



## Climate change in China: risks and responses

**Extreme weather events are forecast to become more frequent, according to the Intergovernmental Panel on Climate Change, as the global climate continues to alter. Even with uncertainty in this future, countries are able to prepare themselves for the future risks by implementing adaption and mitigation strategies. This policy brief looks at China's risk to future extreme weather events and the Chinese policy response. Overall, and despite gaps in some areas, the Chinese policies contain some adequate responses; yet, implementation remains a major challenge, as reactions to recent droughts in northern and southern China illustrate.**

China has experienced extreme weather drought events in its north and in the southern province of Yunnan in recent years. As argued by a report of the Intergovernmental Panel on Climate Change (IPCC) in 2012, the world will increasingly be affected by extreme weather events due to changing climate patterns. Extreme weather events such as droughts and floods can have severe impacts on affected regions and the livelihoods of its inhabitants. The impact of an extreme weather event—and thus its risk—is determined by the combination of two factors, exposure and vulnerability. Exposure is the likelihood of extreme weather events in an area, thus describing the potential for disaster. Vulnerability on the other hand is the degree of susceptibility that regions face. How did China react in the cases of droughts in northern and southern China – and what can be learnt from these actions?

### China in a future of extreme weather events

It is projected that China will see an increase of its average temperature between 1.3 and 2.1 degrees Celsius by 2020. China is also expected to become a more water scarce country, not due to reduced precipitation but due to increased demand. Forecasts show that climate change will lead to an increase of extreme weather events in the country. Due to varying degrees and types of exposure and vulnerability in different regions, it is essential to do area specific analyses for different regions.

#### *Southern China drought*

Traditionally, Yunnan has only rarely been hit by drought, with a frequency of about once per decade. In the past, these

droughts have had no lasting impact on Yunnan's environments, human and natural. In the last decade, however, droughts in the region have become more frequent and more severe. The case drought of 2009/2010, was the driest, severest and longest drought in the last 50 years in China. These trends seem to clearly indicate exposure in Yunnan.

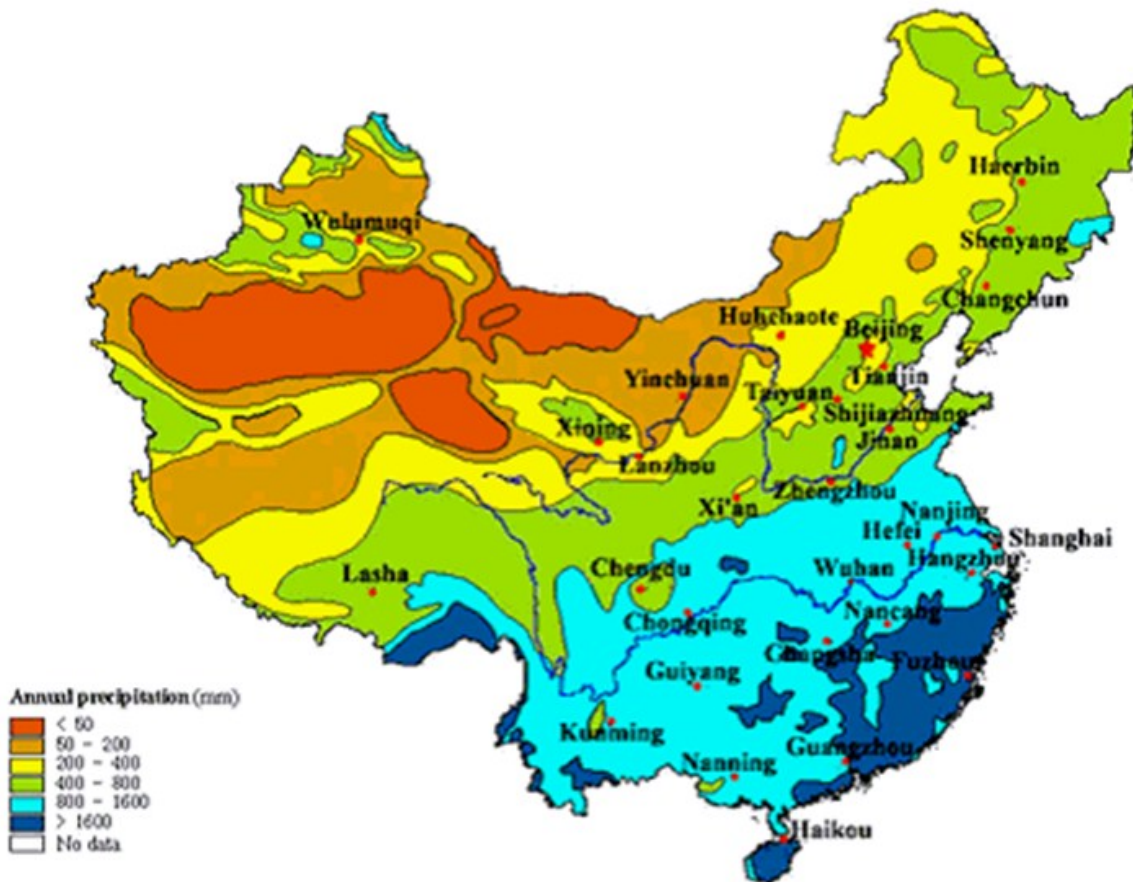
Additionally, vulnerability for droughts is high in Yunnan. Anthropogenic causes have been blamed to some extent for severity of the 2009/2010 drought. As an example, deforestation due to logging and mining practices reduced Yunnan's natural drought resistance. Poverty further adds to Yunnan's vulnerability; it is one of the three poorest provinces in China leaving people with little coping resources in time of crisis.

#### *Northern China drought*

China's north is a drought prone area with a frequency of 0.9 to 1.3 droughts a year, sometimes with devastating effects. As seen in figure 1, there is a noticeable decrease in precipitation from southern to northern China. With temperatures in northern China expected to continue rising and precipitation and river runoff expected to decrease, it is clear that northern China has extreme weather drought exposure. This will continue to be the case in future.

Northern China will increasingly be exposed to extreme weather events, due to skewed development and lacking resource governance. Both exposure and vulnerability in northern China can be seen to contribute to a current and future policy relevant extreme weather drought risk. The area

Figure 1: Map of annual precipitation in China



Source: [www.cropsscience.org](http://www.cropsscience.org)

has become more important as a farming area, despite being a water scarce region. Food demand is increasing in China, but intensified agriculture in the region is not sustainable.

Local government in Inner Mongolia began fencing grasslands to increase commercial farming and increase tax revenues. This led to soil degradation due to over grazing. Another policy, the *Three-North China Shelterbelt programme* aimed at combatting desertification, delivered some results. Yet at times it sees the planting of trees in regions that cannot naturally sustain trees due to a lack of water.

### China's policy response: the National Climate Change Programme (CNCCP)

In 2007, China's highest planning authority, the National Development and Reform Commission, published China's National Climate Change Programme (CNCCP). The CNCCP was developed as a national climate mitigation and adaption strategy. It was originally meant to be in implementation until 2010, but has not as yet been replaced.

The CNCCP reiterates that China is a developing country and that it aims to be "a developing country of responsibility". It states that climate change is an accepted reality and addressing the issue is declared a priority for China. It also points out that China has historically been a low emitter of Greenhouse Gases (GHG), even though emissions have been sharply increasing in the last 50 years; China is currently the world's largest emitter of CO<sub>2</sub>. As a developing country, China does not see itself as responsible for global climate change; in this the 'blame' is put on the developed nations.

The CNCCP was drafted according to eight guidelines, which include some phrasings used during Hu Jintao's presidency as overall guiding slogans, such as a "scientific approach of development" and promoting a "harmonious society". Other principles illustrate the importance of resource conservation and environmental protection as well as the need to secure economic development. More specific guidelines with regard to climate change mitigation are: "to control GHG emission and enhance sustainable development capacity" and "to

conserve energy, to optimize energy structure, and to strengthen ecological preservation and construction". Besides a general call to rely on the advancement of science and technology, one also finds adaptation in the principle to "enhance the capacity to address climate change".

The CNCCP has four stated objectives, based on the above mentioned guidelines. The four objectives are; mitigation of GHG emissions, adaptation to climate change, support of fundamental and relevant climate change research and the desire to promote public awareness of climate change.

### **Drought response – how is the policy applied?**

The drought in Yunnan province in 2009/10 saw three prominent strategies followed as response to the drought, namely the promotion of intercropping, the immediate drilling of wells and a review and improvement of water infrastructure. As an immediate response to the drought the Chinese government dispatched 2,000 drought relief workers to Yunnan. They were ordered to drill wells across the drought ridden area, working 24 hours a day.

Intercropping, as one of the solutions, is an adaption strategy and has been vigorously promoted in Yunnan after the 2009/2010 drought, spearheaded by scientists. The 'new' strategy that has been extended to 80 per cent of Yunnan, protects harvests against climate events and also increases yields. In Yunnan, crop yields for 2010 increased by 30 per cent.

The main problem in the policy response to the 2009/2010 drought was very fact that these had to be responses, i.e. reactive instead of proactive measures. Urgent action at times of the crisis, such as the reactive strategy of well drilling can and did lead to major lapses. The area in which wells were

drilled had not been properly surveyed, meaning that the drill teams were basically drilling blindly. This emergency action thus possibly prepared the ground for future ecological disaster. Pumping groundwater without sustainability or impact studies can lead to a dangerous drop in groundwater levels which can have a devastating effect on ecosystems.

### *Response to the northern droughts*

The responses to droughts in the north of China have generally seen the implementation of grand strategies. The three main strategies used in northern China are the Three-North China Shelterbelt [re-forestation] programme, the grain-to-green [land use conversion] programme and a massive water divergence programme.

The Three-North China Shelterbelt programme is the longest running environmental programme in China. It aims to increase forest cover in northern China from 5 per cent to 15 per cent. The State Forest Administration has reported that the project has already planted over 24 million hectares of forests, with forest cover increasing from 5.05 per cent to 10.51 per cent in the last 50 years.

Other than the Three-North China Shelterbelt project, the grain-to-green programme is the most important large scale environmental initiative in China. It aims to convert cropland situated on slopes into forests and grassland.

The third large-scale response, the water transfer project, appears to be a pragmatic response to the problem of water scarcity in the north. The plan proposes what is referred to as large water highways, diverting water both from the south to the west and from the south to the north.

Despite of their grandeur, the main strategies used in northern China have problems. There are doubts as to

### **SREX "low regrets no regrets"**

The SREX presents a set of criteria, referred to as the "low regrets no regrets" measures. These measures "are starting points for addressing projected trends in exposure, vulnerability, and climate extremes. They have the potential to offer benefits now and lay the foundation for addressing projected changes" in future (Field et al, 2012:16). In other words, the SREX presents a list of mitigation and adaption strategies that provide a good starting point for an adequate and generally applicable climate change policy. According to this approach, there are six general measures that should be included into a national mitigation and adaption strategy for extreme weather events.

The measures that are deemed useful are in the following areas: (i) natural ecosystems and forestry, (ii) agriculture and food security, (iii) coastal zones and fisheries, (iv) water resources, (v) infrastructure, housing, cities, transportation, energy and (vi) health (Field et al, 2012:352-354). These measures are found in the CNCCP, except for number (v), which has oversights such as a lack of planning for organized urbanization with adequate infrastructure development, and number (vi), health, which is completely absent. Minus these lapses, the CNCCP is an adequate mitigation and adaption strategy.

whether the Three-North China Shelterbelt programme has actually delivered sustainable results, namely reversing desertification. There have however been clearly documented cases of failure in the project. In Minqin county in Gansu, almost a third (13 333 hectare out of the 53 333 hectare) of trees planted died, whilst the trees that survived were dwarf trees, due to a lack of water. In Hunshandak in Inner Mongolia the moving sand cover increased from 2 per cent in the 1950's to above 50 per cent by the 2000's.

The effects of the grain to green-project are also limited due to the preference of trees being used, whilst natural grassland would have been more sustainable. In addition, without the current subsidies paid to farmers for converting their lands, the project is likely to collapse. This indicates a need for planning that not only looks at short term solutions, but also considers the social and economic dimensions of sustainability.

The water divergence project, for its part, might be limited by the recent spell of droughts in the south. With the south becoming more water scarce at times of the year, sustainability of this engineering solution is also an issue. The loss of water to the north might, in fact, increase river pollution and risk increasing water stress.

### Conclusions

China is faced with a future of environmental risk and a high likelihood for the occurrence and increased occurrence of extreme weather events. Given the track-record to date, it appears essential that pre-emptive climate mitigation and adaptation plans are improved further, focussing more on implementation and the ecological sustainability of measures taken.

When looking at the two drought cases it is apparent that here was a lack of CNCCP implementation in both instances. Where the CNCCP and government response overlapped, it seemed to be rather due to coincidence than by design.

Overall, the CNCCP, even with its lapses, is a step in the right direction, since it shows awareness of future extreme weather risk. This planning—despite its current shortcomings—could in itself be an example to other developing countries to establish adaptation strategies.

### Recommendations

While it is preferable to have government strategies implemented in a preventative manner, immediate crisis response, as happened in Yunnan, still needs to consider long-term effects in order to not be environmentally destructive

after the crisis. The lack of planning – as exemplified with the well digging - in fact increased the possible vulnerability of the areas in which it was implemented.

Attention should also be given to finding ways in which to reduce the gap between central government environmental policy (such as the CNCCP) and implementation. Where local government is failing in implementation, options need to be explored for addressing the issue. These might include: environmental criteria in performance assessments (thus making environmental issues relevant for promotion) and potential issuing of fines for lack of implementation.

Funds and time should be invested into developing technology that is both environmentally more sustainable and also does not hamper economic growth; China's programme in this regard is heading towards the right direction. It is a two way solution whereby some growth will be lost at present, but where the costs of future disaster management, environmental clean-up and unrest control will be limited. Finding solutions for sustainable growth can ensure sustained stability.

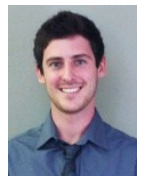
Ultimately, with similarities in risk to extreme weather events such as drought between China and Africa, attention should be given creating systems for knowledge sharing and possible joint efforts in disaster management.

### References

Field, C.B., V. Barros, T.F. Stocker, D. Qin, D.J. Dokken, K.L. Ebi, M.D. Mastrandrea, K.J. Mach, G.K. Plattner, S.K. Allen, M. Tignor, and P.M. Midgley (eds.). 2012. *Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation, in A Special Report of Working Groups I and II of the Intergovernmental Panel on Climate Change*. Cambridge University Press, Cambridge.

### Harrie Esterhuyse

Research Analyst  
Centre for Chinese Studies  
Stellenbosch University



### Contact Us

Centre for Chinese Studies  
Stellenbosch University  
PO Box 3538  
Stellenbosch  
South Africa

Tel: +27 21 808 2840  
Fax: +27 21 808 2841  
Email: [ccsinfo@sun.ac.za](mailto:ccsinfo@sun.ac.za)  
Web: [www.sun.ac.za/ccs](http://www.sun.ac.za/ccs)  
Twitter: [CCS\\_STELL](https://twitter.com/CCS_STELL)

### About Us

The Centre for Chinese Studies (CCS) at Stellenbosch University is the leading African research institution for innovative and policy relevant analysis of the relations between China and Africa.