

An adaptation framework and case study for Ningxia

The project, *Impacts of Climate Change on Chinese Agriculture*, sought to understand how climate change will affect rural China.

Phase I (2001-2004) of this joint UK/China collaboration examined the impact of climate change on crop yields. Phase II (2005-2008) built on this work to investigate the impacts of climate change on national cereal production and the cereal quantities available to each person in China to 2100. This pamphlet gives an overview of the work carried out during Phase II to develop the first regional framework for adapting to the impacts of climate change in China - for the agricultural sector in the autonomous region of Ningxia in northwest China. Important lessons can be transferred from our experiences in Ningxia to elsewhere in China and the rest of the world.



An adaptation strategy for agriculture in Ningxia: recommendations for action

This pamphlet describes the process we used to develop a framework and strategy for Ningxia as it seeks to adapt to the effects of climate change. The framework provides a useful policy tool for decision-makers in other parts of China to structure their thinking about adaptation and so start to develop their own adaptation strategies. Our work draws on other frameworks that attempt to structure and guide adaptation such as the 'adaptation wizard' developed by the UK Climate Impacts Programme (UKCIP).

We recognise that, despite an increasing strategic emphasis on adaptation to climate change at a national and regional level in China (e.g. Ningxia's Eleventh Five-Year Development Plan and national government plans), many questions remain about how to implement effective measures on the ground.

WHAT IS ADAPTATION?

Climate change will alter local weather conditions (including rainfall and temperature) and lead to changes in the frequency and severity of climate hazards such as droughts. Some level of climate change is now inevitable, so society and individuals must adapt to the changes which will occur - either to avoid negative impacts or to take advantage of new opportunities.

Adaptation aims to ensure that people's livelihoods, public and private enterprises, assets, communities, infrastructure and the economy are resilient to the realities of a changing climate. It is vital that adaptation is seen as a process and not a one-off activity. A changing climate requires ongoing activities by institutions and individuals to adjust their behaviour either in anticipation of predicted impacts or in response to emerging trends and extreme events.

THE ADAPTATION FRAMEWORK

The framework for Ningxia was developed with considerable input from stakeholder organisations in the region and in cooperation with the UK Climate Impacts Programme. Following the framework will not lead directly to the creation of an adaptation strategy or the implementation of adaptation actions. However, the process identifies a number of necessary and important stages (and the required resources) in developing an adaptation strategy. The framework should be viewed by individuals and institutions as an ongoing process of engagement with changing climate risks. It consists of six main stages (Figure 1) and has a number of key elements:

- An iterative process is required so that any strategy is constantly updated based on appropriate planning cycles
- A continuous system of review and feedback encourages the engagement of local stakeholders to help identify and monitor relevant activities
- Following the framework and engaging with local stakeholders and institutions will help build capacity to achieve greater understanding and implement adaptation measures
- A certain amount of information (e.g. regional climate projections and an understanding of local vulnerabilities to weather events) is required
- Following this process should enable those involved in promoting adaptation to gather the key pieces of information necessary to develop an adaptation strategy and then refine it through implementation.

APPLYING THE FRAMEWORK TO THE AGRICULTURAL SECTOR IN NINGXIA

The three kinds of agricultural production system in Ningxia reflect the physical and economic conditions of different geographical areas - northern irrigation area, central arid area, and southern rainfed mountainous area. Our assessment of how climate change affects the livelihoods of people living in these three rural areas is described in a separate pamphlet.

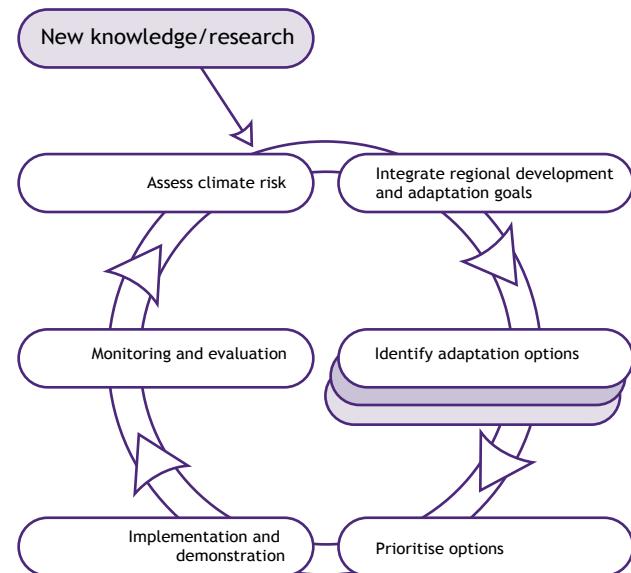


Figure 1. The adaptation framework - each step may require elements of capacity building

Stage 1: Assess climate risks. This involved characterising the extent and impacts of recent climate trends, identifying vulnerability and adaptive capacity in Ningxia, and assessing the significance of future climate change using a risk-based approach that combined an assessment of the likelihood of a particular event or outcome with its potential significance in terms of physical or socio-economic impact. This requires an understanding of climate models and how to translate changes in climate into impacts on the physical environment and socio-economic activities. From the results of our regional climate modelling, we identified four main climate risks for Ningxia and assessed their significance:

- Drought is a major concern for individual and institutional stakeholders in Ningxia
- Surprises/extreme events include weather extremes such as increases in windstorms and heatwaves, but also changes related to the occurrence and effects of agricultural pests and diseases (these are very hard to predict but have potentially major consequences)
- Drying/high temperature. Desertification is already a serious problem in Ningxia. Gradual drying of the landscape as higher temperatures cause more moisture to evaporate from the soil will lead to even greater stress on natural and farmed vegetation
- Shifts in the river flow regime of the Yellow River. Upstream changes in precipitation and evaporation are likely to lead to changes in the downstream flows available to Ningxia (e.g. for irrigation).

Stage 2: Integrate regional development and adaptation goals. This was achieved through consultation, drawing up policy documents, cross-referencing development goals, and assessing climate risks and the threat of climate change. We used Ningxia's agricultural development goals to identify priorities in each area taking into account agricultural features and farmers' sources of income. Table 1 gives examples for the northern area.

Stage 3: Identify adaptation options. Different stakeholders have different perspectives and knowledge of adaptation options - some focus on policy and others on technical responses. For this study we classified adaptation options as 'structural', 'non-structural' and 'high level policy'.

Stage 4: Prioritise options. Due to the wide range of potential options, we trialled three approaches to identifying and prioritising specific adaptation responses:

- An approach for prioritising policy type options at regional government level
- A risk-based approach to identifying options at sector and sub-regional level
- Multi-criteria analysis (MCA) to prioritise specific activities at organisational level.

For Ningxia, we used MCA to rank options in terms of cost-effectiveness, practical considerations, adaptive flexibility, knowledge level, etc. Successful options were presented to Ningxia's Agriculture and Livestock Department.

Stage 5: Implementation and demonstration. No actions have yet been implemented in the agriculture sector in Ningxia as a result of our work. However, the Ningxia Eleventh Five-Year Development Plan mentions the need to strengthen climate change adaptation and the Ningxia Climate Change Response Office was set up in early 2008 to promote adaptation and mitigation programmes.

Stage 6: Monitoring and evaluation. Monitoring and evaluation should be an important feature of policy responses to climate change. Monitoring is necessary to identify whether:

- Changes are occurring in the regional/local climate and/or socio-economic systems
- Actions taken are effective.

Event	Risk priority	Possible options to support agricultural production	Responsible organisations
Drought	Medium	<ul style="list-style-type: none"> • Improve early warning • Improve intra-regional allocation of water during drought • Provide training in agricultural technologies to reduce economic losses 	Yellow River Commission Ningxia Water Resources Department Ningxia Department of Science and Technology Ningxia Department of Agriculture and Livestock
Surprises/extreme events	Medium	<ul style="list-style-type: none"> • Improve early warning, skills and dissemination • Improve weather modification technology 	Ningxia Meteorological Bureau
Drying/desiccation of landscape	High	<ul style="list-style-type: none"> • Review anti-desertification strategies • Monitor soil moisture conditions • Revise policies as appropriate 	Ningxia Land and Resources Department
Change in Yellow River flows	High	<ul style="list-style-type: none"> • Improve intra-regional allocation of water (review irrigation policies) in response to emerging trends • Promote long-term water-saving in agriculture 	Yellow River Commission Ningxia Water Resources Department Ningxia Department of Science and Technology

Table 1. Examples of priorities for the northern area of Ningxia



ADAPTATION IN NINGXIA

Insights and experiences from local/regional experts and consultation allowed us to identify a set of three high-level responses:

- Establish a cross-departmental group on climate change adaptation within the regional government (e.g. the Ningxia Climate Change Response Office acts as steering committee).
- Raise awareness of climate change trends, potential impacts and adaptation activities across the region.
- Make adaptation an important element of development plans and poverty alleviation programmes.

Opportunities for further actions on adaptation lie primarily with the newly established Ningxia Climate Change Response Office. One of our final activities will be to present the project's main findings at the Office's inception meeting and to help initiate a series of next steps.

LESSONS FROM APPLYING THE ADAPTATION FRAMEWORK IN NINGXIA

Application of the framework in Ningxia highlighted some important lessons and insights for wider application of adaptation measures in China and elsewhere:

- Adaptation must be seen as an ongoing process
- There is a need for awareness raising, flexible treatment of the framework and co-ordinated management across sectors
- Climate risks and adaptation priorities vary across the region and sectors
- Opportunities for adaptation lie in reducing vulnerability to existing climate hazards
- Consultation with stakeholders at all stages of the framework is crucial for identifying appropriate adaptation measures
- There are no blueprints for moving adaptation into the mainstream of policy. Local context is critical.

FURTHER INFORMATION

The full report, *Adaptation Framework and Strategy*, together with all the other reports and six summary pamphlets from the project, are available from the project website www.china-climate-adapt.org .

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