilise these institutions. But that doesn't mean it is an institutionalised practice. It's still dependent entirely on particular government individuals. Now maybe that's the best you can ever hope for because the more you institutionalise it, the more you bureaucratise it. So maybe you need to look at how better to influence that. (Key informant)

Another informant pointed to the power relations between senior DST officials and NACI:

In your dealings with them you should never underestimate the real or self-perceived importance of a senior government official. I have seen it in DACST and subsequently DST that you would have a guest from overseas and make an appointment with your CEO/DG, and you sit in the reception room and the secretary just comes in and says: the Minister is on the line, and you would sit or you would go and have coffee. The importance and the power of the hierarchy is hugely potent, at least in this government department [the DST]. Colleagues of mine from the States, UK, Holland and Belgium have, with unpleasant expressions on their faces, repeated that kind of experience (and you could say its subjective): they are civil servants. But in practice it doesn't work that way. … And I think that it is important – that power. They can say 'yay' or 'nay' and if you want to get money from the surplus in February, then you better have maintained good relations with them. (Key informant)

I asked key informants to reflect on the notions of use in the empirical literature including instrumental, conceptual, political, strategic and symbolic (see Chapter 2) and how the utilisation of NACI's advice by the Minister and/or DST might be described in this respect. Given NACI's general

'invisibility' in the system and the lack of feedback from the Minister/DST on NACI's advice (highlighted in section 7.4 above), informants were hard-pressed to talk to this issue in terms of specifics. One informant did express the view that the way in which the Minister/DST employ evidence in policy-making can be about ideological or political point-scoring:

> Where we have had very strong evidence this has often been misinterpreted and the misinterpretation has then grown its own legs and it keeps getting recycled within the system. So even when you've got apparently hard evidence in the form of official statistics, it's handled badly or its deliberately mismanaged to score ideological points. (Key informant)

This respondent clarified 'misinterpretation' as a mixture of a lack of understanding and purposeful misinterpretation for political reasons:

> I will give you two examples. The one is what they called 'frozen demographics' and that starts with the work of CREST at Stellenbosch which looks at the restricted set of academics, and because of the power of the database you are able to look at the age profile by discipline and publication output over time. And from that comes a story about aging white males, and so on. But when you actually look at the parallel evidence from the R&D survey for the system as a whole, the first story does not hold water. But the first story gains currency and, instead of it being a statement about academia, it becomes a statement about the entire system. So it now gets used for its own political point-scoring [in that] it adds fuel to the fire of employment equity. The second example is the time series for business expenditure on R&D which from the time that [the project] started at [the HSRC] goes up quite nicely and then it begins to accelerate and we point out to DST: be careful; the steep rise is because of state investment in the pebble bed reactor. If that for any reason levels off or falls, this picture is going to change dramatically, which it did. … So you have the time series and it goes up nicely, it falls – and now this is because business is disinvesting. So its point-scoring. It is fundamentally incorrect and that particular explanation has been ignored year-on-year by both NACI and DST. (Key informant)

However, another spoke to the question in a way that pointed to what might be regarded as a naivety in these conceptions of use because they do not do justice to the realities of policy-making:

> It reduces the complexity of a multi-dimensional system to a binary one. It's not really like that. In the implementation of any system there are always practicalities. Sometimes those practicalities can be overcome in a way that the system can be enhanced. Sometimes those practicalities prove to be an ongoing constraint on the system, and you can't do better than try and manage them from time to time. So even if you set up a really independent NACI, and you have a Minister who is really interested in the advice from NACI, and you have a DG who is really interested in hearing what NACI and the Minister have to say about something, you'll still have the practicalities of: well, how do I actually accommodate this? So unless you have a government system that has enough breathing space to try new things, to bring in new things, and enough guts to close down old things, unless you have a government system that is that flexible, you will always be stuck with trying to manage something at the risk of looking sceptical about it. (Key informant)

The complexity of the environment into which NACI and its advice enter was highlighted by various informants, including various practical and political considerations. The following quotes reflect these observations:

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The Minister might ask for a view, right, and very often what the Minister needs to do is take into account the scientific facts, but also the economic issues, the political climate, the national views and all of that before the Minister makes a decision. So that's one of the reasons why the Minister can do whatever he or she likes with the advice. He or she doesn't have to follow all of it. (Key informant)

There is a real resource constraint – the civil service in South Africa is an incredibly pressurised environment. They don't have space for anything coming in from the outside that they aren't already dealing with. So within this environment, the natural instinct is to regard everything that's not coming directly from the Minister as just a side line; something that I simply cannot deal with right now. I can see there's merit in it and it's really great, but I've got this report to do, I've got that Parliamentary briefing to attend, I've got this submission to make to the Minister, I've got this funding that I've got to transfer. There are real practical constraints to making that interaction more regular. (Key informant)

It's idealistic to think of evidence-based policy as something that is going to be uninfluenced by any other factors. The world doesn't work like that. A body like NACI must do its job and get the evidence and, based on the evidence, make recommendations and provide advice to government. The job of government is to look at the evidence and the advice but to think of a number of other factors. So you've got to think: is this economically viable? Do we have the infrastructure? If we don't, can we afford the infrastructure? So even if you take out the political angle there are a number of other factors that have to be brought to bear on the matter: how important is this to the country? Is this a sector we want to grow or is it a sector we don't mind seeing diminish or decline? So all of those kinds of considerations have to be brought to bear on what actually happens. But that doesn't mean it's *not* evidence-based. So you've got to see evidence as an important input, but it cannot be the only perspective. … Now utilisation might sometimes mean the advice is not accepted. But there are rational reasons. You know, if you get a recommendation that says: the evidence suggests we should do X, but X is going to cost us R50 billion, but the need in the country at this point is such that it's for something else; we can't allocate R50 billion to whatever that's going to be; you know, therefore. So it's not wasted advice; it's still important but sometimes it can't be implemented. (Key informant)

Elaborating on this topic, a former NACI Chair noted that as NACI came to understand these dynamics and complexities better, it had attempted to adapt its approach to advice formulation accordingly:

NACI is just one vehicle and it is an advisory vehicle. DST, on the one hand, has to deal with its own internal politics and agendas, and a whole bunch of personalities and strong personalities and a whole bunch of very strong stakeholders. The heads of science councils are generally senior influential people who have got quite a say in these things but even then they don't always get what they want. Then you have the broader political picture and the role of the DST and the bigger government structures – and remember you had Mosibudi Mangena as a Minister from a minority party and then Ngubane, at the beginning and [Inkatha Freedom Party] – so they didn't necessarily have the political clout although they still ran pretty effective ships. They were always blessed with very good DGs. So you have that macro political space and then the relationship between all the other ministries. There are so many factors that come into play and I think the role that NACI can play is obviously to make its case. If NACI feels very strongly about something and believes that something is fundamentally wrong, well then what NACI has to do is get stubborn and carry on chipping away at it until something happens. But otherwise you have to be pragmatic and understand that there is a diversity of views, and that it's the role of the Department to take those different viewpoints and to come up with something that is going to work for them. … So you can take a theoretical approach to national systems and innovations and you can look at all the good words and the White Paper that talks about a South African incorporated approach and we are all working together as one team. But the political reality is very different and you have to recognise that, you can't just carry on saying: well, the White Paper says this and it therefore has to apply. It doesn't work like that. We would always have those discussions at NACI and I would always come back to it and say: yes but let's actually give the Minister advice that is quite within his or her domain to implement. So we stopped then giving this wide, overarching, South African view advice

that you didn't have a hope in hell of actually getting implemented. Instead, we'd give very pragmatic, down-to-earth advice that was within the domain of the Minister to implement. If it wasn't in the domain of the Minister to implement, we would point that out to the Minister and say: look, this is the advice; we know that it is outside of your department but we suggest that you engage with the Minister of Health or Minister of Education or whatever, in getting this advice implemented. (Key informant)

Putting things into perspective, a key informant argued that there are much more powerful forces than NACI that influence policy, namely budgetary control, political patronage and legislation:

NACI has no ability to influence anything. In the public service, there are three ways in which you can exert authority. The first is through budgetary control. If you control the budget of somebody or determine the budget of somebody, you can influence what they do. The second is through political patronage. I'll give you a concrete example here. There was a period of about two years under President Mbeki when ICT was the new game in town, and any department that had authority over anything related to ICT immediately had significant political authority by virtue of the fact that they were doing something in ICT, which was enjoying political patronage from the President. Two years after that, President Mbeki became more involved in HIV/AIDS issues and ICT fell by the way. There was a presidential commission for ICT, all kinds of structures set up, and it was all through political patronage. It was all a way of exercising political patronage. As soon as the political patron's interests moved on, that entire system crumbled. But, while it's in place, political patronage provides you a lot of leverage. The third source of authority – and this is the most enduring one, well it's the most likely one because budgetary authority will always vest with the Treasury and the Minister of Finance. There are processes around there that mitigate it but a large proportion of the budgetary process is technical and not political, and that's because there are so many things that have to be funded which you can't close down. If you close them down you would have a calamity which you can't even begin to conceptualise or quantify. So even if you wanted to reduce the defence force's expenditure by 40% over a period of three years, you don't know what the consequences of that would be, so you'd better not even go there. So the third force is legislative authority or legislative responsibility. You can put it either way. So if there's an Act that says this institution is responsible for doing this and everybody else is responsible for responding to that, that is the most enduring thing. (Key informant)

This complexity extends to the fact that STI policy is cross-cutting in nature insofar as it reaches beyond the purview of the Minister of S&T to various other government departments. As a key informant remarked, the science system is 'nebulous'. As has already been established, NACI is mandated to provide advice to the Minister of S&T who, in turn, can share and engage with other ministers and departments regarding that advice where he or she deems necessary. However, as key informants pointed out, this does not always work in practice and has created obstacles to the potential value and influence of NACI's advice. One respondent highlighted the advice on the mobility of research workers, which would have required the involvement of the Department of Education, and on the subject of technical skills, the need for work visas or work permits for foreigners would have been an issue to be dealt with by the Department of Home Affairs. However, according to this informant, in neither instance did anything come of this advice (and the research underpinning it) in terms of it being communicated to the relevant departments. Another key informant also described such a scenario in which areas on which NACI might provide advice – in this

case skills for the NSI and R&D tax incentives – need the involvement of multiple government parties and do not come down to the Minister of S&T alone:

> If you look at skills for example, what sort of skills would the country need down the line – and down the line is 10, 20, whatever years – to make sure from an innovation viewpoint it has got the right skills. Now it comes back to that innovation is not just science and engineering, you've also got the social scientists and the rest of it involved. In that case, the science Minister by himself doesn't decide; he's got to convince the Minister of Education and the Portfolio Committee, Parliament and so on and so forth. A lot of other people get involved before something becomes national policy, because it's rare, especially in the Science Department [DST] where it's an issue that involves the science Department only. More often than not it will involve somebody else. I mean, if we look at to what extent should the country have tax credit for R&D, I remember there was such a study at some point. Well, you know, the science Minister can say: we've got to interact with Treasury or whoever makes the tax law because that's a good idea. So the science Minister might have a view, but it's more: people get involved after it's gone to the Minister and not just for the Minister to say if it happens or not. (Key informant)

In fact, in talking about in what ways the DST might find NACI's advice useful, an informant suggested that it would be in its interaction with other government departments. His comments refer back to the earlier discussion about the need for NACI to be perceived as credible by other key stakeholders:

> Where the Department could use [NACI and its advice] beneficially, and probably would, is where it comes to influencing other government departments. So if NACI comes up with something and says the Department of Trade and Industry's innovation instruments need to be re-jigged for this and this reason, then the Department might opportunistically use that information in its engagements with the Department of Trade and Industry. But if NACI is not regarded by *all* of government as an 'all of government' advisor, then the DTI is simply going to pooh-pooh that advice. They're going to say: ja, so? That's interesting, but. So this goes back to: where do you position such an advisory body? (Key informant)

A former NACI Council member reported, however, that even though NACI was mandated to provide advice to the Minister of S&T, the Council had for many years already thought of and geared itself to providing advice to the broader system:

> We [NACI] were very clear from much earlier than 2009 that we were talking to the system as a whole, even though we were the Minister's advisory body but we were talking to the system as a whole. And that is not unusual for similar organisations. Bodies in the -- well, I just know the Finnish situation a little better because DST was so interested in it, so we seemed to know a lot more about Finland than anywhere else. But in that system too, although the official advice was directed towards the politicians or the policy decision-makers, it was never for their eyes only. It was always intended as or understood as advice to the system … I think that the intention with that language was to address the leadership of the system, not exclusively the Minister, because if we addressed the leadership of the system, then perhaps the advice could be taken. (Key informant)

She made specific reference to the 'New Strategic Management Model' approved by Cabinet in 2004 which, among others, resulted in the reorganisation of the reporting lines of some of the science councils away from the DST and to other government departments. She observed that the fact that

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the DST was then responsible for fewer SETIs influenced NACI's increasing mind-set that their advice was also intended for stakeholders and institutions in the system more broadly. She also pointed out that this institutional reorganisation in the system had no impact on NACI's positioning:

> The structure of the NSI changed from one where the DST was responsible for all science-performing institutions. Then it changed and different institutions began reporting to different ministries, and I think that also influenced that change, that you were no longer, you could no longer effectively speak to one minister, because that minister was not responsible for the whole NSI. … One of the major failures was that when this system change happened, nobody pressed the restart button. It just kind of continued as if nothing had happened, but something had happened. But nobody said: you know what, we've reorganised the whole system so now let's understand how the various institutions relate to each other. There was never any public statement of NACI's new orientation to multiple ministries and institutions, which should have happened. Why it didn't happen – to be honest with you, I don't think anybody even thought about it for a minute. (Key informant)

It was beyond the scope of this study to explore the dynamics of the relationship between the Minister of S&T and other government departments. However, key informants did make some observations about how this plays out, particularly in terms of the implications for the reach of NACI's advice. For instance, as was noted in Chapter 5, the first two Ministers of S&T were members of minority political parties. According to a key informant, these Ministers were thus regarded as low-ranking, which might have had consequences for the extent to which they were able to get a hearing with other ministers and departments on S&T-related matters and NACI's advice.[125] A respondent also observed that there can be serious 'antagonism or suspicion' between government departments which can inhibit the movement of NACI's advice beyond the Minister of S&T.

Another element of the cross-cutting nature of STI policy is the coordination and oversight role of the DST which, as highlighted in Chapter 4, has been its function since the inception of the former DACST. However, the continued lack of coordination of the NSI and the role of the DST in this regard has been an ongoing theme in external reviews of the STI landscape (from the 2007 OECD Review to the 2012 and 2017 Ministerial Reviews). A key informant provided greater insight into the nature and extent of the DST's scope for coordination in relation to the many different bodies and actors in the NSI:

> [The DST] sees itself – and if you look at the White Paper that's explicitly how it sees its mandate, is to coordinate science, technology and innovation across the national system. So drawing on science and technology as an input into innovation and ensuring that all different stakeholders do what they're supposed to do. The Department's remit or authority to ensure that is greater in some instances and

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[125] The exception to this highlighted by key informants was the appointment of Naledi Pandor as Minister of S&T, who was both an ANC member and an individual of high status. As a key informant remarked, 'Pandor is acknowledged as an important person and I think she has got credentials in her ancestry also in this particular field.'

it's very remote in others. It's direct in response to the NRF, the CSIR, the HSRC, [South African National Space Agency, Technology Innovation Agency] – its entities, it's direct in that sense. It's fairly direct in terms of how it directs the research funding through the NRF. But it is very indirect in how it influences the [Industrial Development Corporation] or various other innovation or commercialisation entities and platforms and grants and funds in the DTI. It can only do that by persuasion, by liaison. It can't direct those departments. Or in environmental affairs. There it can only build networks, provide examples to those other government departments of how their policy-making can be improved by drawing on the knowledge resources of the country. (Key informant)

The idea of interest here is the implications this has had for the reach and influence of NACI's advice. This was highlighted in the 2012 Review which noted that a significant effect of the New Strategic Management Model implemented in 2004 was that it had constrained the DST in its coordination role (Ministerial Review Committee, 2012: 15):

> The New Strategic Management Model … emphasised a cross-cutting role for the DST in setting common governance standards and quality assurance mechanisms in place for each SETI. In the case of sector-specific science councils, the function of the DST would be to develop interventions in the case of market failure, under-subscription or where there were technology gaps of a strategic nature. The NSMM provided for sector-specific research agencies to remain in the domain of their respective line departments … The DST, largely as a result of the NSMM … has not been in a position to create a coherent, truly systemic policy framework to promote and coordinate the NSI, and has been obliged instead to throw its energies into activities that it seems to have undertaken in the manner of a 'line department', rather than as a system-wide facilitator.

Importantly, the Review observed that NACI had effectively been 'constrained to "advise" only in the same limited NSI domains in which the DST can operate' (ibid.). The constraints on the DST in terms of its position vis-à-vis other government departments, agencies, SETIs and HEIs was demonstrated in Chapter 6 (section 6.5.2) in relation to the draft (2006) and final (2009) versions of the gender and SET policy and M&E framework developed by NACI's SET4W committee as a major advisory output. In that I analysis I highlighted some subtle but possibly important shifts between the two documents, including a change from a prescriptive voice to the language of guidelines or proposals, and from responsibilities assigned to the DST to other institutions. I interpreted this as talking to the point that the DST does not have control over what institutions do, which in turn limits the potential reach of NACI's advice, and the discussion here seems to support this notion.

7.6   Conclusion

This chapter has explored various factors which have come into play with respect to NACI's real or potential influence on STI policy-making. Internally, NACI has experienced ongoing challenges relating to its capacity to carry out its mandate effectively, with a high staff turnover in the Secretariat, contract rather than permanent positions, vacancies not being filled for periods of time,

and a general lack of expertise and skill-sets in terms of policy analysis and knowledge of the system. There has also been something of a leadership vacuum with the post of Head of Secretariat and the CEO (post-2011) standing vacant for a number of years. It appears that the NACI Chairs, to different degrees, stepped in to address these problems but there was only so much they could achieve given their commitments to their own organisations.

The strength of NACI's evidence-based approach to advice formulation is also its weakness insofar as the timing of its advice provision can be out of step with the policy-making process or simply take too long to generate. This is a common problem experienced by advisory bodies of this kind, as highlighted in Chapter 2. The institutional set up of the Council only meeting on a quarterly basis to discuss and finalise advice also contributes to the problem. In addition, NACI's advice formulation process was slowed down by its dependence on the DST's bureaucratic administrative procedures and, reportedly, by the fact that the Department did not communicate in a timely fashion about which matters were on its agenda. Furthermore, based on a small survey of DST officials, there appears to be a perception in the Department that NACI's advice outputs were often not regarded as particularly useful, either because they were too superficial and academically-orientated and therefore could not practically be implemented, or because they were not directly relevant to the Department's work. Questions have also been raised about the extent to which NACI added value to the information and evidence it gathered.

These kinds of problems fed into a general concern about NACI's lack of effectiveness and credibility as an advisory body. However, there are much more fundamental issues in this regard. Key among these were NACI's real and perceived lack of independence from the DST. This concern was rooted in the fact of NACI's location in the Department – particularly in terms of the DST's control over NACI's budget (giving it some measure of control over NACI's work) and the role of the DG as the CEO of NACI (up until 2011). This positioning had a number of effects. One of these was the potential for interference by the Department in NACI's advice agenda and formulation and in the interaction between NACI and the Minister. In this regard, there were reports of a kind of 'circularity' since while the DST was supposed to be the *recipient* of NACI's advice via the Minister, it was – via the DG – also involved in generating that advice and acted as a conduit of the advice to the Minister. Another effect was a blurring of and confusion over the roles of the CEO and Head of Secretariat and between NACI and the DST in general. As noted in Chapter 5, the S&T Laws Amendment Act of 2011 did amend the NACI Act such that the CEO of NACI be appointed from among external candidates, but it made no changes to the line of reporting. Furthermore, since following this amendment the

CEOs of NACI continued to report to the DST and were all in 'acting' positions, the relationship between NACI and the DST in this regard did not change substantively. Over the years, other recommendations and attempts were made to address NACI's independence from the DST (e.g. in terms of control over its budget) but these never materialised. The result is a general perception that NACI was and remains an extension and handmaiden of the Department and unable to provide advice free from political interference.

Key informants stressed the importance of NACI's independence for two reasons. Firstly, it was observed that other advisory sources, such as the DST and the Minister's advisors, are clearly not independent brokers of advice. Other agencies which also provide advice, such as the science councils, equally have vested interests as both beneficiaries and implementers of national STI policy. Thus, NACI remains – at least in theory – as the best positioned as a source of independent, non-partisan advice. However, this idea is inherently problematic because it assumes that Council members are in fact disinterested parties. This is perhaps best illustrated by the term of the fourth Council whose membership contained the CEOs of major science councils and vice-chancellors of universities. The second reason for the importance of NACI's independence was to put it in a position of sufficient distance to be able to critique the DST's policies, plans and programmes as well as its effectiveness in implementation. At the same time, there was the recognition that there is a need to balance NACI's independence – particularly in terms of the formulation of its advice agenda – with cooperation and alignment with the Minister and DST.

NACI's lack of independence fuelled general perceptions of its lack of credibility on the part of key stakeholders both within and outside of government. Given that NACI is mandated to provide advice to the Minister of S&T, the question might be posed as to why NACI's credibility in the eyes of others is important? One answer is that NACI requires the input of other roleplayers in the system in the formulation of advice. It depends on these expert inputs whether it be through inclusion in advisory committees or via general consultation practices. If external stakeholders do not regard NACI as a credible body with some level of influence over policy-making, they are less likely to make themselves available. Another response to this question has to do with the role of other government departments to whom NACI's advice is relevant. Should the Minister of S&T or the DST attempt to convey this advice or use it as a point of persuasion with its sister departments, the perceived lack of credibility of the advice makes it easier and more likely for other departments to not take the advice seriously. Perhaps ironically, this in turn can reflect negatively on the Minister.

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Aside from the independence issue, NACI's lack of credibility has been linked to its low profile and its general invisibility in the system. People simply do not know what NACI does, what its role is or what its outputs are. Over the years NACI has made various attempts at increasing its visibility and profile, including the introduction of a NACI newsletter and the NACI Innovation Awards (which were soon scrapped), putting its strategic plans in the public domain for scrutiny (which for the most part it has done), widening the composition of the Council membership to make it more representative of stakeholders in the NSI, and intentions to publish the research outputs as a resource for external stakeholders (although, as highlighted, only a very small proportion of these is actually available). However, it seems that none of these efforts have had a major positive impact on NACI's perceived role and influence in the system.

NACI's low profile and lack of credibility have been exacerbated by the lack of transparency – especially with regard to its advice outputs and the research underpinning it. Even if we concede that it might only be appropriate to release advice outputs once the Minister has had an opportunity to reflect on such advice, the fact is that for the most part they are not available in the public domain. This means that outsiders, including those in other government departments, cannot scrutinise the advice or the evidence. As Owens (2011: 75) argues, advice should be transparent so that it can be 'defensible in the public domain.' Neither can others engage in a broader debate about what policy issues should be on the agenda and the recommendations being made about how to address challenges in the system. The lack of feedback from the Minister also means that neither NACI nor external stakeholders can assess the usefulness or impact of NACI's advice. Furthermore, without this feedback, NACI remains in the dark about where it could make adjustments to improve its work and processes. Finally, instead of contributing to the knowledge base on STI, the publicly-funded research that NACI generates is kept behind closed doors and thus cannot be utilised by academics or other stakeholders. Even worse, since NACI/DST effectively 'owns' the research because of intellectual property rights, should they decide not to sanction the release of the research reports, the researchers themselves cannot publish or disseminate their work.

Factors impacting on NACI's real or potential influence were also explored in relation to its intended 'targets' – the Minister of S&T and the DST. One aspect of this was the culture of policy-making and the extent to which it made space for and/or encouraged external inputs. The culture of policy-making was described by key informants as somewhat consultative, perhaps more so in its early years as there was some suggestion that the Department had become quite top-down approach with a tendency to resist inputs or interference by external actors, and to be defensive in the face of

criticism. Formally, the DST is considered to be central to the promotion of EBP across government insofar as it is responsible for the public sector institutions which produce research-based or scientific evidence. However, while it was described as having adopted the discourse of EBP, it appears that this had not really manifested in practice. Reasons highlighted included the lack of financial resources and expertise required, that it is not properly integrated into the DST's procedures, and that it is particularly difficult to implement given the complexity of the NSI. There was also a sense that to the extent that the DST articulates an EBP approach, it does so for symbolic or political reasons. At the same time, the view was expressed that the Department has an enormous range of issues on its plate and operates under various pressures and constraints. Unless they would judge specific inputs to be of immediate relevance or utility, it was unlikely that they would take such advice into account. There are also practical and political issues other than advice or evidence that need to be taken into account. These factors resonate with the broader empirical literature on the relationship between the realities and politics of policy-making and evidence/advice utilisation.

A final and significant factor impacting on NACI's influence had to do with the cross-cutting nature of the STI policy sphere. While NACI is mandated to provide advice to the Minister of S&T only, its advice is of relevance to other government departments and institutions in the system more broadly. Should the Minister not disseminate this advice, it literally goes nowhere. Furthermore, if the Ministers of S&T are low-ranking or there is antagonism or competition between ministries or departments, this also impedes any efforts to disseminate or engage about NACI's advice in other spheres. To the extent that the DST has been hamstrung in its coordination role, this has had implications for NACI insofar as it is mandated to advise on coordination matters but is confined to doing so only in relation to aspects over which the DST has some kind of 'jurisdiction'.

CHAPTER 8: CONCLUSION

8.1   Reflections on 'influence': Dilution amidst complex dynamics

NACI as a statutory advisory body, in terms of its organisational structure and procedures, reflects many of the generic features of similar bodies in other countries. If its annual reports are anything to go by, in its time NACI has produced a substantial number of advice outputs and, in the process, commissioned many research projects. However, while NACI looks good on paper, the evidence presented in this thesis suggests that it has been regarded as largely ineffectual and uninfluential. This was clearly exemplified in the mini case study of NACI's SET4W advisory committee which was considered to be one of the most successful of the advisory initiatives. The committee comprised a range of external experts and NACI Council members; the focus of its work was both aligned with and in response to broader national imperatives and informed by the knowledge and experience of the committee members; and it produced a substantial body of research and advice, in close cooperation with the DST and involving broad consultation with other experts and stakeholders. However, SET4W's major advisory outputs led to very little in terms of uptake in the policy sphere.

Unsurprisingly, elements of NACI's institutional and organisational design have been the focus of critiques over the past 20 years, and have impacted on its real and potential influence in the STI policy domain. Central to these have been its real and perceived lack of independence from the DST which has left many in the system viewing NACI as a mere extension or handmaiden of the Department, and therefore unable to realise its full potential and contribution to strengthening STI policy-making. In this regard, NACI has been on the back foot from the outset. It must be remembered that 1994 was not a run-of-the-mill changing of the guard following an election; it was a fundamental regime change. Wide spaces opened up for the imagining and development of policies and institutions that would reflect the new democratic dispensation, as well as the pressing socio-economic imperatives facing the country. And yet, despite the severe criticisms of the apartheid Science Advisory Council, especially its lack of independence and credibility, despite advice from foreign experts (such as the IDRC), despite warnings from within the mass democratic movement and existing institutions about reproducing what had not worked or was regarded as inappropriate or ineffective, and despite alternative iterations proposed in the Green Paper on S&T, NACI did not take on a new institutional form but instead was in core respects a replica of its dysfunctional predecessor. The historical institutionalist notion of path dependency appears to have

won out in this case. As Thelen (1999: 400) notes, 'some institutional legacies seem to contain the seeds of their own destruction.' Similarly, Lieberman (2002: 702) observes that 'while institutions, policies, or sets of ideas might have arisen in response to particular historical circumstances, they often outlast the conditions that led to their creation and may persist despite being dysfunctional.' This certainly seems to have been the case with NACI insofar as it appears to have experienced a crisis of legitimacy and credibility since its inception.

Ostensibly, NACI's advisory process starts in a substantial space – with a formal mandate enshrined in legislation; a Council membership with considerable collective knowledge, expertise and experience; a Secretariat and various advisory structures to support the work of the Council; an advice agenda that is developed in consultation with the Minister of S&T; and an advice formulation process that in many cases is underpinned by information, data and research evidence and informed by consultation with external stakeholders. So what has gone wrong and how? It is easy to list sets of factors that have come into play, but how might we conceptualise how these have worked together to produce a particular outcome? My observation is that there have been ever-increasing degrees of 'dilution' in the production and movement of NACI's work, leaving the potential for its influence progressively weakened, and I discuss these below.

Firstly, NACI's ability to produce quality advice has been diluted by key aspects of its institutional design and organisational capacity. The Secretariat has almost continually been understaffed, with personnel on contract-based as opposed to permanent posts and a high turnover resulting in a loss of knowledge, experience, institutional memory and continuity. There have also been difficulties in finding staff with the requisite skills and expertise and a lack of staff development and capacity-building. NACI's reliance on the DST's bureaucratic administrative system and its dependence on the Department for its budget have left NACI hamstrung in terms of being able to address staffing issues adequately or make decisions about what research to commission and to whom, and in general has slowed down its own operations. Capacity issues were exacerbated by the post of Head of the Secretariat standing vacant for a number of years. The norms and procedures of NACI's advice formulation have also diluted the potential influence of its advice. NACI's evidence-based approach is its strength but also its Achilles' heel since the time it takes for the evidence to be generated through research slows down the production of advice outputs. Added to this is the fact that in general the Council only meets four times a year in plenary sessions to consider, discuss and finalise advice. The end result is that the advice outputs can be out of step with the policy process. The potential value of NACI's advice is further eroded to the extent that it is (sometimes, at least)

considered to be too academic and/or not sufficiently practical. This could be attributed in part to the Council composition.

A second level of dilution is NACI's general 'invisibility' in the system. While some regard NACI as having been ineffective, others cannot ascertain whether or not it is effective because they do not know what it does or have knowledge of its outputs. Indeed, as an outsider looking in, it has been difficult to 'see' NACI because so much is hidden. Returning to Bal et al.'s (2004: 1340) distinction between procedural and substantive transparency highlighted in the conceptual framework, we can see much of the former since these are reported on in annual reports. This includes how the advisory process is organised in terms of its advisory structures and the focus of its advice agenda. However, there is virtually no substantive transparency in terms of openness around the advice formulation process, such as what evidence was drawn upon or excluded, differences of opinion within the Council, what other factors were taken into account (practical, political), or the underlying assumptions of the advice. Significantly, there is very limited access to the research reports produced and the advice outputs submitted to the Minister. What is available in the public domain is the tip of the iceberg. It has been argued reasonably that the contents of NACI's advice should only be available for public consumption once the Minister has had a chance to digest and work with it. After all, policy deliberations and decision-making take place in a political context. But insofar as STI is not regarded as a particularly politicised or sensitive policy domain, why the secrecy? And is STI not of national interest? The fact that the Minister is not legally required to provide feedback on the use or otherwise of NACI's advice, and reportedly seldom does, adds another layer of invisibility to NACI's work and potentially undermines the value and credibility of NACI in the eyes of other stakeholders. This lack of transparency also amounts to a lack of accountability – for the public funds expended on the running of NACI and for the research it produces, and for the 'will of the people', so to speak, insofar as Council members are drawn from key stakeholder groups and there is consultation in the system in the formulation of advice. Furthermore, the closed nature of the advice formulation process and the lack of access to its outputs effectively excludes others from engaging with the data/evidence and its interpretation, the content of the advice (even if in a tailored-for-wider-consumption format), or what should be on the policy and advice agenda. Arguably, this state of affairs undermines rather than promotes democratic principles and practice. Finally, the lack of access to the research outputs – whether as a result of internal disorganisation within NACI or because they have not been sanctioned for release – is a great loss to the STI knowledge base in the country and as valuable resources for academics and other actors in the system.

The third level of dilution is the near absorption of NACI into the DST. One of the theories about the uptake of advice highlighted in the conceptual framework was that the closer the advisory body is to the government, and the greater the degree of control by government over the advisory body, the greater the chances of the uptake of advice. In the case of NACI this seems to have had the opposite effect. Not only has NACI's proximity to and control by the DST hampered its work in practical terms, it has also brought into question its ability to provide advice that is at arm's length from political interference, critique the DST and produce innovative advice (i.e. advice that is not only tied to DST priorities or perspectives). It has opened up opportunities for the DST to influence NACI's advice agenda and substantive focus, to interfere with NACI's relationship with the Minister, and for the DST to act as a conduit or kind of filter of advice to the Minister rather than as a recipient. All in all it has weakened the potential value of NACI's advice – both substantively and in terms of how it is perceived (and received) by other relevant actors in the system. Another effect of NACI's embeddedness in the DST has been the blurring of boundaries between the two – to the extent that at times they are indistinguishable – which has resulted in confusion over roles and responsibilities and competition between them as providers of advice to the Minister. Not only has this resulted in inefficiencies and duplication of efforts, it has also left NACI with something of an identity crisis – a matter it has grappled with over the years. All of these problems have been exacerbated by what might be considered 'too much leadership' in the form of the DG as CEO and then 'too little leadership' with the externally-appointed CEOs in acting positions since 2012.

A fourth level of dilution is that the NACI Act is vague, and even silent, on some key aspects of NACI's institutional design and arrangements, such as how the advice should be formulated or what form it should take, how the advice should be incorporated into the policy-making process and what route it should take in getting there, whether or how the Minister should be required to respond to the advice, or to what extent its advisory process and outputs should be publicly accessible. Neither are NACI's independence or autonomy mentioned. As a key informant remarked, it might be undesirable to impose too many rules so that different Ministers and NACI Chairs can come to their own workable arrangements. Indeed, too much prescription might make the workings of NACI too inflexible. However, the vagueness of the NACI Act has contributed to the confusion over roles, functions and procedures, and has left NACI vulnerable to the whims of different actors and the vagaries of the policy process. As Chirwa (2014: 30) puts it, it 'creates the possibility for a battle for territory and a passing of the buck between the relevant ministry and council/commission.' This is evident in the problems arising as a result of NACI's embeddedness in the DST. Another example is that the Minister is not required to provide feedback on whether the advice was utilised. Not only

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does this mean that NACI is unable to assess the usefulness or impact of its work and thereupon make the necessary adjustments, but crucially leaves it in a position where its advice can quite easily be bypassed or ignored, with no reason given. As Schulz et al. (2015: 5) note, the requirement that government principals provide feedback on and/or acknowledge or justify the use or non-use of the advice is 'to ensure government does not overlook its advisors.' Boin and Christensen (2008: 276) observe that this lack of clarity is quite typical in the establishment of public sector organisations:

> In the public sector, new organizations generally do not formulate the formal goals found in their charters; these are usually imposed upon them. Formal goals tend to be multiple, complex, vague, symbolic, mutually conflictive, and subject to constant interpretative shifts. Moreover, these goals do not come with a clear set of implementation instructions.

They go on to note that such organisations are faced with having to 'reconcile the goals without causing collateral damage (angry clients, dissatisfied stakeholders, gross inefficiencies, etc.)' and 'invent or adopt a way of working that is both effective and legitimate' (ibid.).

NACI's structure and mode of operating shifted and changed in various ways over the years – formally in response to critiques from external reviews or its parent body, and informally in attempts to improve its operations, increase the uptake of its advice and counter negative perceptions of its value, credibility and legitimacy. In short, it has had to fight to keep a seat at the table. This has been observed in other empirical studies; for instance, Van Damme et al. (2011: 129) have noted that advisory bodies 'have to be able to gain and sustain access to the policy-making process', and Hustedt (2013: 92) that they need to 'interpret the institutional requirements to gain environmental legitimacy and hence acceptance by their institutional environment.' What has become apparent is that NACI has been forced to walk a tightrope between various competing demands, tensions and dynamics which they have had to negotiate, and sometimes renegotiate, and to which they have had to adapt. As such, NACI has been confronted by dilemmas and countervailing tensions such as: Should it be closely aligned and responsive to Departmental imperatives so that chances of its uptake are possibly increased, but in so doing lose its potential for producing innovative advice and its credibility in the eyes of outsiders because it is seen as an extension of the Department? Should it emphasise the collective wisdom and knowledge of its Council in the development of the advice agenda, identifying critical issues that are not being addressed or might be a failure of the DST, but risk having its advice bypassed or ignored because it does not fit with Departmental priorities or perspectives? Should it adjust its mode of operations to meet the immediate needs of the Minister/Department (e.g. quick response advice) and in the process lose its capacity for providing long-term, strategic evidence-based advice? Should it have a more stakeholder-representative

membership to ensure greater relevance and buy-in or should it include more experts who can bring evidence and theory to bear, but at the risk of the advice being too theoretical or impractical?

NACI has made adjustments in terms of, among others, the composition of the Council membership with regard to sectoral representation; the development of guidelines for the advice formulation process; the introduction of different modalities and advisory structures for advice formulation as a way of making it more flexible and responsive to the needs of the Minister; and incorporating feasibility and acceptability considerations into the advice to make it more 'user-friendly'. Individuals such as NACI Chairs have also attempted to use informal routes to try to effect change, negotiating new or different practices and arrangements (e.g. dealing with independence issues by personally negotiating with the DG about boundary arrangements). There is no visible evidence, however, that these changes had any substantive effect on the uptake of NACI's advice or perceptions of its relevance and value in the eyes of other stakeholders. In part this may be explained by Thelen's (1999: 387) historical institutionalist point of view that while 'institutions continue to evolve in response to changing environmental conditions and ongoing political maneuvering' they do so 'in ways that are constrained by past trajectories.' To this I would add that all these efforts have amounted to is 'tweaking' and that without more fundamental change to the broader environment within which NACI operates, such adjustments are likely to be ineffective. I return to this point later. And, Hall and Taylor (1996: 16) warn that in seeking social legitimacy, the changes organisations make can actually result in further dysfunction.

The fifth level of dilution has to do with the nature of the terrain within which NACI's advice 'lands'. Its primary destination is the Minister's desk which, of course, is a political rather than administrative space. As was highlighted in the conceptual framework, there are many and varied influences on policy decision-making and choice and that evidence and advice flow into a complex environment of competing voices, inputs, pressures and demands. This is no different in this case where, in terms of sources of policy advice, the Minister has a large pool of organisations and experts on which to draw, including his/her own and other government departments and agencies, other statutory advisory bodies such as the CHE and ASSAf, science councils and universities, and non-governmental and sectoral stakeholder bodies. Furthermore, in the context of the politics of policy-making, the Minister has to take into account a multitude of other factors such as resource constraints, issues of feasibility and political acceptability, and so on. This inevitable dilution of NACI's influence was exacerbated by the reportedly limited opportunities for NACI to interact with the Minister (as highlighted in the SET4W case) − although this was offset to some extent by

informal interactions through, for example, the NACI Chairs. This means that NACI's potential influence on the Minister's thinking has possibly been limited largely to its formal advisory outputs.

An important part of this terrain has been the DST itself. While it has been beyond the scope of this study to investigate the inner workings of the Ministry and its Department, indications have emerged in the data of internal dysfunctions which have a bearing on their attitude towards and capacity to integrate NACI and its advice. To begin with, as was noted in Chapter 4, the discourse of EBP has been embraced at the central government level (formally manifested in the form of performance M&E) and has been put into practice in some other government departments. The DST is seen to play a key role in the promotion of EBP in government, given its oversight of a large segment of the public sector institutions involved in producing scientific and research-based evidence. However, the Department has reportedly struggled to implement EBP in its own policy processes. Key informants also raised questions about the extent of the DST's openness to external inputs (which would include NACI's advice), describing it as taking a top-down approach to policy-making and sometimes defensive towards critique. We also cannot assume that NACI's advice enters into a smooth-running, rationally-ordered system within the Ministry and Department. Looking at it sympathetically, the DST has been operating under multiple pressures, demands and constraints. It has had a lot on its plate in terms of the challenge of transforming a deeply fragmented, skewed, uncoordinated and under-resourced system. They literally cannot attend to everything that comes their way, including all of NACI's advice. Aside from the bureaucratic hindrances typical of government departments, it appears that there have also been issues with its own internal systems. One of these was reports that NACI's advice does not always get disseminated by the Minister to the relevant directorates in the Department, another of poor communication between the Department and NACI about which policy matters were being considered and when. One can conclude from this that while NACI has been embedded in the DST, it has not been institutionalised in the policy-making process.

Ironically, NACI's lack of legitimacy and credibility can have a negative impact on that of the Minister and Department. The conceptual framework pointed to the need to increase policy legitimacy as one of the rationales underpinning EBP and the establishment of statutory advisory bodies. However, if NACI is not credible, how can it contribute to policy legitimacy? And to the extent that NACI is seen as dysfunctional or ineffective, what does this say about its parent body? I have throughout this study asked myself the question: how has it served the DST all these years to keep the status quo in terms of its relationship to NACI? Or to put it another way: why might the DST be reluctant to give

NACI too much influence in the policy process? One possible explanation is an idea advanced by Marleen Brans, Jan van Damme and colleagues.[126] Like ministerial bureaucracies elsewhere, the Minister and DST operate within a context of countervailing pressures. As was highlighted in the conceptual framework, modern bureaucracies are faced with the dual pressures of the 'professionalisation' or 'expertisation' of policy-making (i.e. the increasing reliance on expert advice, policy analysis and evaluation), and 'interactiveness' (the involvement of stakeholders and intended beneficiaries in the policy process to increase policy support). A third trend or discourse can also be discerned, namely that of 'political primacy'. Political primacy refers to the idea that (ultimately) 'political decisions should be taken independently by the government, by those officially mandated … and are accountable for their decisions' (Brans et al., 2010: 39), and is in response to an 'underlying fear of the "capture" of a policy domain by interest groups' (ibid.: 40). In short, it is about maintaining political control and, according to Brans et al. (ibid.: 39), preventing a body that is not accountable to the public from having too much influence over policy.

Even if it appears that NACI has relatively little influence, the fact is that Council members and even the leadership of the Secretariat do, to some degree, have privileged access to the policy process and important policy-makers and senior Departmental officials. The NACI Act states that Council members (other than those from the DST and DTI) should participate in their personal capacities and not as representatives of their organisations. But is this even possible? At the risk of suggesting that NACI Council members do not have the interests of the public good of STI at heart, it is reasonable to suggest that in practice they cannot be separated from their organisational or sectoral interests, or their own personal beliefs, preferences and motivations. This is perhaps particularly the case where Council members are part of the leadership of science councils, universities and other government agencies as these institutions are both the intended beneficiaries and implementers of STI-related policy. The same could be said of the NACI Chairs who are first and foremost the primary channel of communication and interaction between the Council and the Minister and senior DST officials, and to some extent or another (it would differ between incumbents) the final arbiters of the advice that goes to the Minister. Thus, even where the advice is non-binding (as is the case with NACI) and therefore in principle does not conflict with political primacy, as Brans et al. (ibid.: 203) observe, this tension can compel advisory bodies 'to react and redevelop themselves in forms which are not perceived as threatening the sovereignty of their political institutions.'

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[126] See Brans et al. (2006), Brans et al. (2010) and Van Damme et al. (2011).

A final level of dilution is the result of the mismatch between the legal requirement that NACI provide advice to the Minister of S&T, and the actors and sectors in the system to whom NACI's advice often applies. It is an obvious observation that it is innovation and not S&T that appears in NACI's title. Innovation relates to multiple policy sectors and actors – from the educational institutions that produce the skills required, and the funders and performers of S&T and R&D, to the government bodies responsible for developing policies, strategies and instruments and undertaking M&E, and the state-owned and private sector companies as generators and consumers of innovation. In short, STI-related policy is highly cross-cutting in nature. Those involved in writing the NACI Act were probably cognisant of this but in their wisdom gave the responsibility of disseminating NACI's advice to other relevant government departments to the Minister of S&T, and to do so at his/her prerogative. It emerged in the data that this seldom happens or happens effectively, thereby creating the conditions for NACI's advice to slip out of sight altogether.

To the extent that the various Ministers have not carried out this function might be the result of simple inaction or a lack of foresight on their part. However, it is perhaps more complicated than that since it presupposes a level of capacity within the Ministry/Department and functional, cooperative relationships between ministries across government (which reportedly is not always the case). In addition, as external reviews such as the 2007 OECD Review and the 2012 and 2017 ministerial reviews of the STI landscape have indicated, although improvements have been made, the NSI – and within that, the S&T system – is still far from functioning optimally. One of the ongoing concerns in this regard has been the lack of effective coordination of the policies, strategies and activities relating to STI across government. The task of coordination has been one of the core functions assigned to the DST but it has been criticised consistently for failing to achieve this. The reasons for this are beyond the scope of this study. Nevertheless, it is important because it has had the effect of limiting the extent to which NACI's advice can be disseminated to and taken up by other relevant government departments, and of constraining NACI to advise on matters that are only within the DST's purview.

8.2   New institutional arrangements going forward

This leads us to developments underway at the time of completing this study. In March 2019, the *White Paper on Science, Technology and Innovation* was published (see DST, 2019), which replaces the 1996 White Paper on S&T. The 2019 White Paper recognises the ongoing challenges of a poorly

coordinated NSI in terms of policies and programmes and articulates various policy intentions to address this going forward. Key among these is the establishment of a Ministerial STI Structure to be chaired by the Minister of S&T and comprising the relevant STI-related government departments, chairpersons of the government clusters, National Treasury and the DPME. This new body will be tasked with, among others, 'setting a high-level public agenda for the NSI, approving decadal plans on innovation', and 'reviewing reports on the performance of the NSI over three-year cycles' (ibid.: 25). Annual STI Plenary sessions convened by the Presidency will also be held to ensure that 'STI enjoys the required support and stature across government and society' and will involve representatives from business, government, academia and civil society (ibid.).

Significantly, repeated reference is made in the new White Paper to a 'strengthened' role for NACI in contributing to policy coherence and programme coordination in the NSI. Functions attributed to NACI in this regard include facilitating stakeholder engagement, undertaking expert studies, and playing a key role in M&E including undertaking 'regular environmental scanning to support the agenda-setting function of the Ministerial STI Structure' (ibid.). The White Paper refers to NACI having an 'expanded mandate' and indicates that the NACI Act will be amended to reflect this. It also addresses NACI's capacity constraints, pointing to the intention for NACI to work more closely with 'other sources of technical expertise and data, such as the Centres of Excellence and Research Chairs' (ibid.: 26). In light of past capacity challenges, this is a promising intention and could be quite easily realised through the DST-NRF Centre of Excellence, SciSTIP, which has considerable data and knowledge capacity as well as a long-standing working relationship with NACI.

What the expanded mandate for NACI will look like and in what respects its role and capacity will be strengthened obviously remain to be seen as we await the amendment to the NACI Act. However, I would argue that for NACI to evolve into a more effective body that can make a valuable contribution to policy development, other institutional and systemic issues will also need to be addressed. After all, NACI has always been a product of the system that produced it and the same will be true going forward. Prime among these issues will be whether the problematic relationship between NACI and the DST in terms of independence and discretionary powers is attended to. This will be particularly important since if the intended target of NACI's advice is to a wider range of ministries and government departments, then its credibility and legitimacy will be more crucial than ever.

In this regard, it is worth noting that a few months after the publication of the new White Paper and

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following the general election in May 2019, President Cyril Ramaphosa announced his Cabinet reshuffle. One of the outcomes was the merger of the Ministry of S&T with that of Higher Education and Training into a new Ministry of Higher Education, Science and Technology. Within this are two departments with their own DGs – one for higher education and training, and the other newly-named Department of Science and Innovation (which replaces the DST but currently retains the DG). This new institutional arrangement reflects further intentions to bring about greater coordination within the system. But it means that there are uncertain times ahead for the Department. For instance, in a recent article in *University World News*, vice-chancellors of various universities warned that unless properly managed, the Department of Science and Innovation might be overshadowed by its bigger brother, DHET, which commands more than 10 times the budget vote.[127] Furthermore, any existing dysfunctionalities – internally and in relation to other spheres of government – might simply be exacerbated and, to the extent that NACI remains tied to the Department, will continue to impact on NACI's own functioning. There will also be a need to disentangle and clarify distinctive roles and functions for the two bodies (e.g. as a key informant pointed out, the Department already performs an M&E function so where and how will NACI's M&E role fit in?). And, if government is really serious about NACI as an advisory body it will need to find ways of better institutionalising it within the policy process and the workings of the new Ministerial STI Structure and the Department of Science and Innovation. Will these new developments and intentions bring about the much-needed re-envisioning and reinvigoration of the governance of STI and a role for NACI? With tentative optimism, the remarks of one key informant perhaps sum up the general feeling:

> The history prior to this suggests nothing is going to happen because the coordination story was already there in the NACI Act. And if you don't commit yourselves to making this thing really independent, it's not going to happen. … The track record doesn't give one great hope that this is going to lead to a significant change. It's good that it's there. I'm pleased it's there; we're all pleased it's there. The signal is there. But what's going to happen in the wash? (Key informant)

8.3 Value of the study and areas for further research

This study has confirmed the findings of other empirical studies of the use and influence of advisory bodies and their advice; for example, the importance of the legitimacy and credibility of the advisory body in the eyes of both its principal(s) and external stakeholders, its internal capacity and leadership, the constraints and complexities imposed by the politics of policy-making, and that policy

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[127] 'Academics warn against 'cannibalisation' of science funding.' *University World News,* 21 September 2019. https://www.universityworldnews.com/post.php?story=20190920081251710, accessed September 2019.

advice and advisory bodies have a relatively limited impact on the policy process. The study has added value to these insights in three ways. Firstly, it has highlighted the significance of the nature of the policy domain. Compared to other policy sectors, the STI policy sphere is broad and cross-cutting, involving an array of government departments and agencies responsible for aspects of policy development and implementation in different subsectors, and a landscape of public sector institutions which are both recipients and implementers of policy decisions. The institutional design and location of an advisory body that is to serve such a complex policy environment thus need to be carefully considered. Secondly, and on a related note, the study has demonstrated that the provision of advice and the real and potential influence of an advisory body are intimately tied to systemic institutional arrangements and relationships and the functionality of these. To the extent that key government ministries and departments lack capacity, do not communicate well or even compete with one another, and the system remains uncoordinated, has implications for how effectively the advisory body functions and the degree of its institutionalisation in the policy process. Thirdly, the study has offered a fresh interpretive lens through the metaphor of 'dilution' to demonstrate how institutional design, organisational capacity and the features and dynamics of the broader policy context intersect and impact on the influence of an advisory body. It also moves us away from the somewhat two-dimensional notions of instrumental, conceptual, political, strategic and symbolic use as heuristic devices for understanding influence and more towards a conceptualisation of influence as part of a process, as relational and a form of interaction, as an outcome of other implicit roles it plays or functions it serves, and as the result of the intersection of ideas, interests, structures and ways of doing things. A nascent idea, I believe it is worth further reflection and development.

The study has been able to explore NACI and its policy environment to varying degrees and depths. This opens up spaces for further investigation in order to develop a more complete picture. To begin with, it would be useful to explore the ministerial-bureaucratic context in much greater depth with perhaps a focus on two key dimensions: the nature and culture of its policy-making and how it views and engages with external inputs, evidence and advice; and the constraints and challenges it faces with regard to internal capacity and its relationships with and to other government bodies at national and subsector levels. Our understanding of NACI itself could be deepened. Additional case studies of specific advisory initiatives would enable comparison of the effects and outcomes based on an analysis of how their different contexts (historical, policy subsector), institutional designs (structure, approach to advice formulation), and interaction with the ministerial bureaucracy and other key stakeholders have played a role in the uptake of advice. Similarly, a comparative case study of the CHE would be very illuminating given that it too is a statutory advisory body, although

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there are some key institutional and organisational characteristics that differ, and that it is part of the same political and policy ecosystem as NACI as a component of the NSI, but works primarily in a domain that has clearer boundaries and a different and narrower policy focus.

Something I would have liked to have explored further in this study is what 'roles' or 'functions' NACI plays in the system – aside from advice generation – which may be explicitly agreed upon or the (unintended) consequences and effects of its 'being' and 'doing', and how its influence might play out in these ways. Owens (2011: 79) reminds us that while advisory bodies can act as 'rational analysts, providing information upon which governments can act', they can also function as 'symbols and legitimisers, enabling the powerful to pursue their favoured objectives …'. Brans et al. (2010: 33) observe that advisory processes can contribute to conflict resolution, social learning and the development of mutual trust over time. In this regard, NACI's involvement in coordination has been a subject of some debate. The 1996 White Paper on S&T emphasised that NACI was to play an advisory and not operational role, and rightly so. However, by its very nature NACI is positioned to make a valuable contribution to coordination through what I would call 'soft coordination'. In other words, through its Council members, the members of advisory committees (which include external experts), its interaction with government bodies and officials and engagement with external stakeholders, and bringing in expertise and knowledge from the system through research, it already serves as a mechanism or space for different actors, sectors, perspectives and interests to raise issues, share ideas, and discuss and debate policy issues and solutions. What does influence look like through this lens?

Finally, it goes without saying that a few years down the line some very rich empirical material is going to become available in the form of the policy intentions and institutional arrangements presented by the new White Paper and ministerial portfolio, and particularly how NACI's expanded mandate and strengthened role is manifesting and playing out.

Appendices

Appendix 1: Members of the NACI Council (1999-2018)

1st Council November 1998-March 2004

	Affiliations	Sectors
Chairpersons		
Sibusiso Sibisi (Nov 1998-Dec 2001/Nov 2003-Feb 2004)	Director of Technology: Tellumat; Deputy Vice-Chancellor: Research and Innovation, UCT; President and CEO: CSIR	Business/ Academia/ Science council
Roy Marcus (Apr-Oct 2003)	Executive Director: ADCORP Holdings Ltd; Chairperson: Da Vinci Institute of Technology Management	Business/ Academia
Calie Pistorius (Appointed March 2004)	Vice-Chancellor and Principal: University of Pretoria	Academia
Executive Committee		
Rob Adam (CEO)	Director-General: DACST/DST	Government department
Roy Marcus	President: South African Engineering Association; Executive Director: ADCORP Holdings Ltd	Business
Adi Paterson	Executive Vice-President: Information, CSIR; Branch Manager: Science and Technology, DACST; Chief Operating Officer: DST	Science council/ Government department
Alan Hirsch	Deputy Chief Economist/Head: ICT-Electronics Industry Cluster, DTI; Chief Director: President's Office	Government department/ Presidency
Lucienne Abrahams	Director: LINK Centre, University of the Witwatersrand	Academia
Members		
Lucienne Abrahams	Associate/Director: LINK Centre, University of the Witwatersrand	Academia
Percy Amoils	Opthalmic surgeon, inventor and businessperson	Business
Ahmed Bawa	Deputy Vice-Chancellor: Academic, University of Natal; Programme Officer for Higher Education: Ford Foundation	Academia/ Overseas funding agency
Alan Hirsch	Chief Director: DTI; Policy Coordination and Advisory Services Division, The Presidency	Presidency
David Jacobson	Executive Director: Science and Technology, Altron Group	Business
David Kaplan	Deputy Director: Development Policy Research Unit/Director: Science and Technology Policy Research Unit, UCT; Chief Economist: DTI	Academia/ Government department

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Louis Kriel	Managing Director and CEO: Capespan Ltd; Non-Executive Director: Capespan Holdings; Executive Chair: Vinfruco (Pty) Ltd	Business
Malegapuru Makgoba	President: Medical Research Council; Vice-Chancellor and Principal: University of KwaZulu-Natal	Science council/ Academia
Vincent Maphai	Corporate Affairs Director: South African Breweries	Business
Roy Marcus	President: South African Engineering Association	Business
Bongiwe Njobe	Director-General: Department of Agriculture	Government department
Adi Paterson	Executive Vice-President: Information, CSIR; Chief Operating Officer: DST	Science council/ Government department
Carl Pistorius	Professor and Director: Institute for Technological Innovation, University of Pretoria; Dean: Faculty of Engineering, University of Pretoria	Academia
Mapule Ramashala	Vice-Chancellor and Principal: University of Durban-Westville; Vice-Chancellor and Principal: MEDUNSA	Academia
Friedl Sellschop	Schönland Research Centre, University of the Witwatersrand; Professor Emeritus: University of the Witwatersrand	Academia
John Stewart	Mining Consultant: Chamber of Mines South Africa; Consultant: Mining Industry and Technology Management	Business
Steve Lennon	Executive Director: Resources and Strategy, Eskom	State-owned enterprise
Callie Pistorius	Vice-Chancellor and Principal: University of Pretoria	Academia
Geoff Rothschild	Director: Strategic Projects and Customer Relations, SG Frankel Pollak Securities (Pty) Ltd; Director: Sasfin Frankel Pollak Securities (Pty) Ltd; General Manager: Marketing Department, Anglo Gold	Business
Thero Setiloane	Executive Director: Real Africa Group	Business
Jennifer Thomson	Department of Molecular and Cell Biology, UCT	Academia
Craig Venter	CEO: Altech Group	Business

2nd Council April 2004-February 2009

	Affiliations	**Sectors**
Chairpersons		
Calie Pistorius (Apr 2004-Feb 2008)	Vice-Chancellor and Principal: University of Pretoria	Academia
Steve Lennon (From March 2008)	Managing Director: Corporate Services Division, Eskom	State-owned enterprise
Executive Committee		
Rob Adam (CEO) (Until 28 February 2006)	Director-General: DST	Government department

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Philemon Mjwara (CEO) (From April 2006)	Director-General: DST	Government department
Lucienne Abrahams	Director: LINK Centre, University of the Witwatersrand	Academia
Johannes Potgieter	Chief Director: Innovation and Technology, DTI	Government department
Nombasa Tsengwa	General Manager: Safety, Health and Environment, Kumba Resources	Business
Cheryl de la Rey	CEO: CHE	Statutory body
Nhlanhla Msomi	Executive Director: Africa Vukani	Business
Khungeka Njobe	Group Executive: R&D Outcomes and Strategic Human Capital Development, CSIR	Science council
Members		
Lucienne Abrahams	Director: LINK Centre, University of the Witwatersrand	Academia
Ntuthuko Bhengu	Executive Director: Africa Biopharma Investments; Executive: Provider Networks, Qualsa Healthcare	Business
Cheryl de la Rey	Deputy Vice-Chancellor: UCT	Academia
Alan Hirsch	Chief Director/Deputy Director-General and Deputy Head of the Policy Unit: The Presidency	Presidency
Fairoz Jaffer	CEO: Abnoba Information Dynamics	Business
Steve Lennon	Managing Director: Resources and Strategy, Eskom	State-owned enterprise
John Marriott	Advisor: Sasol Synfuels International	Business
Tshilidzi Marwala	School of Electrical and Information Engineering, University of the Witwatersrand	Academia
Khotso Mokhele	President and CEO/Advisor: NRF	Government funding body
Nhlanhla Msomi	CEO: ECOBIO, Lifelab East Coast Biotechnology Regional Centre; Executive Director: Africa Vukani	Business
Francis Petersen	Head: Strategy and Planning, Anglo American Platinum Corporation Ltd; Dean: Engineering, UCT	Business/ Academia
Geoff Rothschild	Director: Marketing/Director: Government and International Affairs, Johannesburg Stock Exchange	Business
Thero Setiloane	General Manager: Marketing Department, Anglo Gold/AngloGold Ashanti Ltd	Business
Sibusiso Sibisi	President and CEO: CSIR	Science council
Mala Singh	Executive Director: Higher Education Quality Committee, CHE	Statutory body
John Stewart	Consultant: Mining Industry and Technology Management/Technology, Environment, Safety and Sustainable Development, JMS Consulting	Business
Nthoana Tau-Mzamane	President and CEO/Former President and CEO: Agricultural Research Council	Science council
Jennifer Thomson	Department of Molecular and Cell Biology, UCT	Academia
Mala Singh	Acting CEO: CHE	Statutory body
Johannes Potgieter	Chief Director: Innovation and Technology, DTI	Government department
Nombasa Tsengwa	General Manager: Safety, Health and Environment, Exxaro Resources	Business
Lucienne Abrahams	Director: LINK Centre, University of the Witwatersrand	Academia
Lineo Mazwi-Tanga	Vice-Chancellor: Cape Peninsula University of Technology	Academia
Khungeka Njobe	Group Executive: R&D Outcomes and Strategic Human Capital Development, CSIR	Science council
Adi Paterson	General Manager: Business Development and Operations, Pebble Bed Modular Reactor (Pty) Ltd	Business

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| Thuli Radebe | CEO: South African Centre for Public Service Innovation | Statutory body |
| Calie Pistorius | Vice-Chancellor and Principal: University of Pretoria | Academia |

3rd Council March 2009-July 2014

	Affiliations	Sectors
Chairpersons		
Dr Steve Lennon	Managing Director: Corporate Services Division/Group Executive: Sustainability, Eskom	State-owned enterprise
Executive Committee		
Philemon Mjwara (CEO)	Director-General: DST	Government department
Krish Bharuth-Ram (CEO) (Until July 2012)		
Kelebogile Dilotsotlhe (CEO) (Until February 2013)		
Thulani Mavuso (Acting CEO)		
Cheryl de la Rey	Vice-Chancellor and Principal: University of Pretoria	Academia
Khungeka Njobe	Managing Director: Aveng Water	Business
Johannes Potgieter	Chief Director: Innovation and Technology, DTI	Government department
Geoff Rothschild	Johannesburg Stock Exchange	Business
Nonkululeko Shinga	Chief Director: Innovation and Technology, DTI	Government department
Members		
Ntuthuko Bhengu	Executive: Provider Networks, Qualsa Healthcare (Pty) Ltd	Business
Cheryl de la Rey	Vice-Chancellor and Principal: University of Pretoria	Academia
Lineo Mazwi-Tanga	Rector and Vice-Chancellor: Cape Peninsula University of Technology	Academia
Khungeka Njobe	Group Executive: R&D Outcomes and Strategic Human Capital Development, CSIR	Science council
Francis Petersen	Dean: Engineering and the Built Environment, UCT	Academia
Johannes Potgieter	Chief Director: Innovation and Technology, DTI	Government department
Geoff Rothschild	Director: Government and International Affairs, Johannesburg Stock Exchange	Business
Jennifer Thomson	Department of Molecular and Cell Biology, UCT	Academia
Paul Baloyi	Managing Director and CEO: Development Bank of Southern Africa	Financial institution
Irene Charnley	CEO: Smile Communication	Business
Kuseni Dlamini	CEO: Old Mutual South Africa and Emerging Markets; Anglo American Corporation SA; New Bond Capital Ltd; Times Media	Business
Azar Jammine	Director and Chief Economist: Econometrix	Business
Helen Laburn	Dean: Health Sciences/Deputy Vice-Chancellor: Research, University of the Witwatersrand	Academia

Nthabiseng Ogude	Deputy Vice-Chancellor: University of Pretoria	Academia
Gerhard Prinsloo	Director: Technology Transfer and Innovation, Durban University of Technology	Academia
Arnold van Zyl	Deputy Vice-Chancellor: Research, Stellenbosch University	Academia
Phil Mjwara	Director-General: DST	Government department
Michael Pepper	Professor: Faculty of Health Sciences/Director: Institute for Cellular and Molecular Medicine, University of Pretoria	Academia
Mamokgethi Phakeng	Vice-Principal: Research and Innovation, University of South Africa	Academia
Louisa Zondo	Advocate: SASOL	Business

4th Council August 2014 – 2018

	Affiliations	Sectors
Chairperson		
Cheryl de la Rey (until December 2018)	Vice-Chancellor and Principal: University of Pretoria	Academia
Derrick Swartz	Vice-Chancellor: Nelson Mandela Metropolitan University	Academia
Executive Committee		
Mlungisi Cele (Acting CEO)		
Dhesigen Naidoo	CEO: Water Research Commission	Government agency
Garth Strachan	Deputy Director-General: Industrial Development Division, DTI	Government department
Jennifer Thomson	Emeritus Professor: Department of Molecular and Cell Biology, UCT	Academia
Members		
Claire Busetti	Government Liaison: SiMODiSA	Non-profit/Civil society
Roseanne Diab	Executive Officer: ASSAf	National academy
Thulani Dlamini	CEO: CSIR	Science council
Anton Eberhard	Executive Officer: Graduate School of Business, University of Cape Town	Academia
Glenda Gray	Executive Director: Perinatal HIV Research Unit, Chris Hani Baragwanath Hospital	Academia
Azar Jammine	Director and Chief Economist: Econometrix	Business
Mafika Mkwanazi	Independent Logistics and Supply Chain Professional	Business
Shadrack Moephuli	CEO: Agricultural Research Council	Science council
Zanele Monnakgotla	Head: Innovation of the Industrial Development Corporation	Business
Kevin Nassiep	CEO: South African National Energy Development Institute	Government agency
Andile Ngcaba	Founding Partner and Chairperson: Convergence Partners	Business
Nonkululeko Nyembezi-Heita	CEO: IchorCoal N.V.	Business

Sullivan O'Carroll	CEO: Nestle, Malaysia	Business
Molapo Qhobela	CEO: NRF	Government funding body
Olive Shisana	CEO: HSRC	Science council
Sibusiso Sibisi	CEO: CSIR	Science council
Crain Soudien	CEO: HSRC	Science council
Paul Steenkamp	Head: Innovation Capability Build, Standard Bank Group	Business
Sim Tshabalala	Group Chief Executive: Standard Bank Group	Business
Louisa Zondo	CEO: Bertha Gxowa Foundation	Non-profit/Civil society

Appendix 2: NACI projects and advice outputs (1999-2014)

Projects and advice outputs (1999-2004)

Project/report	Output
Growth and innovation: Perspectives on the interaction between the economy, S&T and human capital	Advice 2001
Open source software	Advice April 2002
9/11: Implications for the NSI	Advice April 2002
NACI performance audit	Advice August 2003
Audit of the implementation of the innovation policy	Draft advice
Utilisation of research findings	Draft advice
Mobility of R&D workers	Advice June 2004
Database of innovation databases	Website
Product design strategy	Advice February 2003
Audit of SETI reviews	Internal reference
S&T facts and figures	Advice June 2003
Advanced manufacturing and logistics strategy	Advice September 2003
AWACS: Medium-term scenarios	Internal reference
Potential impact of skills shortages on innovative capacity	Advice June 2004
Optimising the role of S&T within the context of NEPAD	Internal reference
Innovation facts and figures	Draft advice
Profile of postgraduate HE and the academic research community	Advice being drafted

Source: NACI (2004a)

Projects and advice outputs (2004-2010)

Project/report	Advice output
Mobility of research and development workers	Advice to the Minister June 2004
Facing the Facts: Women's participation in science, engineering and technology	Advice to the Minister November 2004
Potential impact of the skills shortage on the innovative capacity of major capital	Revised submission to the Minister March 2005
Profile of the postgraduate higher education and the academic research community in South Africa	
South African national system of innovation: Structures, policies and performance (background report to the OECD country review of the South African NSI)	OECD report submitted to the Minister July 2006
Intellectual property rights from publicly financed research findings	Concise advisory notes to the Minister July 2006
ASSAf report: A strategic approach to research publishing in South Africa	
R&D tax incentives	
Assessment of the participation of women in industrial science, engineering and technology in South Africa	Gender policy submitted to the Minister November 2006
Looking at SET through women's eyes	
Monitoring and evaluation framework to benchmark the performance of women in the NSI	
Creating the future: Gender, race and SET sector policy framework for capacity building and innovation	Advice and report to the Minister November 2006
Development of a profile of best practice in the NSI	Advice and report to the Minister November 2006
Study of the required physical infrastructure to attain the vision of the NSI	
Revisiting NACI's Mandate: The role and structure of NACI	
Required infrastructure to attain the vision of the NSI: secondary school education component	Advice to the Minister October 2007
Regional and local innovation systems in the overall NSI	
Human capital and the South African knowledge base	
Appropriate human resources for a productive NSI	Advice letter on lessons learnt to the DST Director-General October 2007
Effect of the electricity emergency on the NSI and mitigation actions	Advice to the Minister July 2008
Findings of the OECD group review of the South African NSI	
Current global financial crisis and the South African NSI	Advice to the Minister October 2008
South Africa's Science and Technology Indicators Report 2008	Report presented to the Minister December 2008
NBAC position statement on human stem cell regulations in South Africa	Advice to the Minister January 2009
Funding and focus on biotechnology within the technology innovation agency	
Assessment of the participation of women in the SET industry	Joint advice to the Minister January 2009
Changing perceptions of women in SET	Good practice guidelines submitted to the Minister February 2009
Tracking the benefits of publicly funded R&D	Advice to the Minister February 2009
Assessing the value of technology balance of payments as an indicator of the knowledge economy	Advice letter to the Minister September 2009

Project/report	Advice output
Science and technology interactions in Africa and the impact thereof on the South African national system of innovation	Advice to the Minister November 2009
DST's Ten-Year Innovation Plan	
Impact of the South African public understanding of biotechnology	Advice to the Minister February 2010
Biotechnology capacity: comparative case studies	
Funding environment of South African biotechnology	

Sources: NACI (2009a) and NACI (2010a)

Research projects and advice outputs (2010/11-2013/14)

2010/11	
Research projects/reports completed	**Summary of advice generated**
- Status of government's poverty reduction programmes: Focus on DST's Science and Technology Social Impact (STSI) programme - Monitoring and evaluation of SET human capital - Exploration of community innovation system: Bridging the innovation divide - Public understanding of biotechnology by media - Adventitious presence of GMO commodities - Funding instruments for SET human capital: assessment of funding tools - Tertiary education cost and other barriers affecting entry by female students to SET fields - Role of women in key economic sectors underpinned by SET: A case of agro-processing - Graduate placement programmes: An evaluation - An analysis of databases underpinning STI indicator system - Finalisation of research for the South African Science & Technology Indicators 2010 - Assessment of incentives for employing women in the corporate environment - Facing the facts: Causes for trends (SET4W) - Development of social indicators to track the impact of broad-based innovations on QoL - Role of biotechnology in food security - SET gender policy: review of the gender policy environment in SET - NACI's perspectives on the national system of innovation (NSI)	- Possible policy contradictions in the Consumer Protection Act (68 of 2008) with the National Biotechnology Strategy (2001) - GMO Act: Problems encountered with decisions made by the Executive Council of the GMO Act - NBAC Position paper on the coordination and governance of the bio-economy and the NSI - Raising South Africa's investment in R&D (venture capital) – a mechanism for achieving the DST target of 1.5% of GDP by 2014 - DST's Science and Technology for Social Impact (STSI) programme

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2011/12	
Research projects/reports completed	**Summary of advice generated**
- Skills and education for Science, Engineering and Technology to inform policy advice on Human Capital - Desktop scan of graduate and placement programmes in STI environments - Desktop research on the centrality of human capital to growth in the NSI - Analysis of progress in the National System of Innovation - Sustainable funding for basic research in biotechnology - Providing incentives along the biotechnology pipeline - Development of social indicators to track the impact of broad-based innovations on quality of life of South Africans - Position paper on national research facilities - Exploration of community innovation system: Bridging the innovation divide between formal and informal sectors - Symposium Proceedings Report – SET Gender Policy and Agriculture - Research to update S&T Indicators for 2011 - Comprehensive input to the National Development Plan - Feedback to the Ministerial Review Committee report - Research report: Assessment of Incentives for Employing Women in the Corporate Environment - Policy analysis: Incentives for Employing Women in the Corporate Environment - Policy analysis: Review of Facing the Facts and Causes for Trends: A Pipeline Illustrating the Overall Participation of Women in SET - Position paper on Systemic Improvements and Policies to Enhance the Position of Women in Agriculture - A SET Gender Policy Framework	- Policy advice on Human Capacity for the National System of Innovation – February 2012 - NBAC advice on Genomic Sovereignty - Information letter: The Role of Biotechnology in Food Security - Scalable Social Innovations to Enhance their Impact on Societal Upliftment (advice finalised, to be presented to the Minister) - Public Understanding of Biotechnology by the Media - Advice on the GMO Act - Advice on Basic Research and Biotechnology Incentives - Advice on Addressing Barriers for Women in Science
2012/13	
Research projects/reports completed	**Summary of advice generated**
- NACI input into the Women Empowerment and Gender Equality Bill - NACI input into the White Paper on Families - Position Paper: Bioprospecting South Africa's Biodiversity - Position Paper: Intellectual Property Awareness in Biotechnology - Research Ethics Clearance Policy : NACI checklist on Biotechnology research - Position Paper: The Role of Biotechnology in Food Security - Assessment of Gaps and Challenges in Policy Instruments that Support Growth of Innovation-Based Small, Micro and Medium Enterprises (SMMEs) in South Africa	- Public Understanding of Biotechnology by the Media - Funding Basic Research in Biotechnology & Providing Incentives to Bio-entrepreneurs - Problems Encountered with Delays in Appeals to Decisions made by the Executive Council of the GMO Act - Genomic Sovereignty - Addressing Barriers for Women in Science, Engineering and Technology

- International Benchmarking of the South African National System of Innovation. - NACI input into the DST's Bioeconomy Strategy - NACI input to the TIA Review Panel	- SET Gender Policy Framework - Information letter: The Role of Biotechnology in Food Security
2013/14	
Research projects/reports completed	**Summary of advice generated**
- South African Science and Technology Indicators Booklet, 2013 - Summary Report: Proposed National Innovation Framework Positioned to Support the Targets of the NDP, 2013 - Report on An Assessment of Gaps in Policy Instruments that Support Growth of Innovation-Based SMMEs in South Africa, 2013 - Policy Discussion Document on Benchmarking the Policy Environment for Gender Mainstreaming in the STI: Mitigating Gender Disparities, 2013 - Report on Realising the Vision of the NDP: Developing South Africa's Innovation Framework, 2013 - Report on Research and Innovation Infrastructure in Support of the Innovation Framework for South Africa, 2013 - Policy Discussion Document on Strengthening Science, Technology and Innovation Skills: a case of vocational education, 2013 - Understanding Mainstreaming: a Practical Guide Toward Mainstreaming Gender and Disability in the STI, 2014 - Proceedings Report: Translational Research: From Laboratory to Industry - An Investigation into the Reasons why certain Biotechnology Enterprises have failed in South Africa - Report on Legislations and Policies that affect the Implementation of the Bioeconomy Strategy	"A Refocused NSI" and better alignment with the NDP - Gender Mainstreaming in the STI - Strengthening Skills in Mathematics, Science and Technology - Support for Up-scaling Innovative Solutions and for growth of SMMEs - Infrastructure for Research and Innovation - An Assessment of the National Innovation System (STI Indicators) - The Reasons Why Certain Biotechnology Enterprises Have Failed in South Africa - Legislations and Policies That Affect The Implementation Of The Bioeconomy Strategy

Sources: NACI (2011); NACI (2012); NACI (2013) and NACI (2014)

Appendix 3: SARG/SET4W committee members

SET4W Committee: 2003-2006			
Chair	Lucy Abrahams	Director: Learning Information Networking Knowledge (LINK) Centre, Wits	Academia/ NACI
South African members	John Duncan	Dean of Research: Rhodes University	Academia
	Sharon Fonn	Head: School of Public Health, University of the Witwatersrand	Academia
	Cheryl de la Rey	Deputy Vice-Chancellor, UCT	Academia / NACI
	Tina Eboka	Director: Group Corporate Affairs, Standard Bank	Business
	Erika Johnson	General Manager: Systems Operations, Eskom	State-owned enterprise
	Bongani Khumalo	Chairperson: Grey Global South Africa	Business
	Allyson Lawless	Director: Allyson Lawless and Associates	Business
	Steve Lennon	Managing Director: Resources and Strategy Division, Eskom	State-owned enterprise/ NACI
	Valerie Mizrahi	Director: Molecular Mycobacteriology Research Unit, Wits & National Health Laboratory Service	Academia / National facility
	Zuki Munyai	CEO: Muvhango Technologies	Business
	Bongiwe Njobe	Director: Corporate Affairs, South African Breweries	Business/ NACI
	Khungeka Njobe	Director: Environmentek, CSIR	Science council
	Susan Nkomo	CEO: Office of the Status of Women, President's Office	Government
	Tebello Nyokong	Department of Chemistry, Rhodes University	Academia
	Helen Rees	Director: Reproductive Health and HIV Research Unit, Chris Hani Baragwanath Hospital	Academia
	Jennifer Thomson	Department of Molecular and Cell Biology, UCT	Academia / NACI
International members	Catherine Didion	Executive Director: International Network for Women Engineers and Scientists	Academia/ Civil society
	Lydia Makhubu	President and Vice-Chancellor: Third World Organisation of Women in Science; University of Swaziland	Academia/ Civil society
	Shirley Malcom	Director: Education and Human Resources, American Association for Advancement of Science	Academia
	Elizabeth Rasekoala	Director: African Caribbean Network of Science and Technology	Academia

SET4W Committee: 2007-2011			
Chair(s)	Cheryl de la Rey (until March 2009)	Deputy Vice-Chancellor, UCT / CEO: CHE	Academia/ Statutory body/ NACI
	Khungeka Njobe (from 2009)	Group Executive: R&D Outcomes and Human Capital Development, CSIR	Science council/ NACI
	Lineo Vuyisa Mazwi-Tanga (from 2010/11)	Vice-Chancellor: Cape Peninsula University of Technology	University/NACI
Members	Lucy Abrahams (until March 2009)	Director: LINK Centre, Wits	University/NACI
	Judith Bishop (until March 2009)	Professor: Computer Science, University of Pretoria	University
	Steve Lennon (until 2011)	Managing Director: Resources and Strategy Division, Eskom / Managing Director: Corporate Services, Eskom	State-owned enterprise/NACI
	Romilla Maharaj	Executive Director: Institutional Capacity Development, NRF	Government funding body
	Linda Makuleni (until 2011)	CEO: South African Weather Service	National facility
	Khungeka Njobe (until 2011)	Group Executive: R&D Outcomes and Human Capital Development, CSIR	Science council/ NACI
	Yolisa Pakela-Jezile	Manager: Sustainable Rural Livelihoods, Agricultural Research Council / Senior Manager: Agricultural Research Council	Science council
	Jacqueline Williams	National Coordinator: Women in Oil and Energy South Africa (WOESA)	Civil society/ Business
From March 2009	Irene Charnley	CEO: Smile Communications	Business/ NACI
	Lineo Vuyisa Mazwi-Tanga	Vice-Chancellor: Cape Peninsula University of Technology	Academia/ NACI
	Nthabiseng Ogude	Deputy Vice-Chancellor: University of Pretoria	Academia
From 2011	Mmantsae Diale	Lecturer: University of Pretoria	Academia
	Bridgette Gasa	Managing Director: The Elilox Pty Ltd	Business
	Louisa Zondo	General Counsel (independent)	Advocate, private sector/ NACI

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