



DECOUPLING natural resource use and environmental impacts from economic growth

The remarkable economic and population growth of the 20th century was closely coupled to substantial increases in the extraction and consumption of natural resources, leading to increasingly-damaging negative environmental impact. However, economic growth globally was faster than growth of the rate of consumption of natural resources, and some negative environmental impacts have been reduced. Globally, about 25% less material input was required in 2002 compared to 1980 to produce one unit of real GDP. It appears that some 'dematerialization' of the world economy has occurred spontaneously. Accelerating this process of decoupling economic activity from consumption and environmental impacts is fundamental to future human well-being. Future policies will require a better understanding of the process, so the International Resource Panel (IRP) has undertaken to define the key issues and challenges, drawing on peer-reviewed research and experience at multiple levels. A major conclusion from its first report on this topic is that decoupling is feasible, and indeed is already happening, but further sustainability-oriented innovations are urgently required to enable decoupling to support sustainable development more effectively. More transformative change is required to meet the size of the challenge.

What is decoupling?

While 'decoupling' can be applied in many fields, from algebra to electronics, the IRP applies the concept to sustainable development in two dimensions. **Resource decoupling** means reducing the rate of use of resources per unit of economic activity. **Impact decoupling** means maintaining economic output while reducing the negative environmental impact of any economic activities that are undertaken. **Relative decoupling** of resources or impacts means that the growth rate of the resources used or environmental impacts is lower than the economic growth rate, so that resource productivity is rising. **Absolute reductions of resource use** are a consequence of decoupling when the growth rate of resource productivity exceeds the growth rate of the economy.

Why is decoupling an urgent concern?

Total material extraction in the 20th century increased by a factor of about 8, and the price index of resources declined by about 30%. But many resources are now reaching their productive limits, as indicated by rising prices and lower grades of ores being mined.

Sustainability demands that resources be used more efficiently, reducing economic and environmental costs of resource depletion and negative environmental impacts. Finally, while in some parts of the world local environmental impacts have declined, global impacts on the environment are becoming ever more important and severe, requiring an international policy response. The impacts of fossil fuels are perhaps the most dramatic illustration of this point.

What resources are the focus of the report?

The report addresses four classes of material resources: construction minerals; ores and industrial minerals; fossil fuels; and biomass. Together, they are extracted at a rate of nearly 60 billion metric tons per year, and extraction rates are steadily increasing. These **material resources are natural assets deliberately extracted and modified by human activity for their utility to create economic value**. They can be measured in both physical units (such as tons, joules or area) and monetary terms.

How does the life cycle of these resources relate to decoupling?

The resources addressed in the report go through a life cycle that begins with extraction, followed by production and consumption before reaching disposal or recycling. All phases of the life cycle can be subject to decoupling, with the costs and benefits differing among the phases.

What will be required to accelerate decoupling?

Decoupling will require significant changes in government policies, corporate behaviour, and consumption patterns by the public. These changes will not be easy, as indicated by three scenarios included in the report. Such changes will be driven by sustainability-oriented innovations in systems of resource extraction and use, as well as economic innovations that could lead to a new indicator that couples the measurement of GDP to evaluations of environmental restoration and social development. The report includes case studies from China, Japan, Germany, and South Africa that indicate significant innovation at the policy level that include decoupling principles.

How are trade and decoupling related?

Internationally traded materials increased from 5.4 billion tons in 1970 to 19 billion tons in 2005. Global trade shifts resources and commodities between countries, as well as the associated depletion of resources and environmental burdens. Different actors, spread across the world, play a key role at some stage, making it challenging to determine where responsibility for decoupling should be assigned. Ideally, every stage of the life cycle should be accompanied by appropriate policies promoting decoupling.

How can decoupling enhance equity among nations?

Decoupling draws on the concept of 'metabolic rates' (resources used per capita) as an objective means of comparing resource consumption rates between countries. While the average person on the globe has a metabolic rate of about 9 tons of resources annually, some people fall far below this average and others float high above it, with one implication being that the latter can afford more decoupling while the former may warrant greater consumption as a means of alleviating poverty. Some economists advocate non-material economic growth, a form of decoupling, while

others suggest that developing countries may be more innovative in decoupling because they are not so heavily dependent on infrastructures that are rapidly becoming obsolete as more ecological thresholds are breached.

What roles do cities play in decoupling?

Urban settings, where an increasing majority of the world's people will live in the coming decades, may be especially fertile ground for decoupling. Transport, heating and housing can be provided more efficiently to denser populations. By concentrating the knowledge and financial, social and institutional resources required for sustainability-oriented innovations, cities could bring ingenuity, resources and communities together to generate practical decoupling in the ways people produce and consume.

What are some major obstacles faced by decoupling?

One major obstacle is the so-called 'rebound effect', which asserts that efficiency gains in resource use may lead to more use of other resources. But this is not always a problem: energy efficiency in India, for example, had a rebound effect of at least 50%, but this meant families could spend less on energy and more on meeting basic needs that were not previously met.

What are some of the challenges that remain to be addressed?

The report identifies several challenges to decoupling. Some of the most important include:

- how can the **understanding of global resource flows and their associated environmental impacts** be coupled with related challenges, such as climate change and the role of ecosystem services?
- how can policymakers (and the general public) be shown the **physical limits** to the quantity of natural resources available for human use on this planet?
- how can **investments in sustainability-oriented innovations and technologies** to accelerate decoupling be rapidly generated?
- what **market signals and regulatory interventions can be developed** to help resource productivity increases become a higher priority?

The future work of the International Resource Panel is designed to support such efforts, in hopes of leading to an effective transition to a Green Economy that enhances human welfare while sustaining environmental resources.

A summary and the full report as well as a PowerPoint presentation with the main findings can be downloaded at: www.unep.org. For further information, please contact: Janet Salem, Sustainable Consumption and Production, UNEP at: resourcepanel@unep.org