

# Global Food Security: How do ecosystem services improve the lives of the poor?

Paul van Gardingen

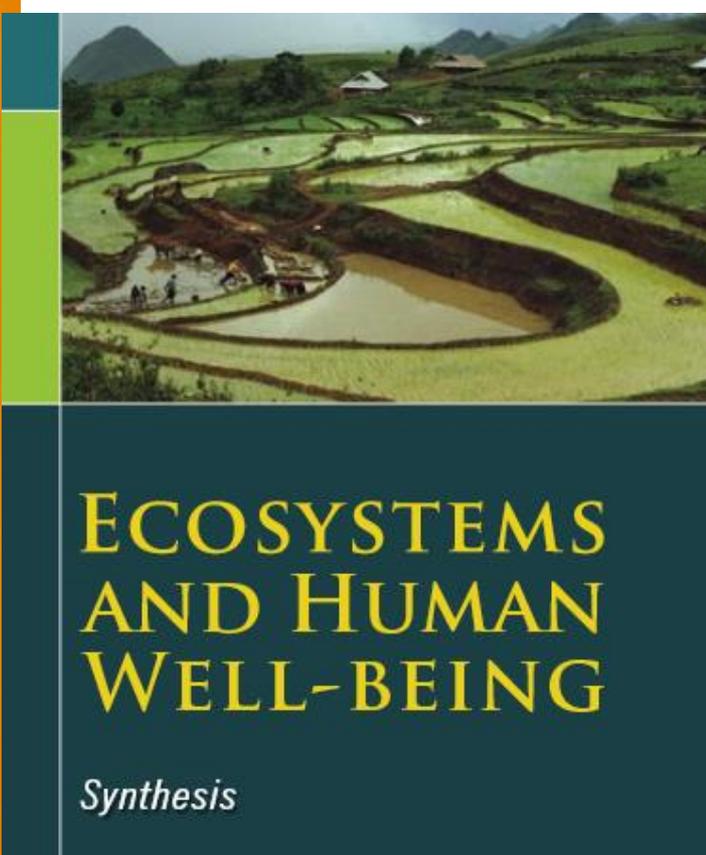
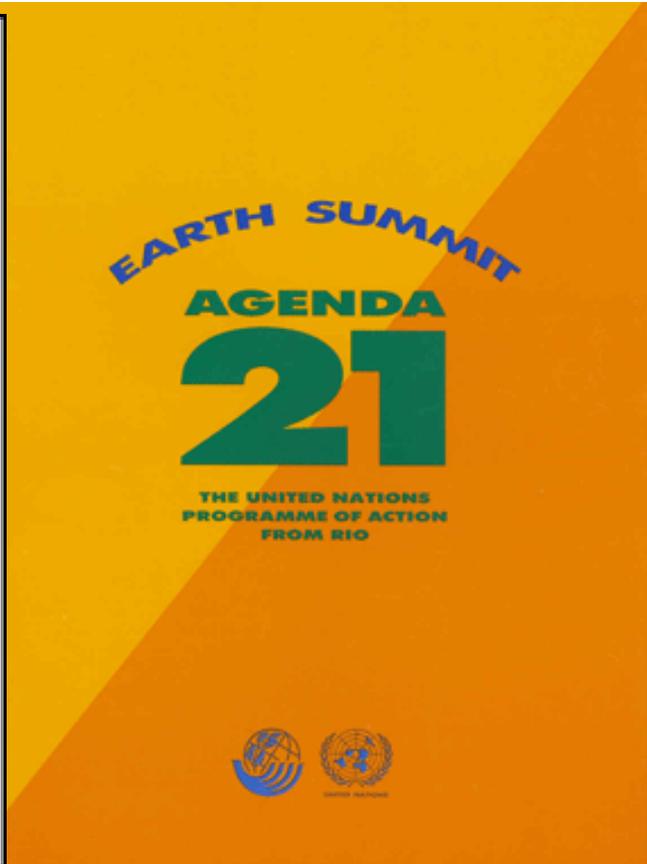
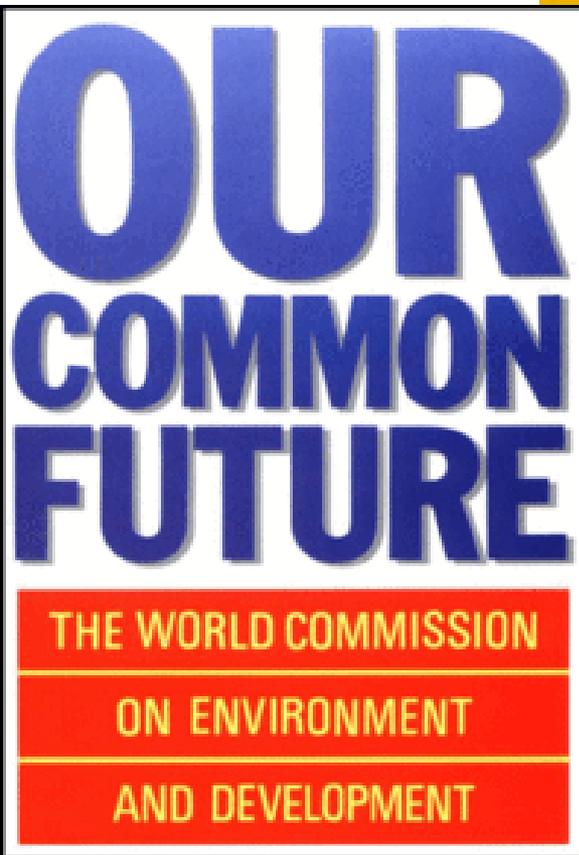
ESPA Director  
UNESCO Chair in International Development



# Outline

- What are Ecosystem Services?
- What is Food Security
- Sustainable Development Goals
- Examples from ESPA Projects.
- Trade-offs and Tipping Points
- Food-Water-Energy Nexus
- Lessons Learnt from ESPA
- Moving Forward

# Where ESPA came from



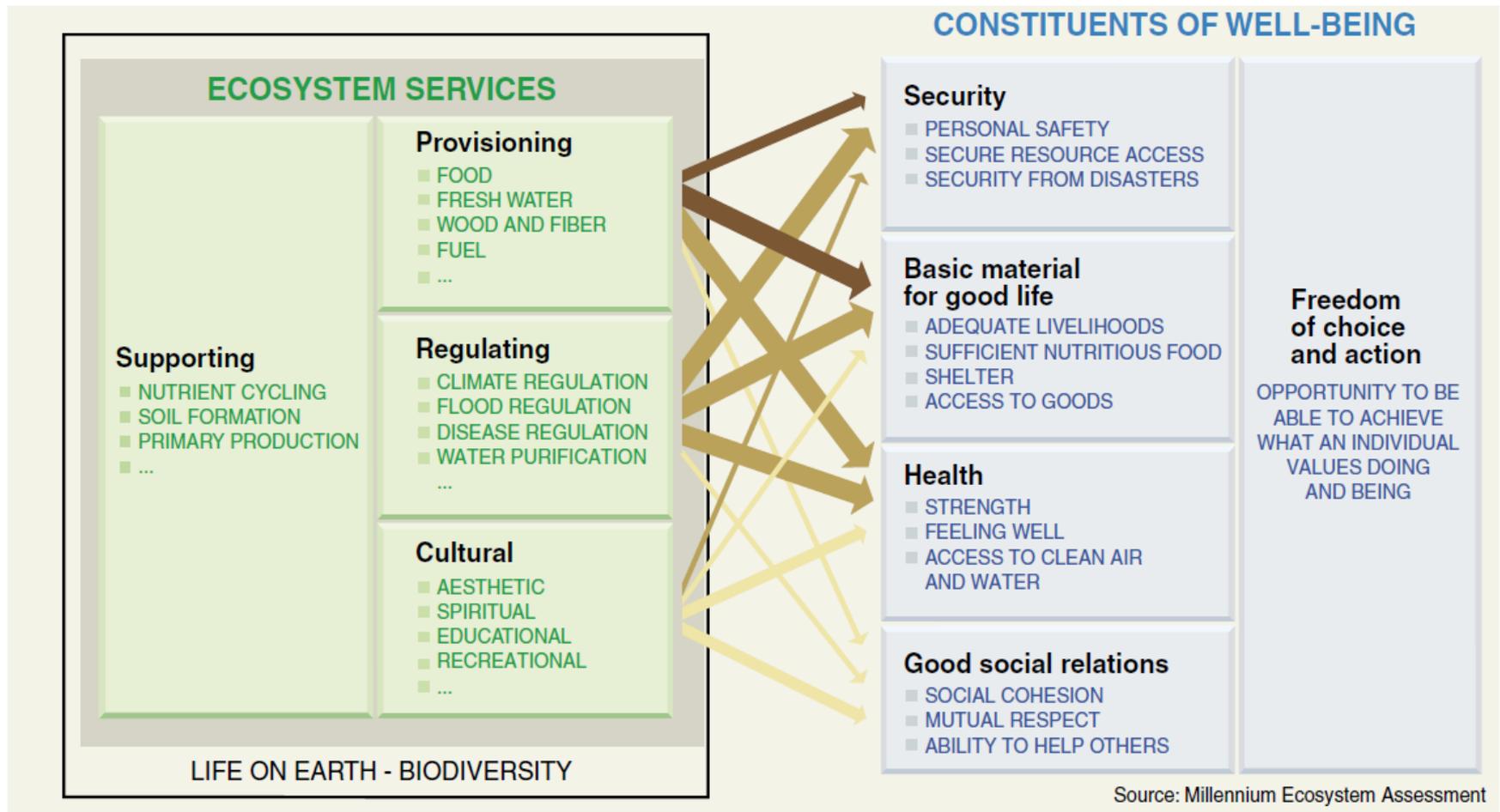
# My Starting Point



# Definitions Matter: Ecosystem Services

- *Millennium Ecosystem Assessment:*
  - An **ecosystem** is a dynamic complex of plant, animal, and microorganism communities and the non-living environment interacting as a functional unit.
  - **Ecosystem services** are the **benefits people obtain from ecosystems**.
  - People are integral parts of ecosystems

# Millennium Ecosystem Assessment



# Definitions Matter: Food Security

- Wood Food Summit 1996:
  - when all people, at all times, have physical, social and economic access to **sufficient, safe and nutritious** food to **meet their dietary needs** and food preferences for **an active and healthy life**”
- World Summit of Food Security 2009
  - four pillars of food security are **availability, access, utilization, and stability**
  - the **nutritional dimension** is integral to Food Security

# Poverty Alleviation / Human Well Being

- Food security and nutrition
- Fuel and energy
- Water
- Employment
- Income and assets
- Health
- Resilience
- Housing
- Access to public goods
- Culture
- Education and skills

# Ecosystem Services, Food Security and Poverty Alleviation

- **Question 1:**

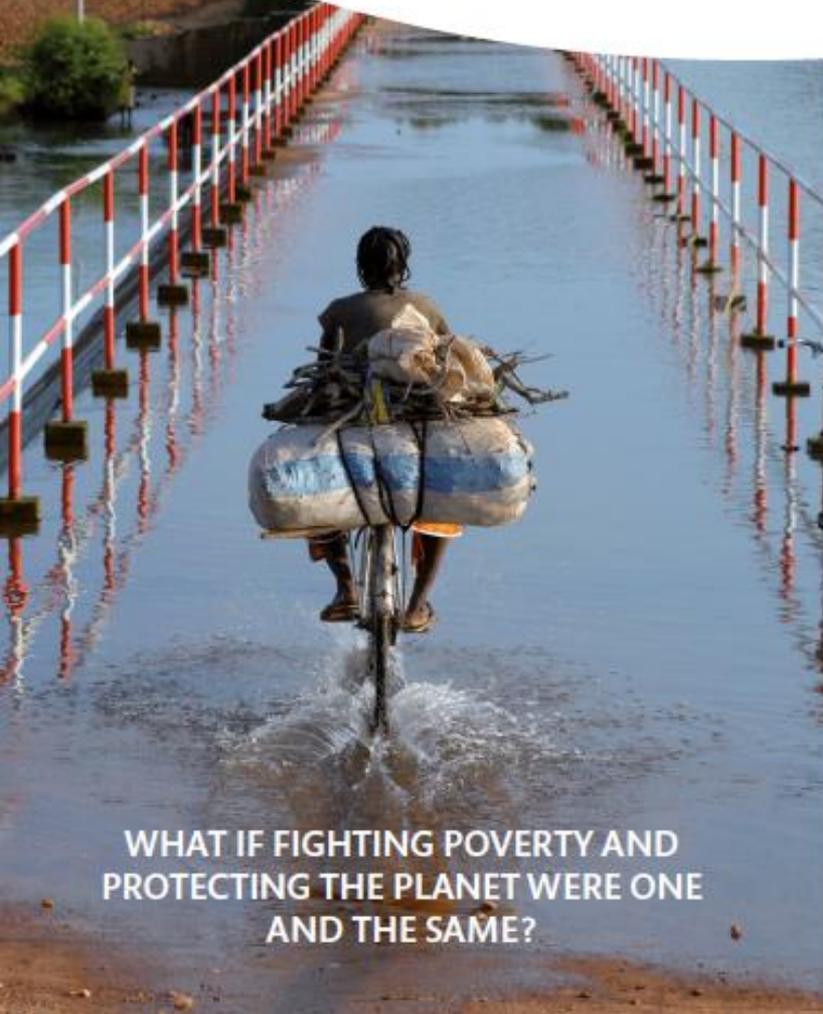
*How do ecosystem services contribute to food security and enhance human well-being?*

- **Question 2:**

*Which synergies and trade-offs exist between food security and other ecosystem services?*

# ESPA's Research Framework





WHAT IF FIGHTING POVERTY AND  
PROTECTING THE PLANET WERE ONE  
AND THE SAME?



MUST  
BECAUSE THEY ~~COULD~~ BE ...



United Nations

A/CONF.216/L.1\*



**RIO+20**  
United Nations Conference  
on Sustainable Development

Distr.: Limited  
19 June 2012

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Rio de Janeiro, Brazil  
20-22 June 2012

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Agenda item 10  
**Outcome of the Conference**

**The future we want**

**I. Our common vision**

# Where can ESPA's Research Evidence Contribute to the SDGs?

1. End poverty in all its forms everywhere
2. End hunger, achieve food security and adequate nutrition for all, and promote sustainable agriculture
6. Secure water and sanitation for all for a sustainable world
14. Attain conservation and sustainable use of marine resources, oceans and seas
15. Protect and restore terrestrial ecosystems and halt all biodiversity loss

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# Examples from ESPA Projects

Africa

Asia

South America

# SDG-2: End hunger, achieve food security and adequate nutrition for all

- ESPA Assets project working in Colombia, Peru and Malawi aims to inform policy makers on how future land use and climate change will affect both food security and the ecosystem services associated with it



# Colombia

- ESPA ASSETS.  
Food security and health at the forest/agriculture interface.
- Some amount of disturbance to natural ecosystems is ***required*** to meet the needs of humanity...



# Food Security in Malawi

- Most systems need to be managed as a mosaic of land-uses and services.
- There may be an optimal level of ecosystem change or disturbance.



# Understanding Costs and Benefits

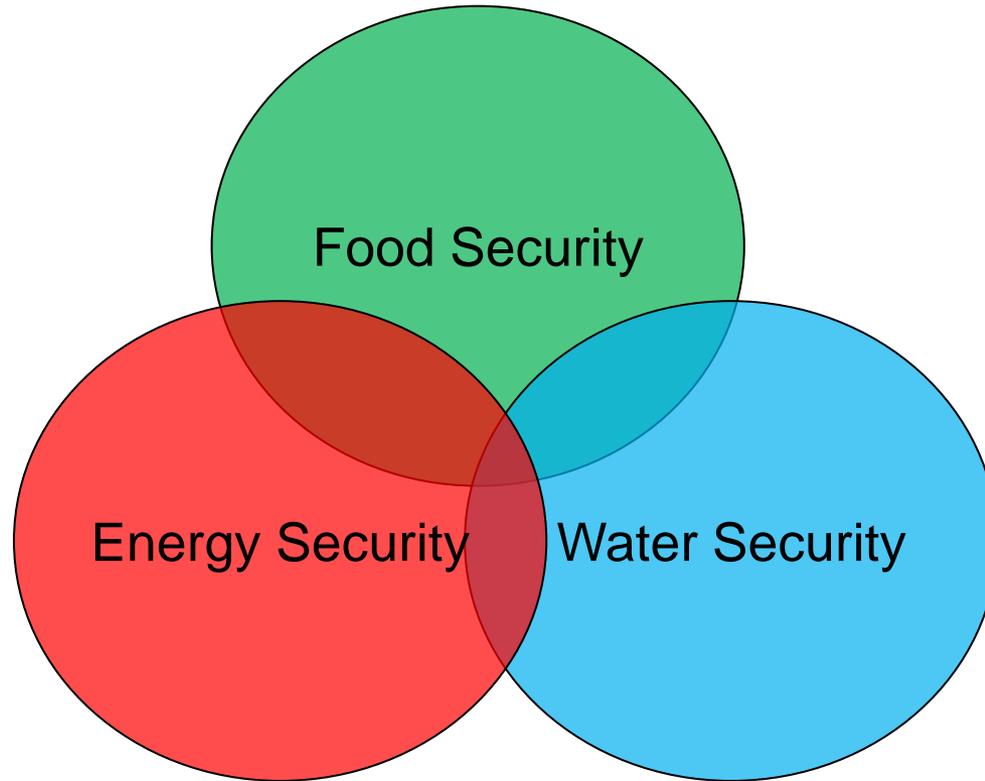
- Better management of ecosystems for a range of services will help to reduce poverty.



# Bangladesh

- The ESPA Deltas is generating evidence on how ecosystems contribute to poverty alleviation and health and sensitivity to climate and land-use change





# Malawi

Equity



Health

Distribution



Soils



# Nepal

Sustainability



Tourism



Climate Change

# Environmental Change and Tipping Points

- Exceeding “tipping points” leads to significant losses of ecosystem services.
  - It is much more difficult to restore services.
- There are often early warning signs of the loss of ecosystem services



# Extending the timescales of ecosystem services through palaeoecology exemplified in the Yangtze basin

John A. Dearing<sup>a,1</sup>, Xiangdong Yan<sup>a</sup>, Weiguo Zhang<sup>c</sup>, and Terence P. Dunning<sup>d</sup>

<sup>a</sup>Palaeoecological Laboratory, Geography Lake Science and Environment, Nanjing University, Nanjing 210008, People's Republic of China; <sup>b</sup>State Key Laboratory of Estuarine and Coastal Environment, University of Dundee, Dundee, Scotland, UK; <sup>c</sup>State Key Laboratory of Estuarine and Coastal Environment, University of Dundee, Dundee, Scotland, UK; <sup>d</sup>School of the Environment, University of Dundee, Dundee, Scotland, UK

## of ecosystem services, making an impact

Learning from ESPA research



### Unearthing history, preventing disaster

Long-term regional records of ecological and economic change can inform development planning



OCTOBER 2011  
**ABOUT THIS PROJECT**  
 Name: Poverty and ecology: developing a new evolutionary approach  
 Principal Investigator: John Dearing, University of Southampton  
 Partners: Zhang Weiguo, East China Normal University; Yang Xiangdong, Nanjing Institute of Geography and Limnology; Terence Dawson, University of Dundee; Paul Gilboa, University of Durham.  
 Time frame: February 2011 to January 2013  
 ESPA regions: China  
 ESPA themes: Biodiversity, coasts, forests, health, political economy, water

**Objective**  
 To provide a longer term perspective on how environmental change, ecosystem services and poverty interact over decades, including models, for policy and sustainable management strategies.

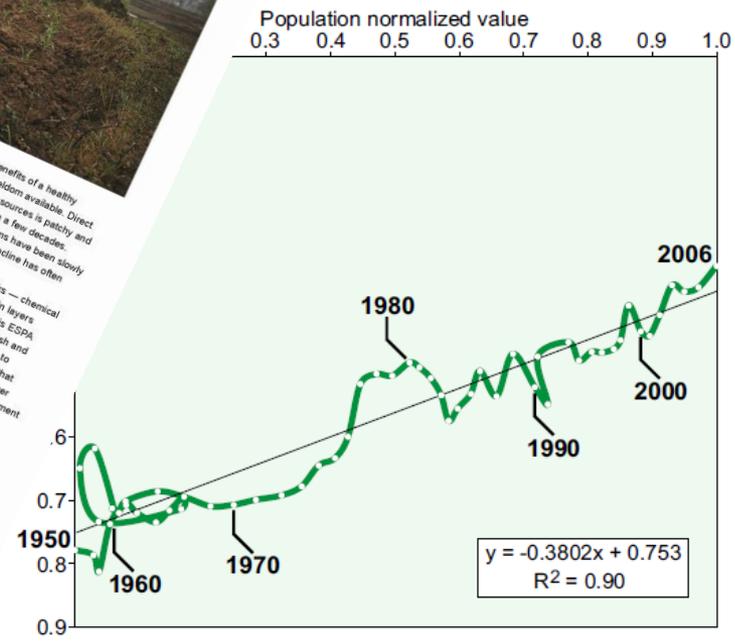
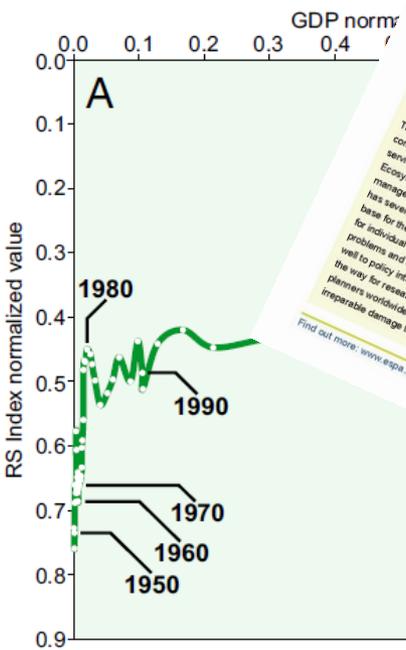
**Summary**  
 Ecosystems under human pressure can undergo irreversible shifts, including the collapse of essential services such as water quality. Anticipating such tipping points is vital to understand links between economic and environmental change — and avoid avert ruin for poor communities — and avoid analysing linked trends over the long term. This project, set in eastern China, has completed the world's first data on ecosystem services over decades. A combined Ecovision Index shows regional base for the farming economy. Trends in individual resources highlight urgent problems and those that have responded well to policy interventions. The work points the way for researchers and development partners worldwide to predict, and avoid, irreparable damage to regional ecosystems.

In the fertile basin along the Yangtze river in eastern China, farmers today look out on a different landscape from previous generations. Like most of the country, this region has adopted intensive agricultural practices since the 1970s, boosting yields with fertilisers and pesticides. GDP has shot up and some people are better off than the previous generation — but rural poverty remains widespread and the gap between rich and poor continues to grow. There are signs that the new practices are badly damaging the natural systems that farmers rely on. Some local water sources are contaminated, and unstable soil has been washed away by floods. Could agricultural development be pushing these systems to the point of collapse, making crisis for poor communities?

This ESPA-funded research offers crucial data to answer the question of how 'ecosystem services' have fared in the region over the past 150 years and what can be learnt from this for low income countries in other parts of the world.

**Uncovering the trends**  
 Across the world, long-term records of ecosystem services — water quality, soil

stability and other benefits of a healthy environment — are seldom available. Direct monitoring of natural resources is patchy and rarely extends back even a few decades. When particular ecosystems have been pushed to their limits, the decline has often gone unnoticed. But the changes have left tracks — chemical and biological traces deposited in layers of lake sediment. For example, this ESPA project, a partnership between British and Chinese scientists, used these cities to reconstruct the history of six systems that regulate environmental health in the lower Yangtze basin: air and water quality, sediment quality and regulation, soil stability and biodiversity.



# Food Security: At what cost?

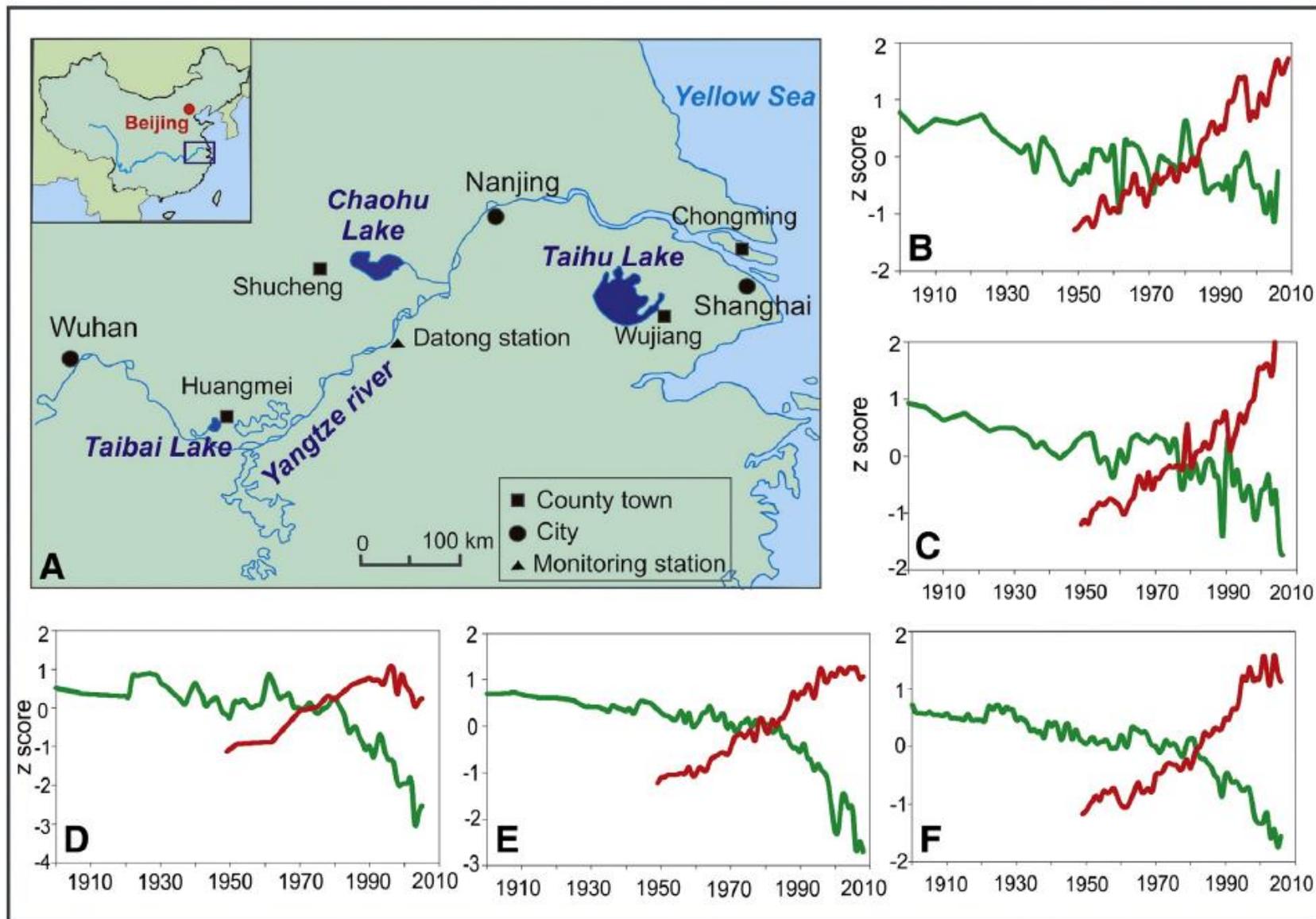


Fig. 1. Long term trends of provisioning services and regulating services in the LYB during the period 1900–2006. A) Map showing study site and locations with names. B–F) Indi

# Governance and Policy Challenges



- Local people are often excluded from the decisions determining how they can benefit from ecosystems.
- Policy is often disjointed and its implementation limited by lack of resources and enforcements
- Justice and Equity lacking

# Can Ecosystem Services Reduce Poverty?



# Yes..... But!

- It's often difficult to reach the poor.
- Households require access to key capitals
  - Land, water, natural resources, finance, social, education.
- Good governance, effective institutions and markets are often required
- Capacity strengthening needs to be addressed



# Enabling Conditions

- Access to key capitals:
  - Land, social, financial, infrastructure, markets.
- Good governance is essential, but don't just focus on policy!
- Land-use planning and management
  - Mosaics of land/water user
- Community-based organisations can help facilitate change
  - Including social enterprises. Multi-functional

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# Ecosystem Services, Food Security and Poverty Alleviation

- **Question 1:**

*How do ecosystem services contribute to food security and enhance human well-being?*

- **Answer:**

*Ecosystem services are essential in supporting current and future food security.*

*– Water, soil, climate and disease regulation ++*

# Ecosystem Services, Food Security and Poverty Alleviation

- **Question 2:**  
*Which synergies and trade-offs exist between food security and other ecosystem services?*
- **Answer:**
  - *Short-term approaches to deliver food security may lead to significant reductions in other ecosystem services.*
  - *Reductions in regulating ecosystem services may lead to reductions in agricultural productivity*

# Conclusions

- Food security is a key ecosystem service
- We need to understand the impact of agricultural production and food security on other ecosystem services.
- Food-water-energy nexus is critical
- Work with multiple ecosystem services and multiple dimensions of well being
- We need to consider landscapes as mosaics of ecosystems and land-uses.

# The Way Forward?

- **Sustainable Food Security?**
- Resilience
- Distributional considerations are important
  - Equity, justice, winners and losers ...
- Understanding decision making:
  - Giving people/communities a voice in decisions.
  - Environmental governance
- Enabling conditions
  - Innovation, institutions, policy, markets, investment, human capacity



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