

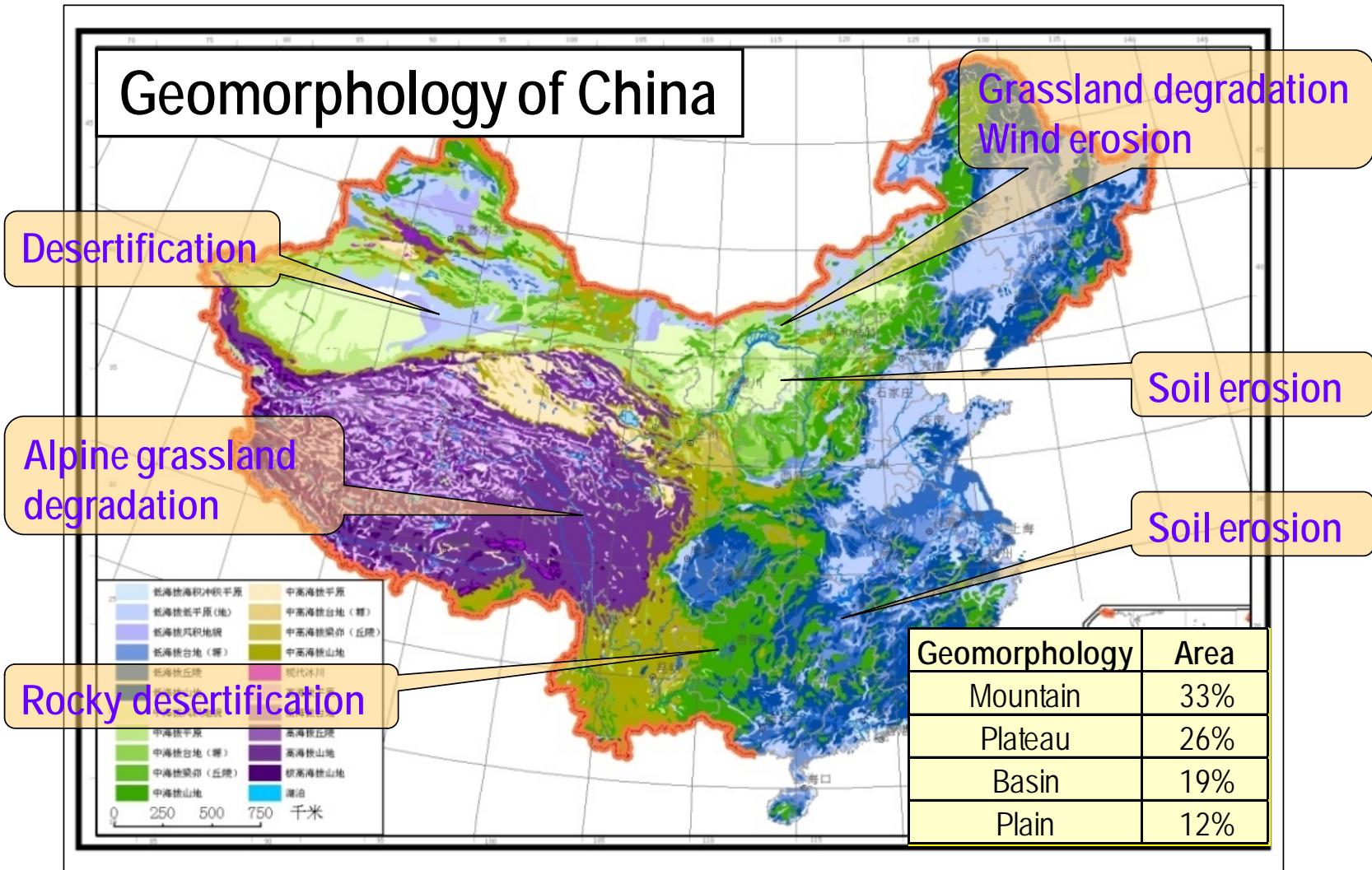


# Harmonizing People and Nature: China's First Ecosystem Services Assessment

Research Center for Eco-Environmental Sciences  
Chinese Academy of Sciences

# Background

Vulnerable ecosystems: > 60% of the total area



# Background – human activities

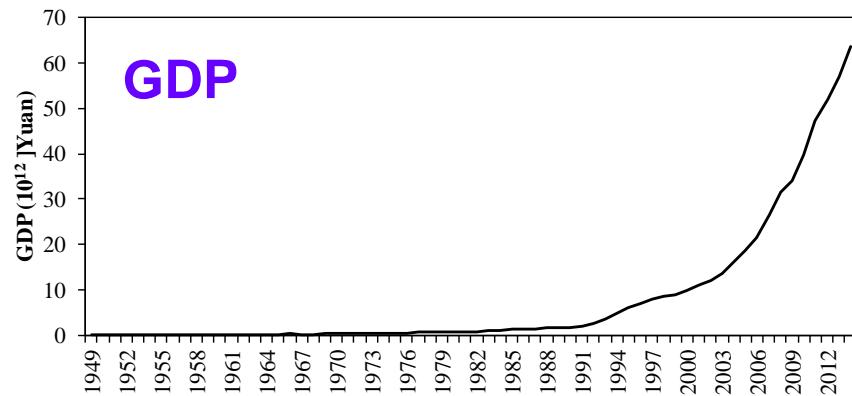
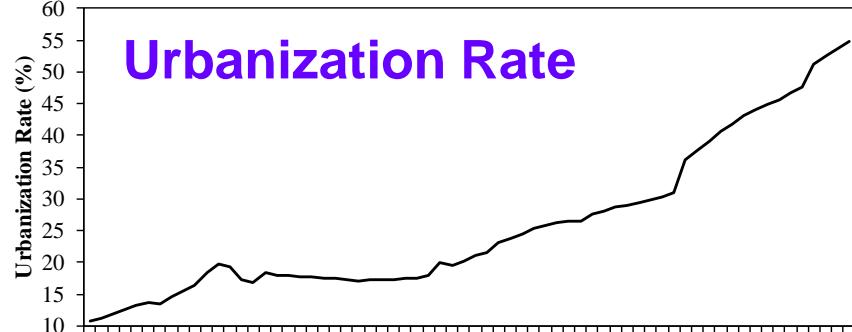
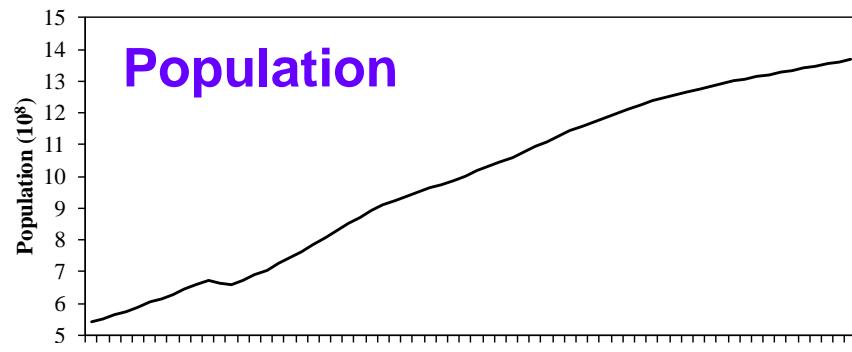
## Increased population pressure and human activities

2014:

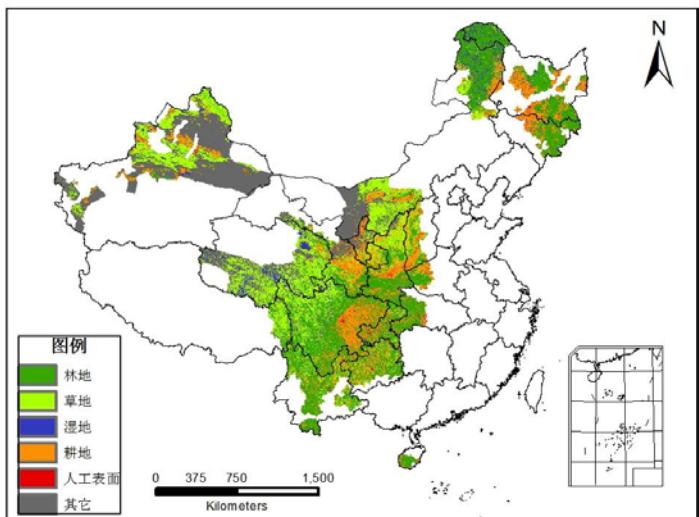
- Population: 1.37 billion
- Urbanization rate: 54.8%
- GDP: 63.6 trillion

2000-2014

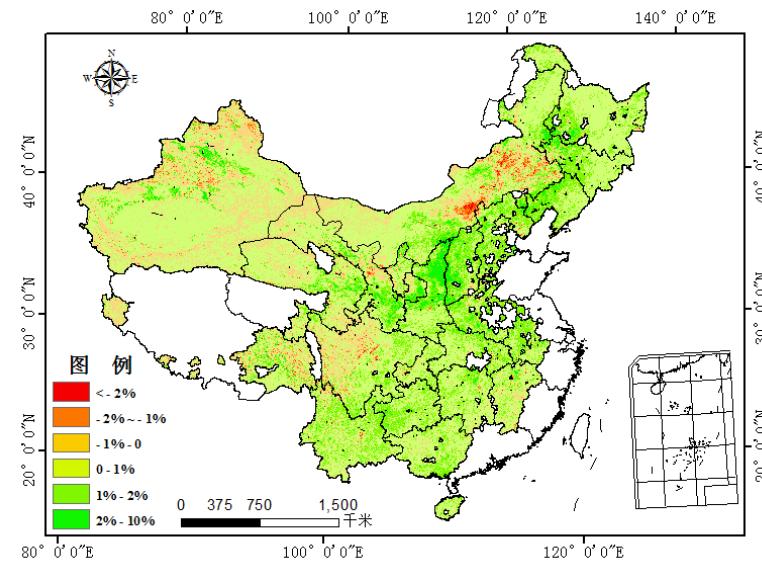
- Population: 0.1 billion
- Urbanization rate: 18.55%
- GDP: 5.4 times



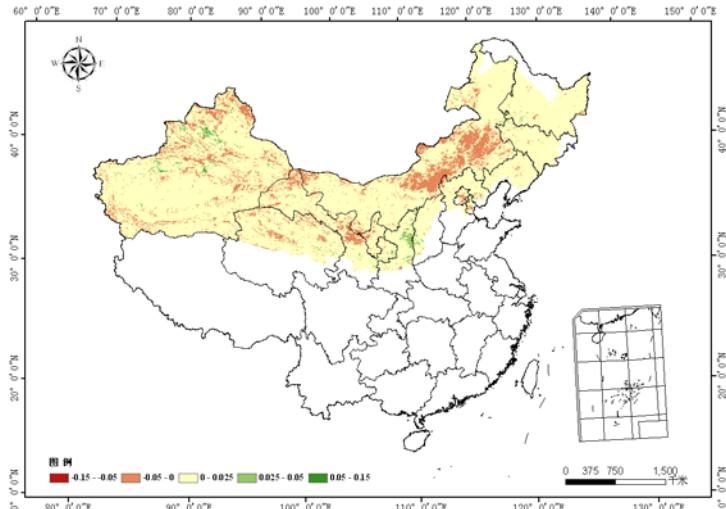
# Background – protect efforts



Natural Forest Conservation (NFC)



Sloping Land Conversion Program (SLCP)



Three-North Shelter Forest Construction (TNSFC)

Type	Scope	Investment (Billion Yuan)	Time
NFC	18 provinces 833 counties	>100	1998-2010
SLCP	25 provinces 1897 counties	237.2	1999-2010
TNSFC	13 provinces 600 counties	15.5	1978-2010

# Goals:

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## Build an overall image of ecosystem status

- Ecosystem distribution and patterns
- Ecosystem quality and their changes
- Ecosystem services and their changes

## Analyze ecosystem problems

- Grassland desertification, soil erosion, rocky desertification , wetland lost, wildlife habitat lost and fragmentation

## Identify driving forces of ecosystem changes

- Urbanization
- Human activities-impacts on ecosystems
- The effectiveness of conservation efforts (policies and restoration projects )

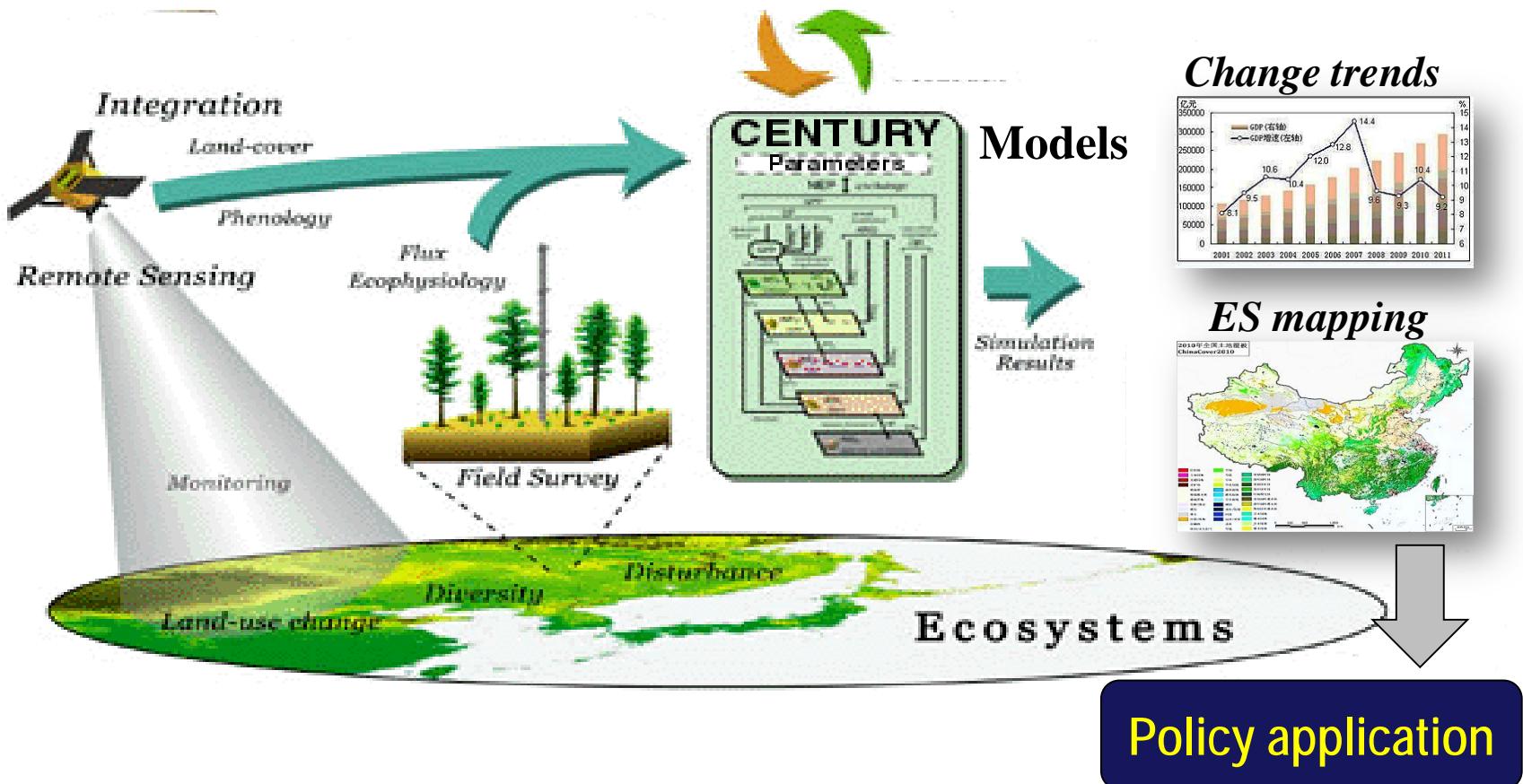
## Propose new management strategies and policies

# Assessment Framework and Index

## Ecosystem Pattern – Quality – Services – Problems – Driving forces

Aspects	Items	Aspects	Items
Ecosystem distribution and pattern	Ecosystem composition	Ecosystem degradation	Land degradation
	Landscape pattern		Forest degradation
	Transition of ecos-types		Grassland degradation
Ecosystem quality	Biomass	Ecological stressors	Wetland degradation
	Coverage		Natural stressing
	River dried up ratios		Economic activities
Ecosystem services	Habitat quality	Comprehensive assessment	Protection efforts
	Soil conservation		Pattern
	Water conservation		Quality
	Sandstorm prevention		Services
	Flooding mitigation		Degradation
	Product provision		Soil quality

# Assessment framework and implementation



■ Scales: Provincial (31) – Regional – National scales, 3000 scientists

# General information

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- Remote sensing data

- ✓ TM/China Satellite data: 16,355 images for 2000, 2005, 2010.
- ✓ MODIS data: 36 time series for 2000-2010

- Ground survey

- ✓ Ground validation sites: 114,500
- ✓ Sampled sites: 5,333

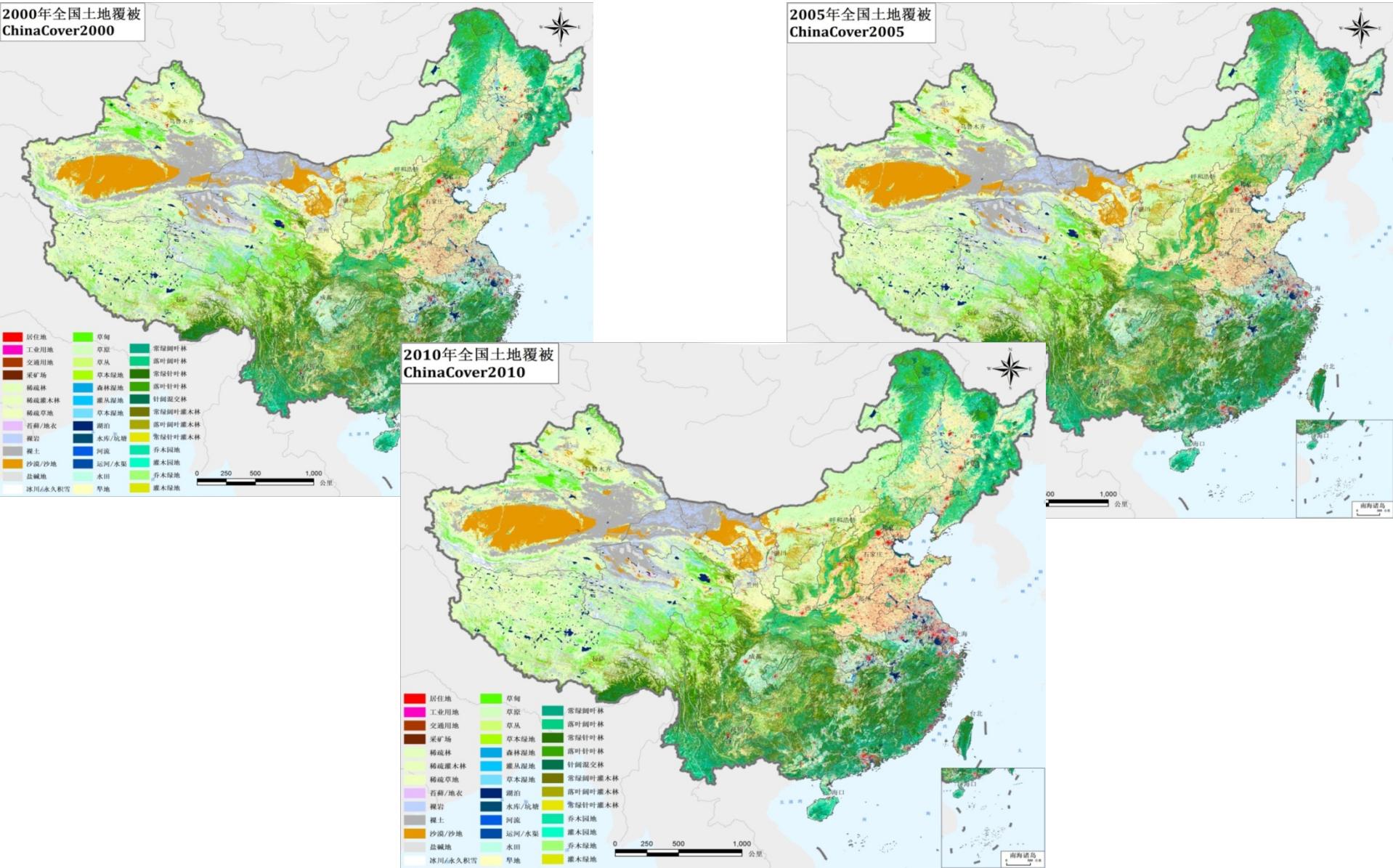
- Land cover / ecosystem cover classification

- ✓ 2000, 2005, 2010
- ✓ Accuracy are >90% for first class ecosystem classification and more than 85% for second class ecosystem classification

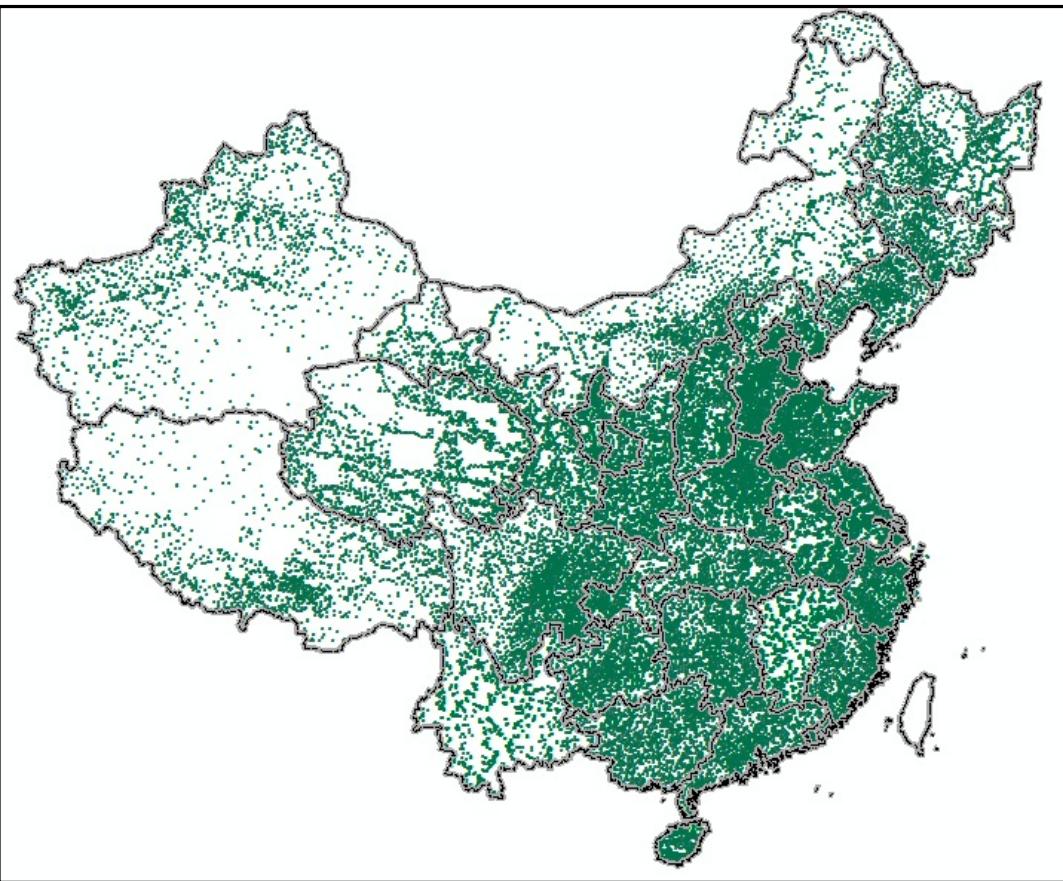
- Ecological parameters from remote sensing data

- ✓ Vegetation coverage, NPP for every 10 days during 2000-2010
- ✓ Biomass data for 2000, 2005, 2010

# General information



# General information

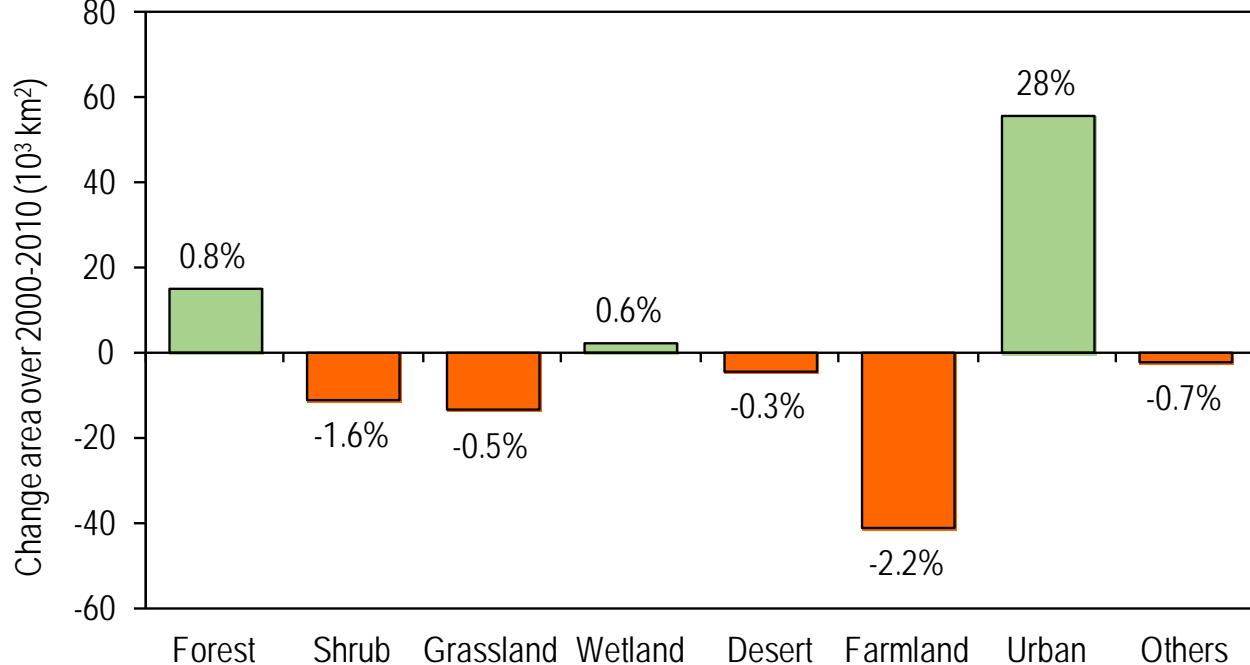
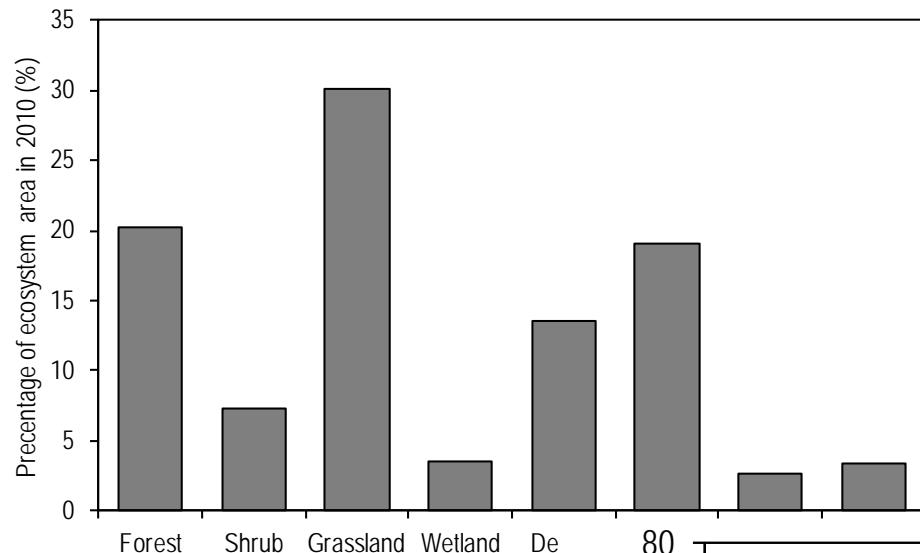


## Ground validation sites

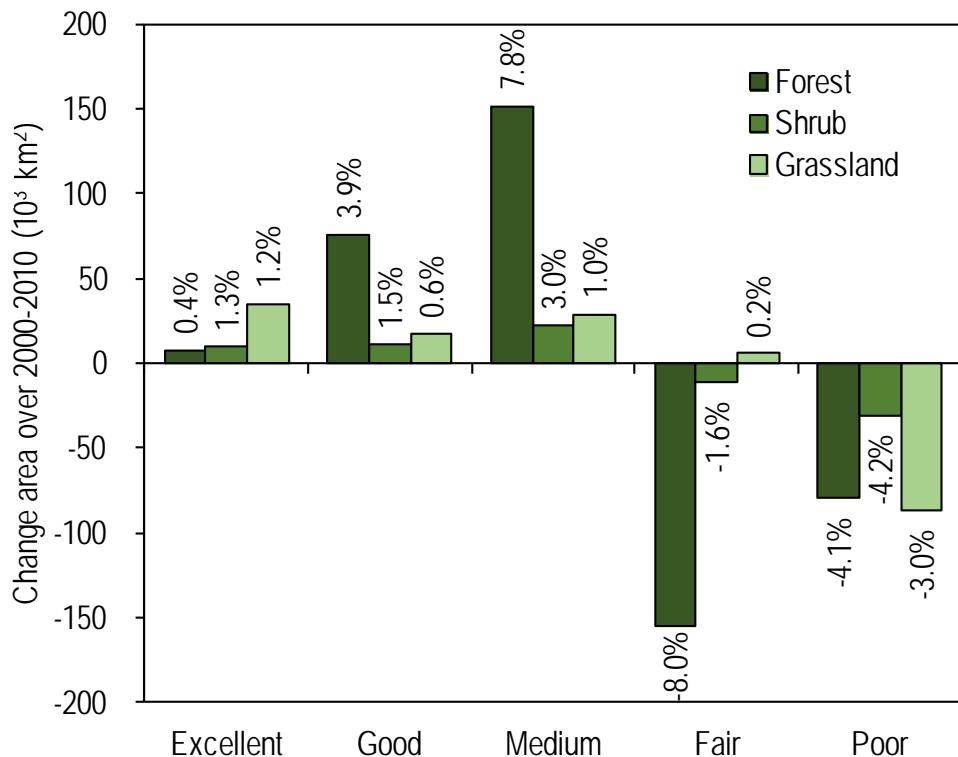
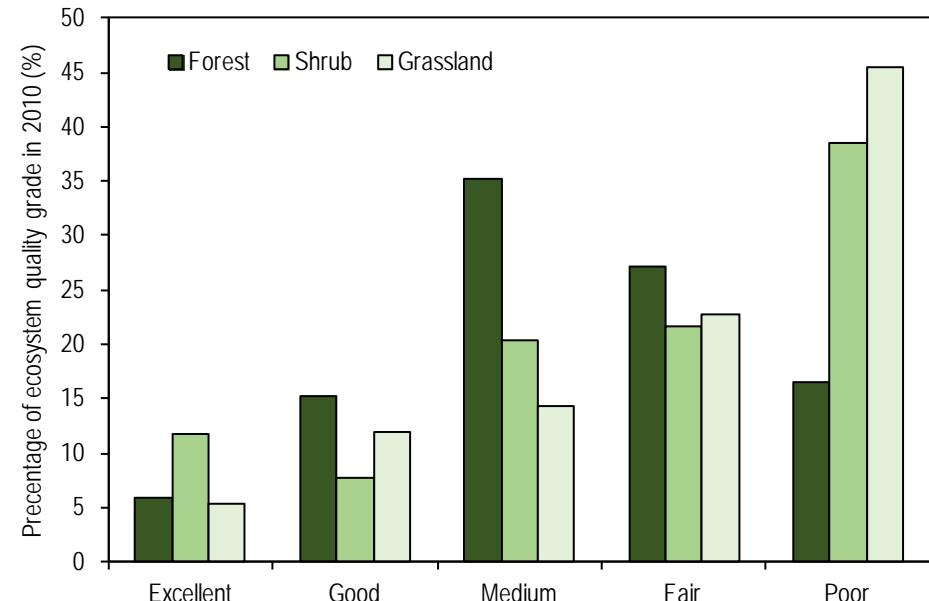
- 114,500



# Ecosystem changes over 2000-2010



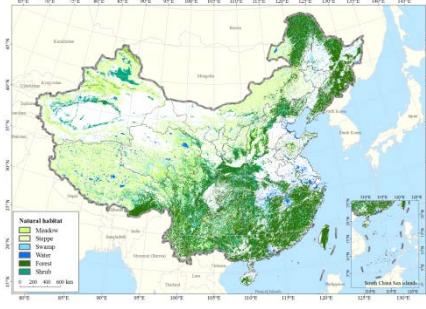
# Ecosystem quality changes over 2000-2010



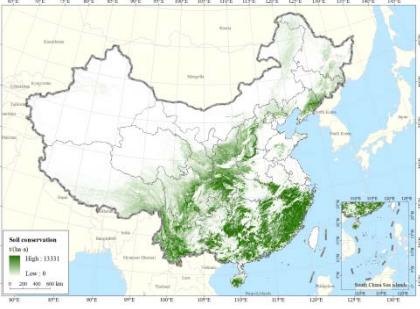
# Ecosystem service in 2010



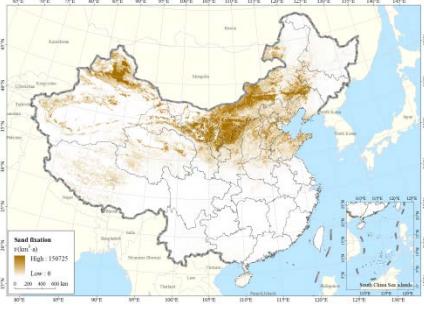
Food production



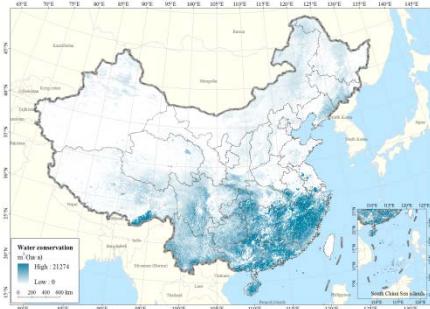
Biodiversity conservation



Soil conservation



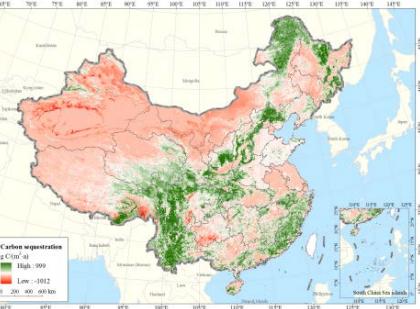
Sand fixation



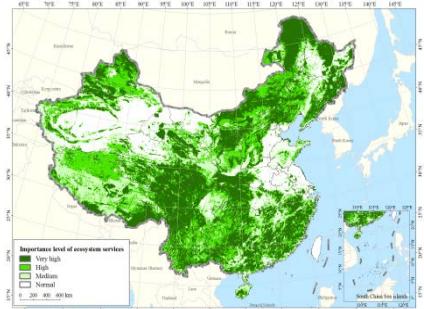
Water supply



Flood mitigation

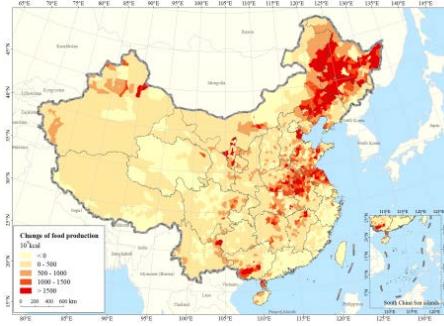


Carbon sequestration



Integrated importance

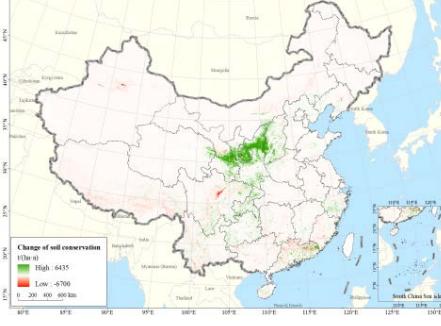
# Ecosystem service changes over 2000-2010



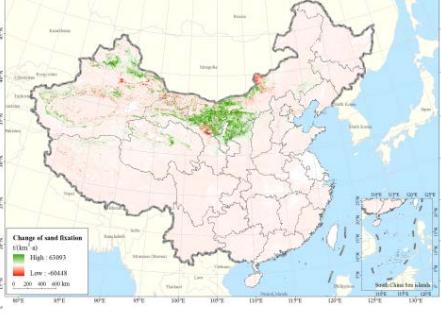
Food production



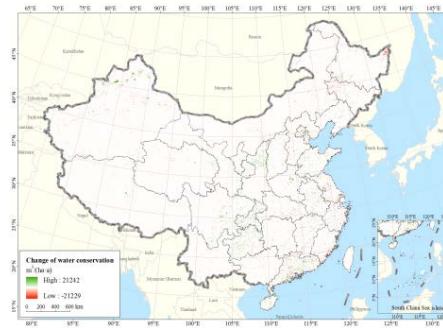
Biodiversity conservation



Soil conservation



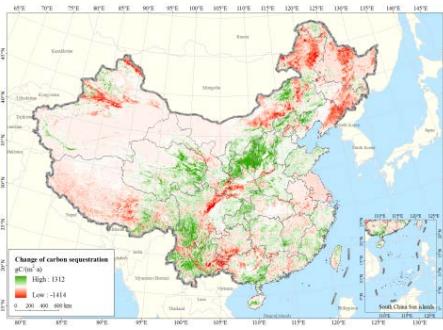
Sand fixation



Water supply

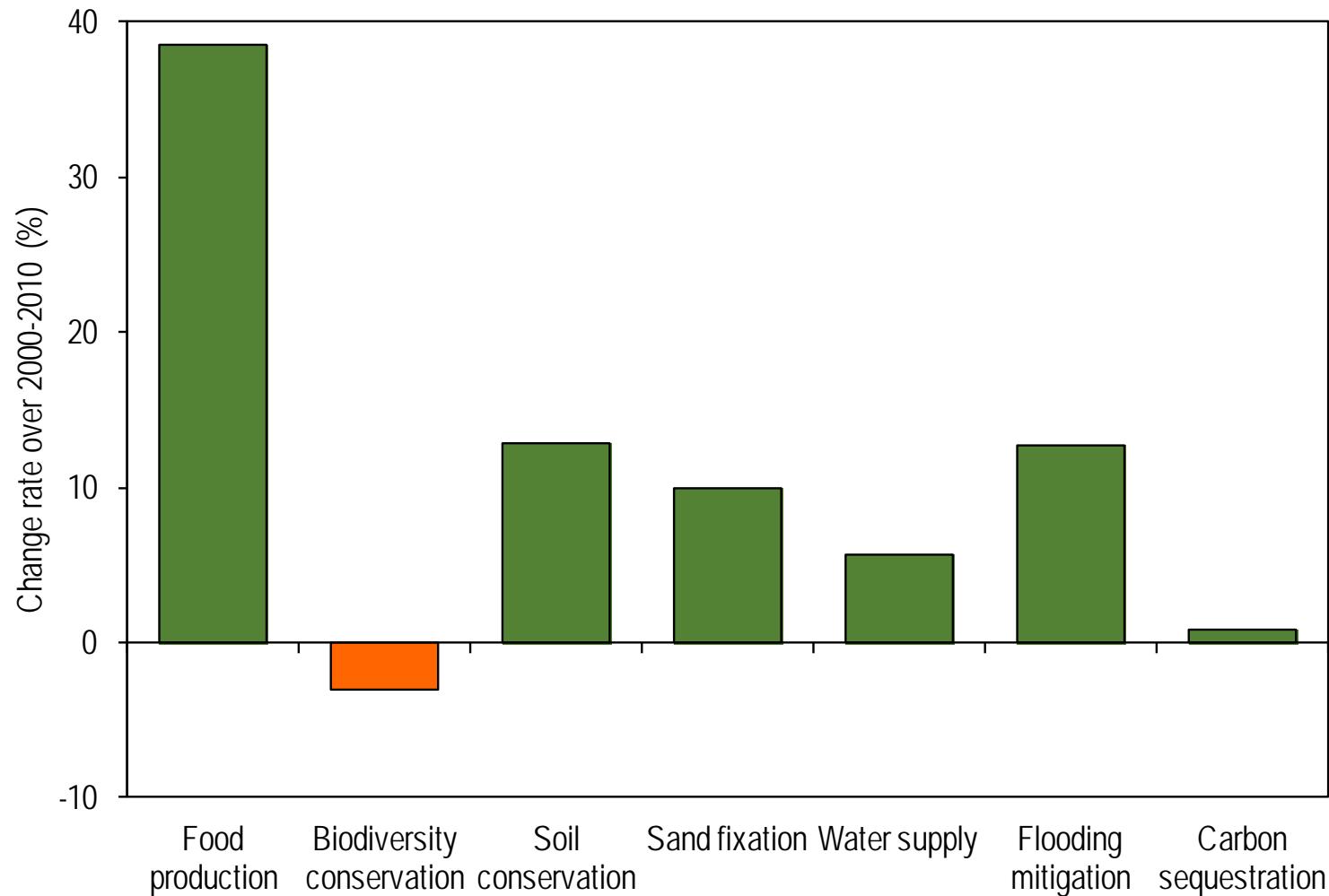


Flood mitigation

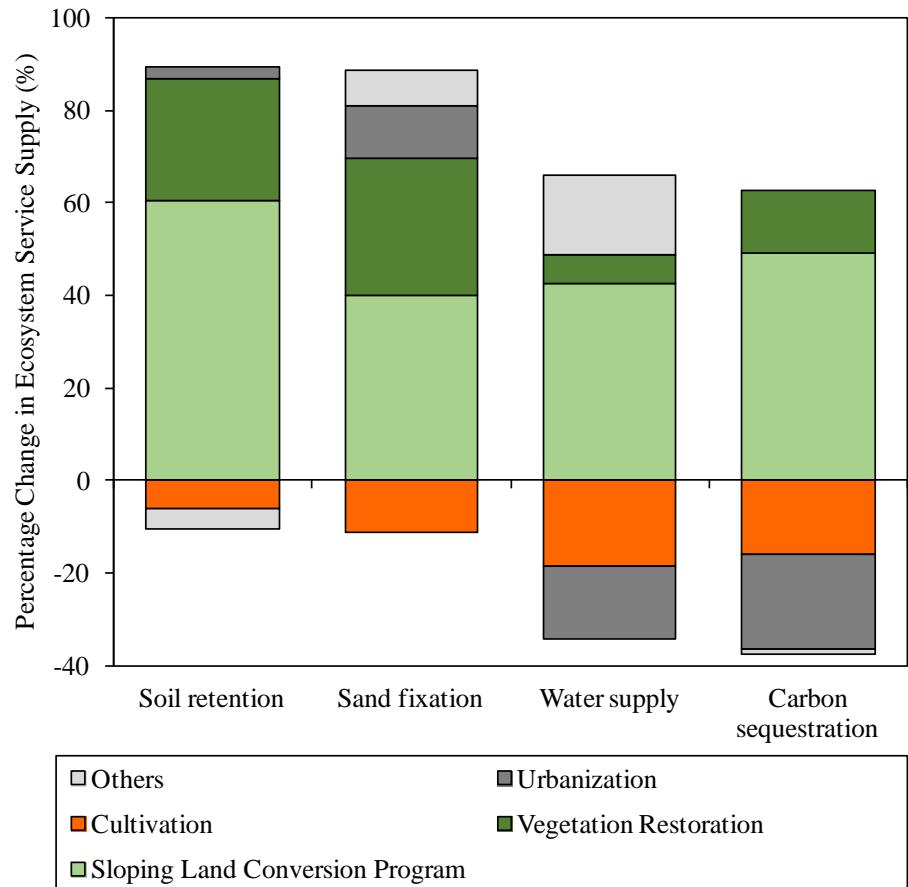
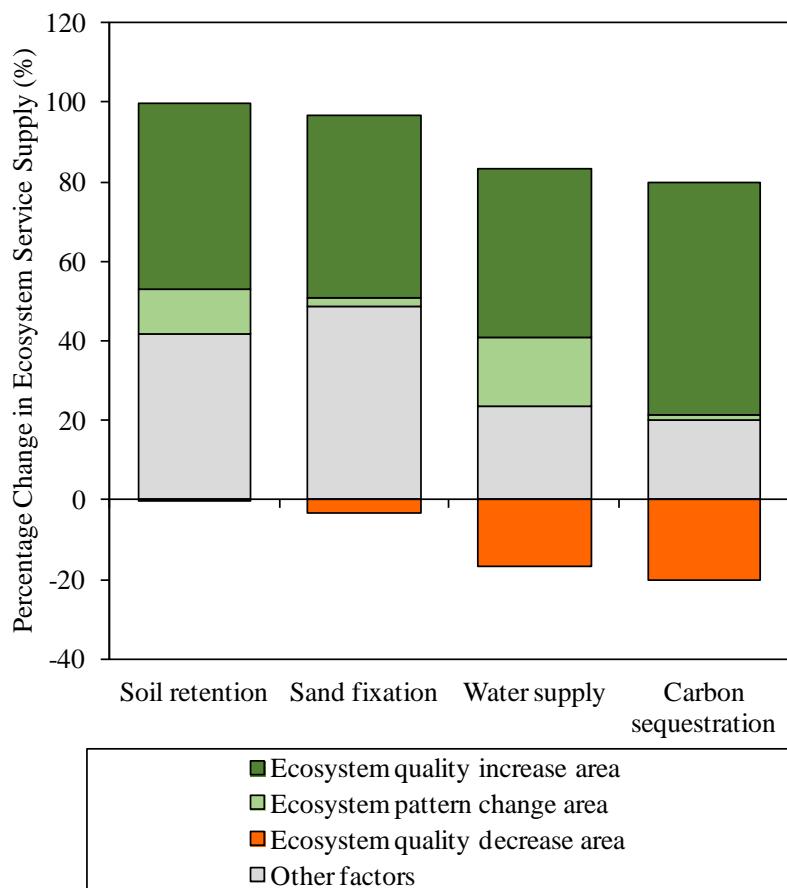


Carbon sequestration

# Ecosystem service changes over 2000-2010



# Driving forces for ES changes over 2000-2010



# Scientific supporting for decision-making

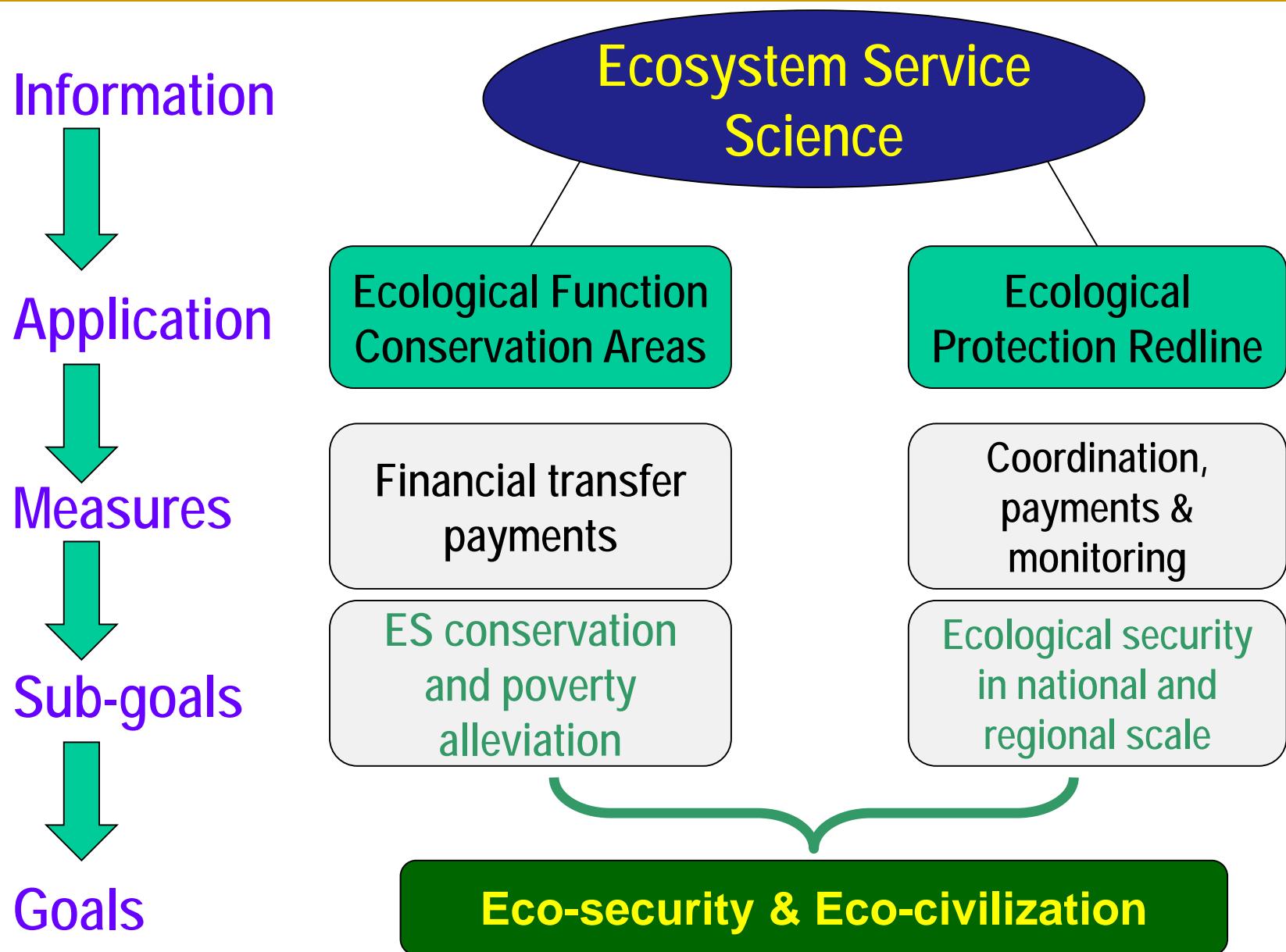
**General goals: China dream; Ecological civilization**

Coordinated development of economy, environment and livelihood

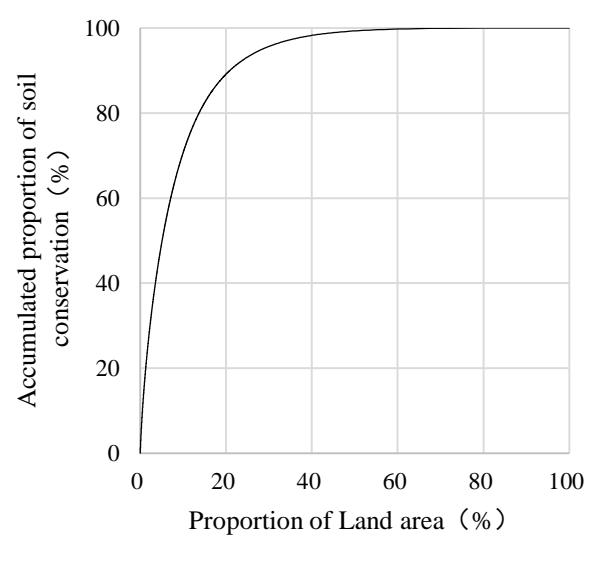
## Key questions

- Q1: Where we must protect for the purpose to coordinate conservation and development in national scale?
  
- Q2: How to implement strict land management to strengthen eco-security?

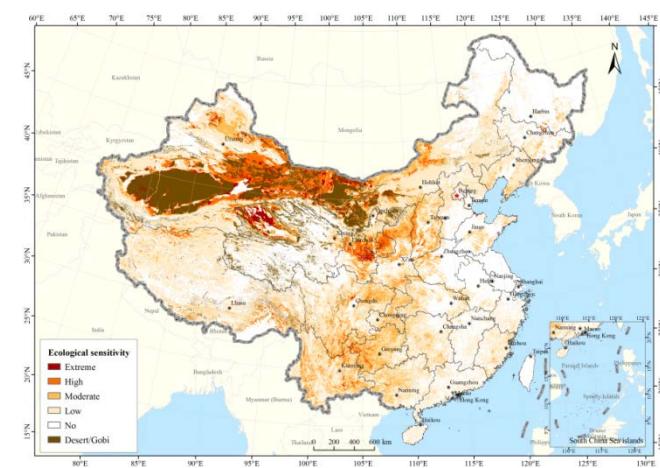
# Scientific supporting for decision-making



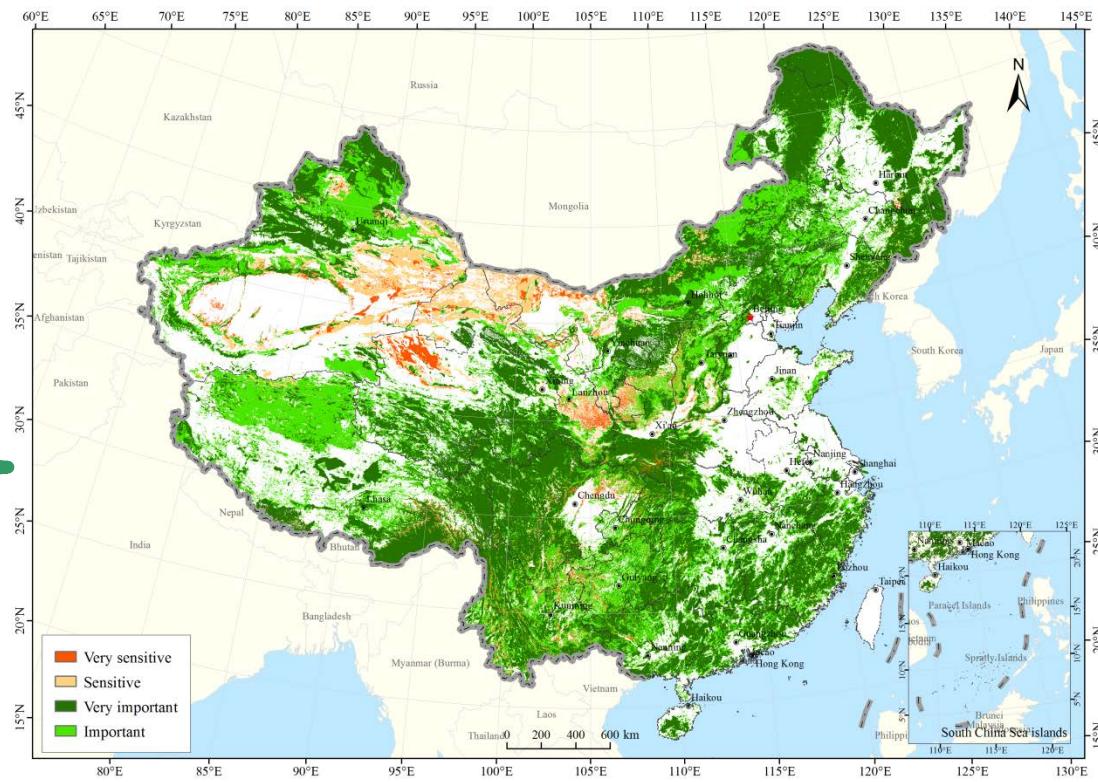
# Eco-importance assessment



Eco-importance



Eco-sensitivity

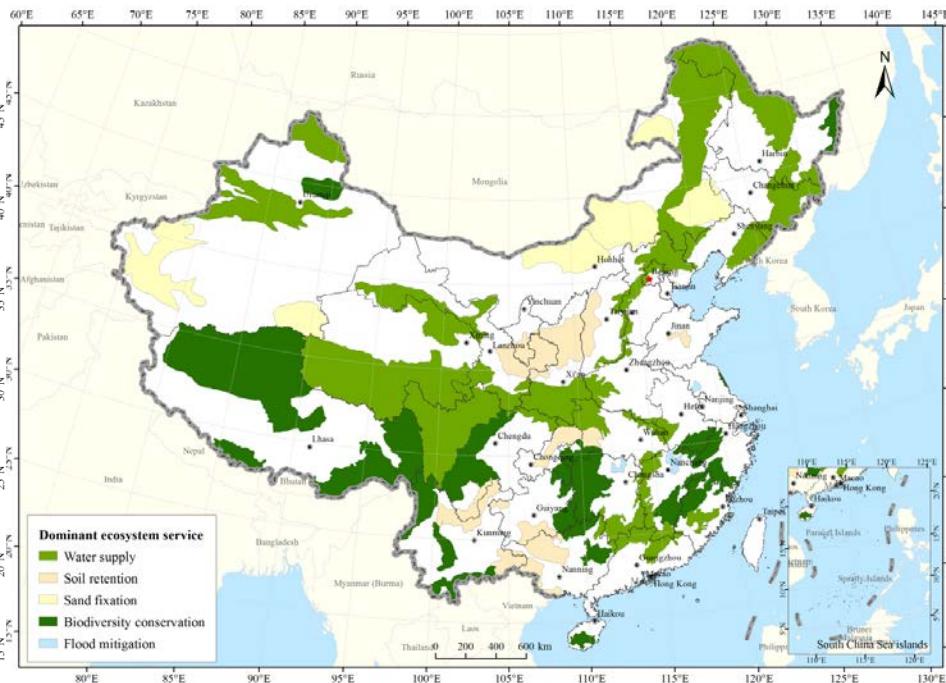


Eco-importance pattern

# 1 Ecological Functional Conservation Areas



EFCAs in 2008 (27%, 461 counties)



EFCAs in 2015 (45%, 865 counties)

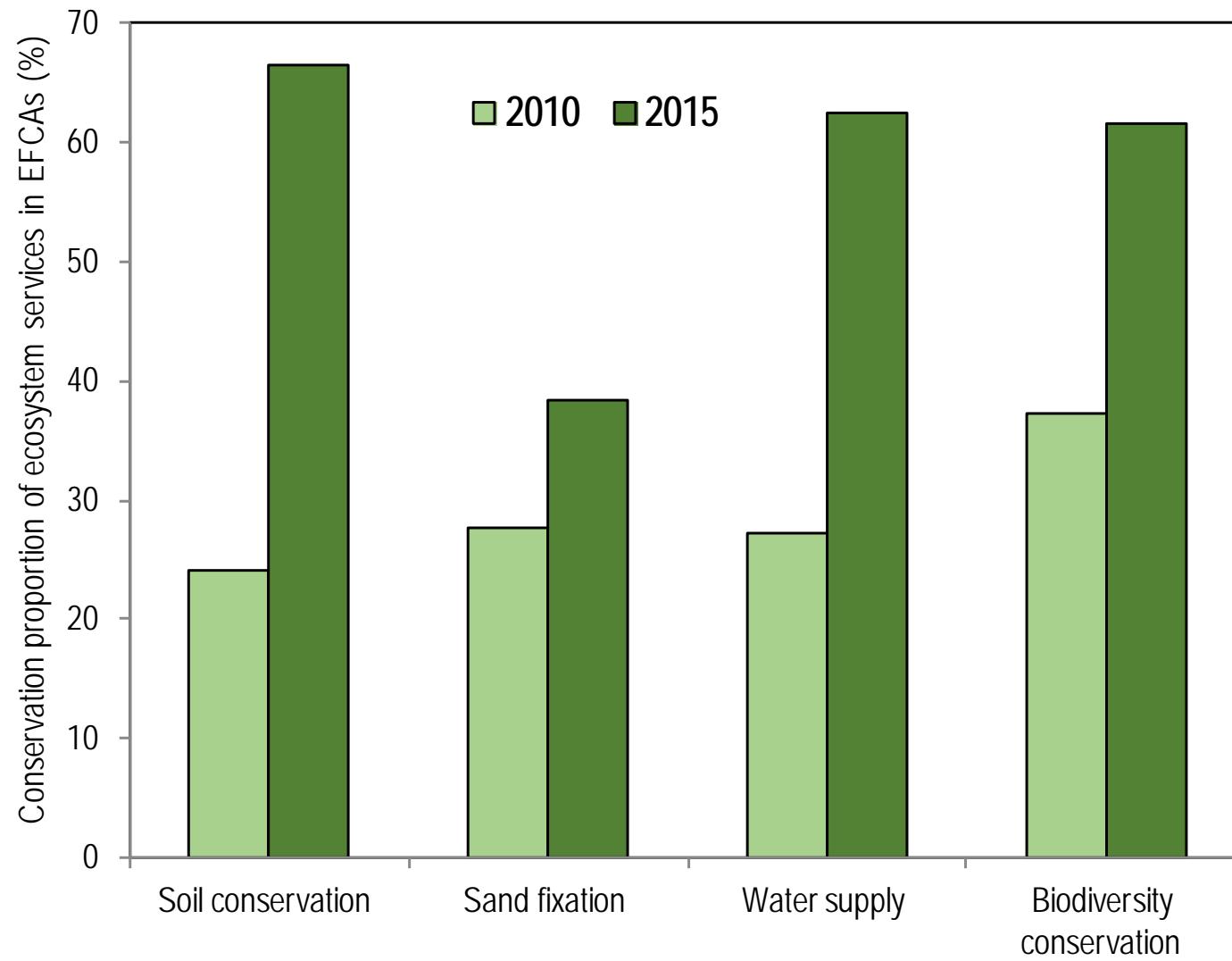
Financial transfer payment in EFCAs

(2008: 6 billion/221 counties)

(2014: 48 billion/512 counties)

Being applied by National Development and Reform Commission, Ministry of Environmental Protection

# 1 Ecological Functional Conservation Areas



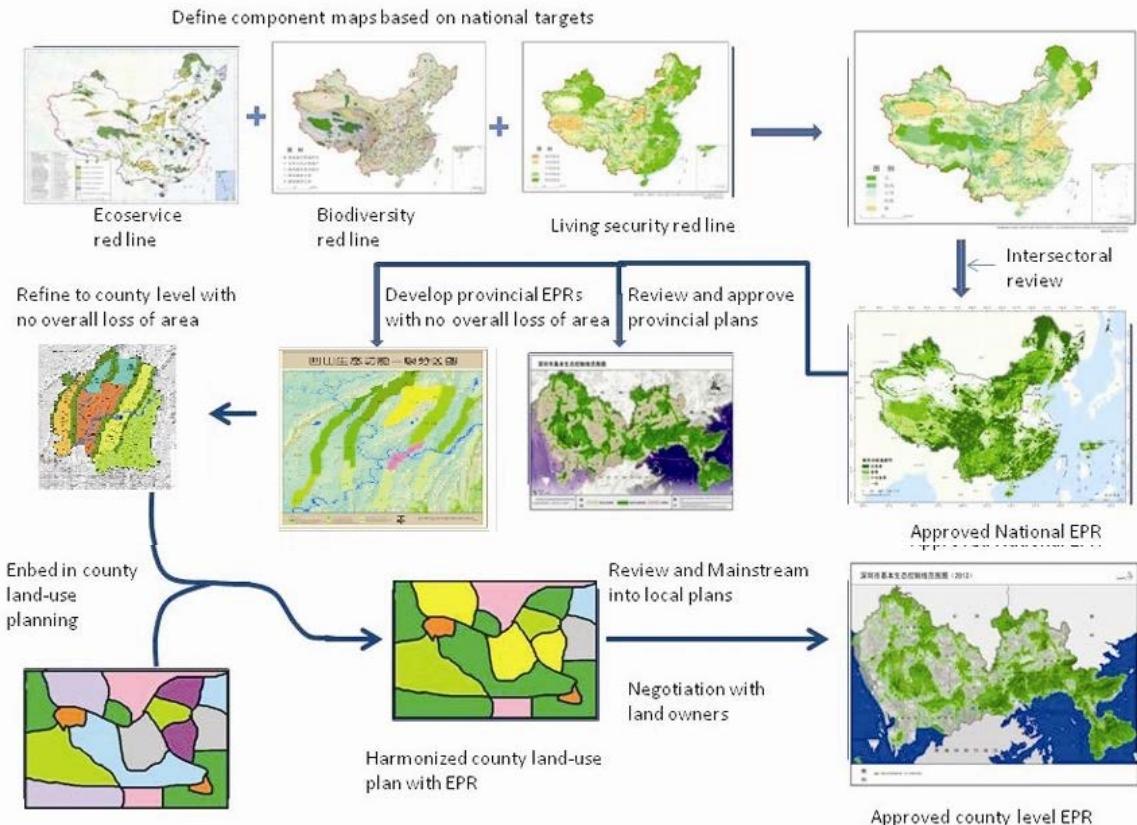
# 2 Ecological protection redline

## ■ Ecological Protection

**Redline** refers to the minimum space or area within which strict development controls can ensure the sustainable provision of ecosystem services

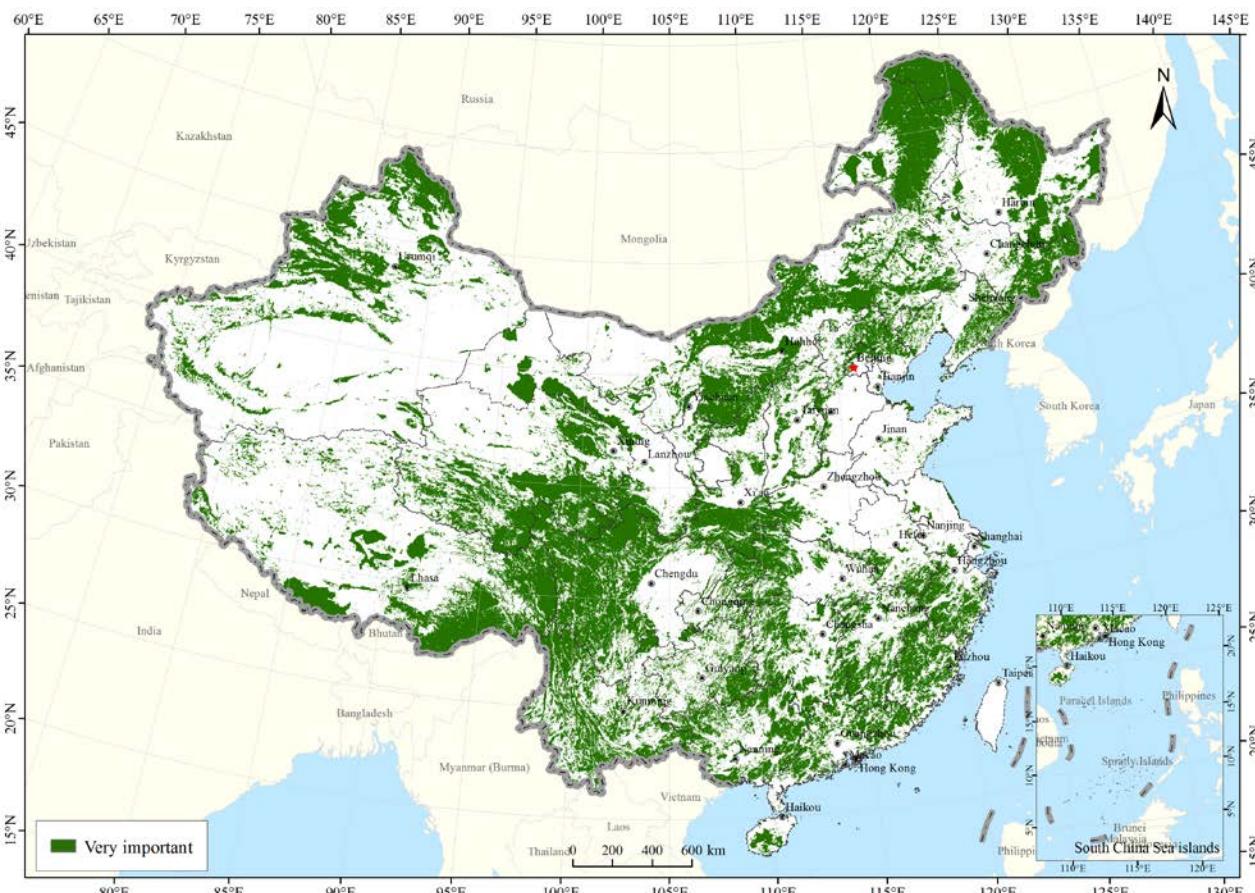
■ that underpin regional and national development and support the attainment of China's vision of an 'ecological civilization'

## Delineation steps of EPRL maps



Top-down + Bottom-up approaches

## 2 Ecological protection redline



- Soil conservation: 62.1%
- Water supply: 60.9%
- Sand fixation: 49.2%
- Biodiversity: 52.7%

**Application**

- National scale
- Local scale:  
provincial & county

- Very important area of ecosystem services was suggested as the national EPR (about 35% of the total area in China)

# Conclusions

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- Ecosystem service assessment can be a powerful instrument to link ecosystem knowledge to policy design and policy evaluation in term of sustainability.
- Ecosystem protection policies play an important role in ecosystem service conservation in China during past decades.
- Spatial pattern of ecosystem services can be applied to identify the crucial areas for conservation, and for ecological compensations, and regional and urban spatial planning as well.
- Ecological protection redlines delimitation will help to strictly manage each land and, help to implement of national spatial planning in local scale through top-down and bottom-up approaches.

# Next step work

Collaboration: CAS + Xi'an Jiaotong University + Natural Capital Project

- **EFCAs:** demonstration research on ecosystem service conservation and livelihood improvement; research on regional development strategies of EFCAs (NDRC, 2015)
- **EPR:** institution design, including delimitation, coordination, monitoring, compensation, et al.



# We appreciate the supports from:

- Natural Capital Project
- Ministry of Environmental Protection, China
- National Development and Reform Committee, China
- Chinese Academy of Sciences
- Many local governments.....