



Integrating Biodiversity and Natural Capital into Policy Innovation in China

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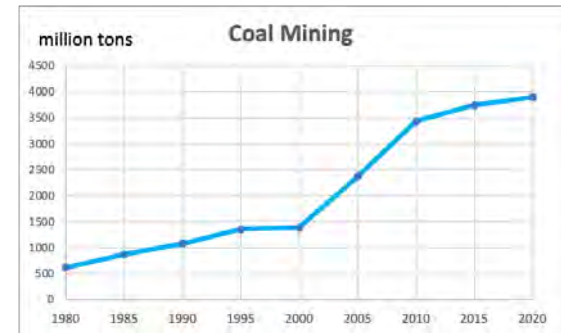
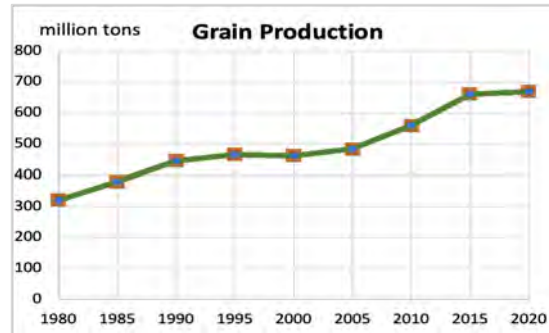
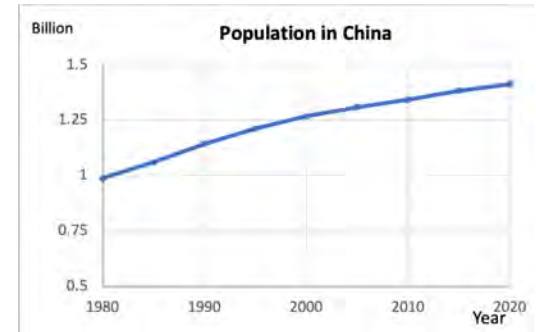
Outline

- ✦ **Challenges for China's environment**
- ✦ **Mapping ecosystem services**
- ✦ **Integrating natural capital into policy innovation**
- ✦ **GEP accounting to track nature's contribution to people**

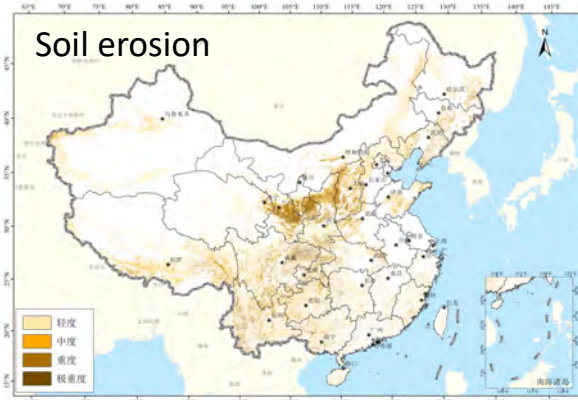
Increasing challenges in China's natural capital

Since 1980, China's environment has faced increasing pressures from

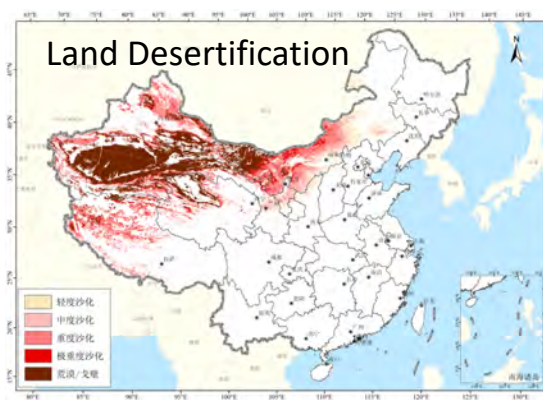
- ✧ Huge population: 1.41 billion
- ✧ Rapid urbanization: 63%
- ✧ Massive natural resource exploitation
 - Coal mining: 3.9 billion tons
 - Fresh water withdrawn: 326.3 billion M³



Increasing challenges for China's natural capital



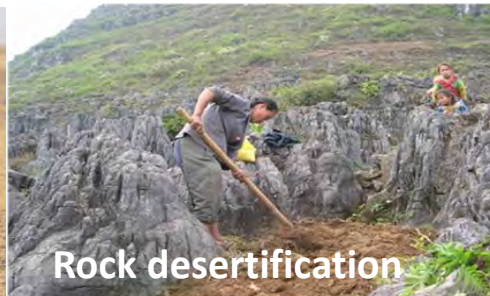
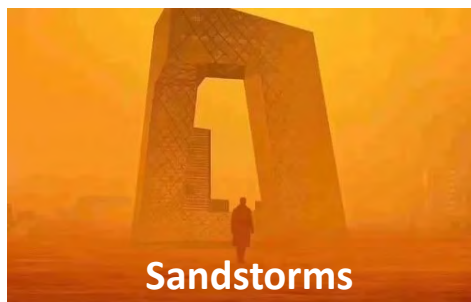
Soil erosion affected 1.73 million km², 18.0% of China



Desertification affected 1.82 million km², 19.0% of China



- Natural forest lost: 10.3%
- Coastal wetland lost: 14.0%



Increasing challenges for China's natural capital

China has declared

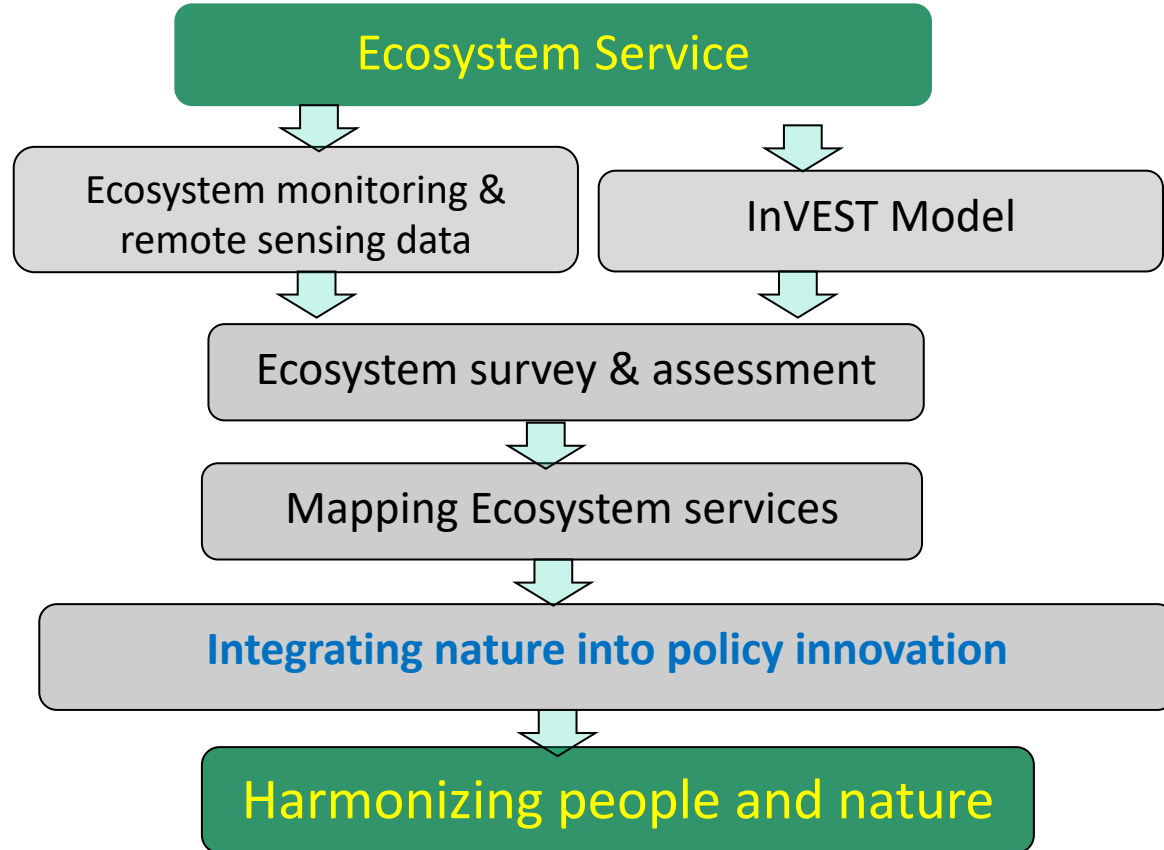
✧ **The construction of an ecological civilization to harmonize people and nature**



Key issue: how to coordinate protection and development ?

- ✓ Where must we protect to ensure sustainable supply of natural capital?
- ✓ How to achieve biodiversity/natural capital conservation & poverty alleviation?
- ✓ How to evaluate development achievements beyond GDP?

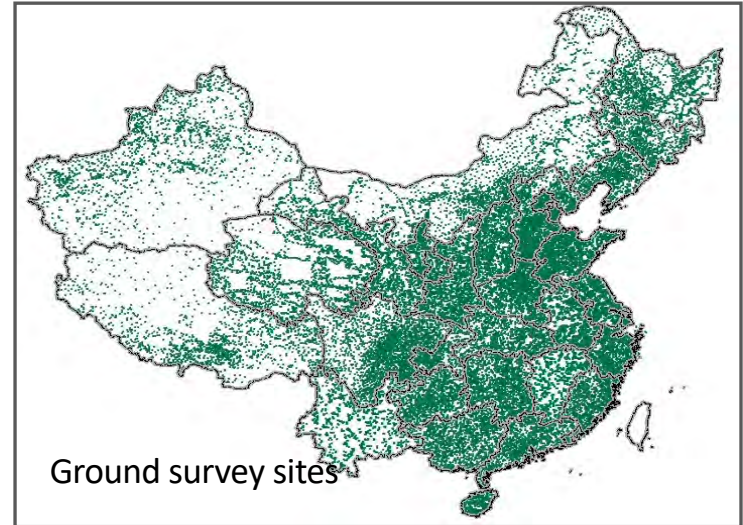
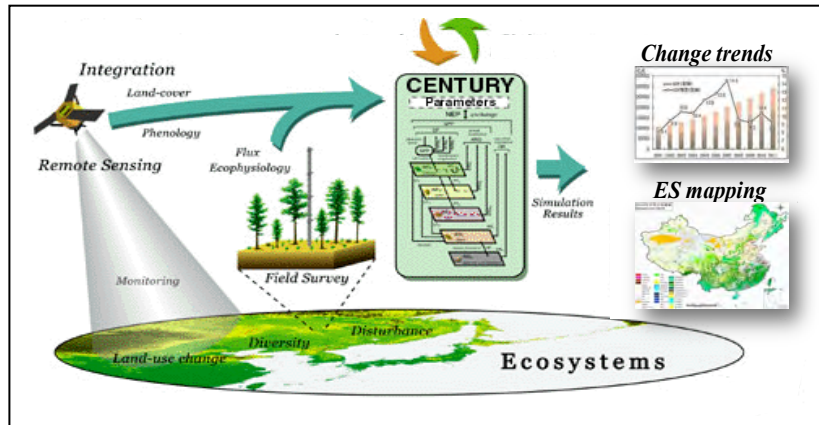
Increasing challenges for China's natural capital



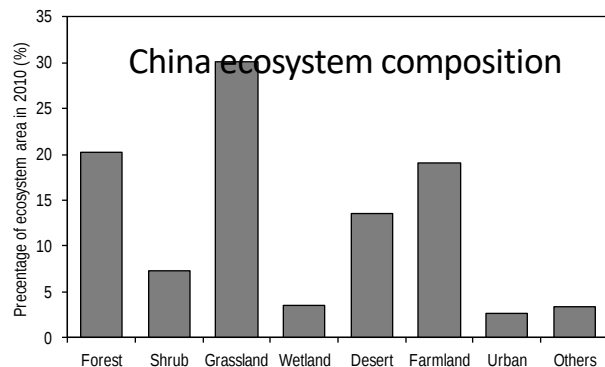
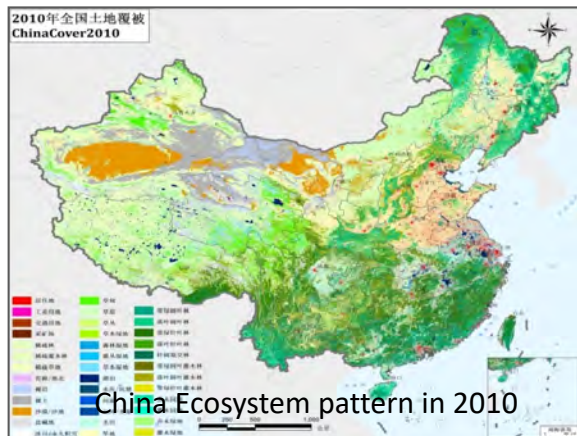
Mapping ecosystem services in China

China ecosystem survey and assessment

- ◆ **Goals:** Build an overall image of ecosystem status and mapping ecosystem services in China
- ◆ **Scales:** Provincial (31)—Regional—National
- ◆ **Remote sensing data:** 42,000+ images for 2000, 2005, 2010, 2015, 2020
- ◆ **Ground survey sites:** 200,000+
- ◆ **Models:** InVEST and others



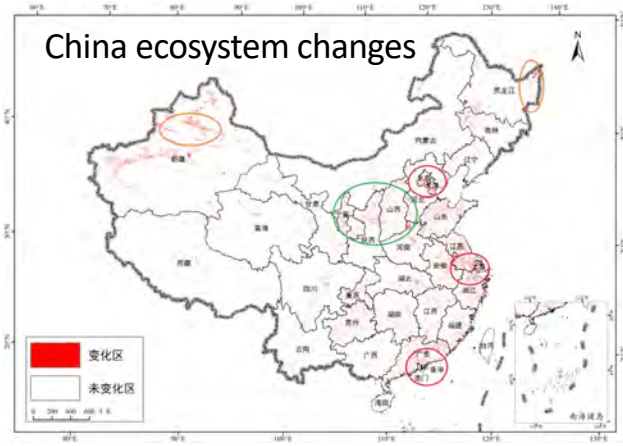
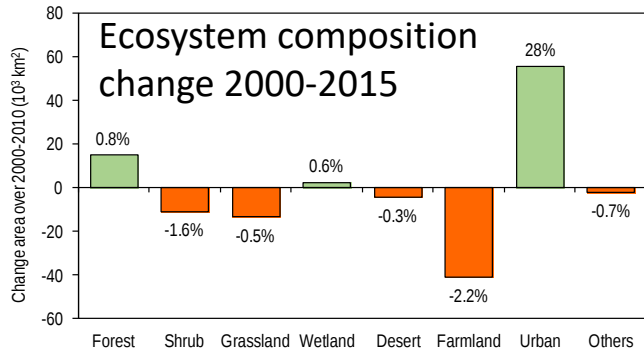
China ecosystem composition and patterns



Ecosystem types	Areas (km ²)	Percentages (%)
Forests	190.83	20.17
Shrubs	69.23	7.32
Grassland	283.68	29.98
Wetland	35.61	3.76
Desert	127.73	13.50
Cropland	181.59	19.19
Urban	25.41	2.69
Others	32.02	3.38

Grassland, forest, cropland and desert made up 82.8% of China's total area

Changes of ecosystem composition and pattern



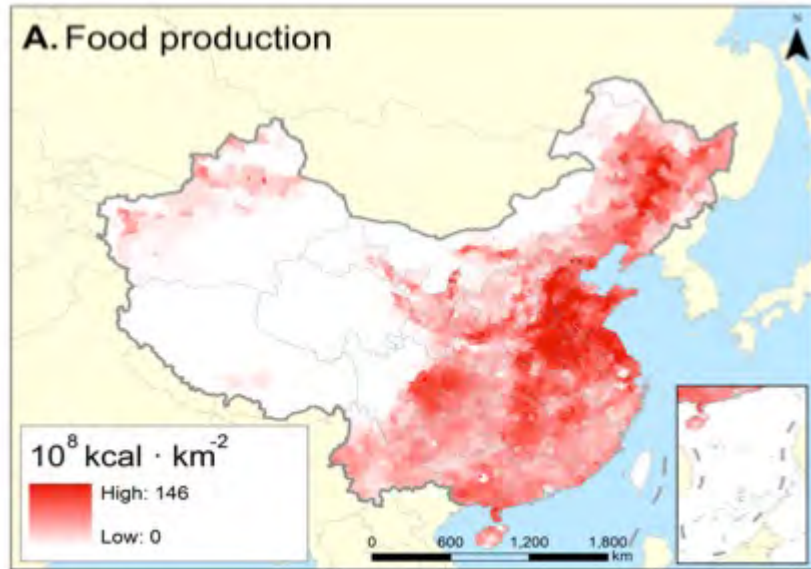
Urbanization regions: Yangtze River delta, Jing-Jin-Ji, Zhujiang (Pearl) River delta, Liaodong peninsula, Shandong peninsula

Cropland expansion regions: Northeastern plain, Daxinganling in northeastern China, oasis surroundings in Xinjiang, coastal regions in northern Jiangsu.

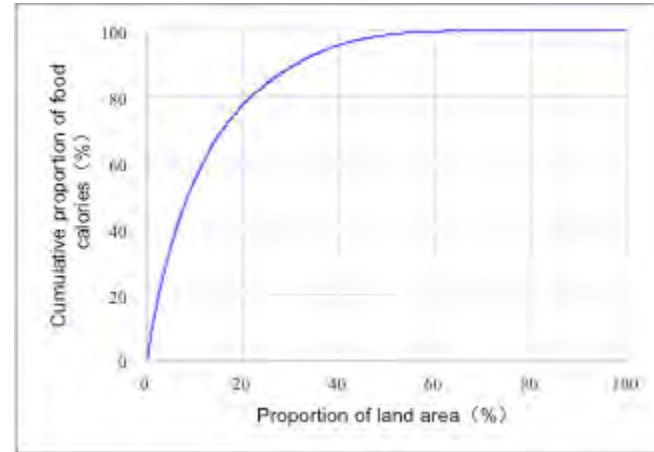
Forest restoration regions: Loess Plateau, the surroundings of Sichuan Plain, Zhejiang, Guizhou, Chongqing

Mapping ecosystem services in China

Food production



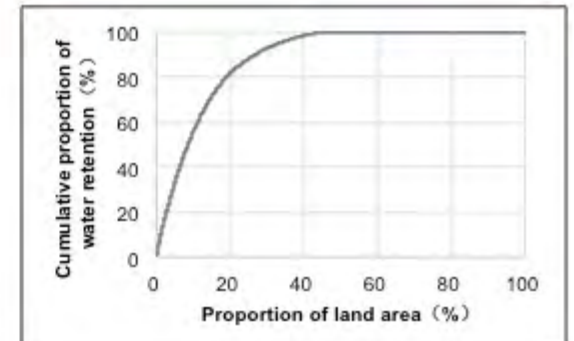
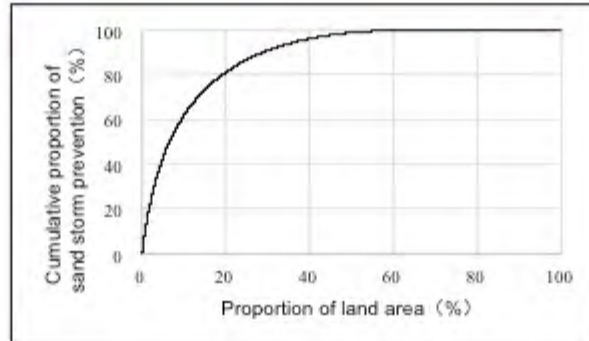
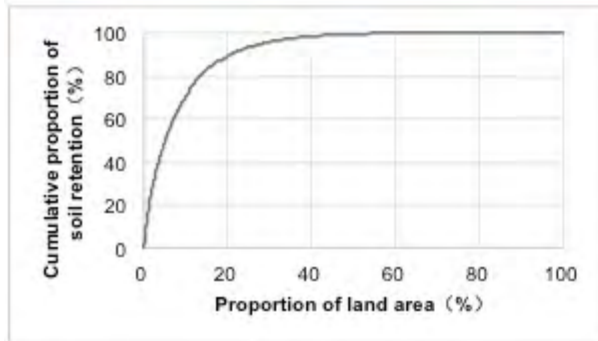
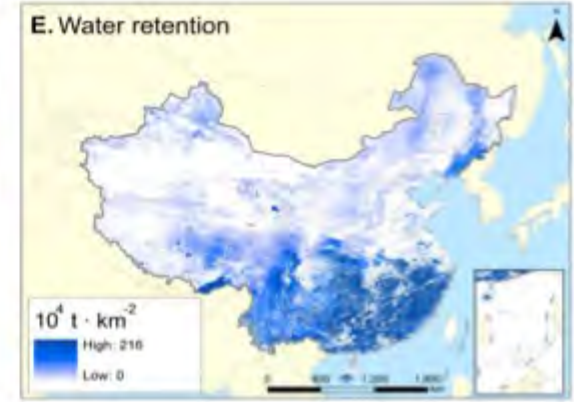
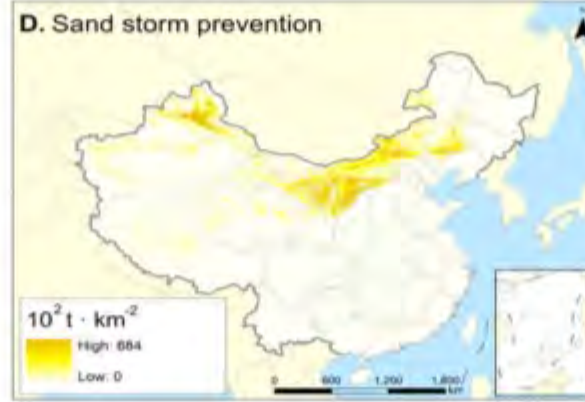
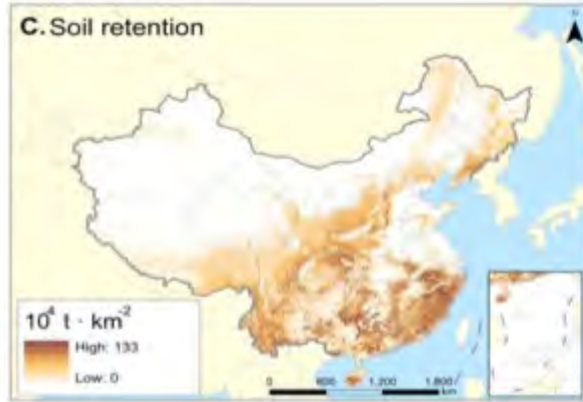
The curve shows that 18.5% of land provided 75% of food production in China



Importance of food production	Area (10^4 km^2)	Area proportion (%)
Very high	80.86	8.54
High	94.71	10.01
Medium	121.74	12.86
Normal	649.25	68.59

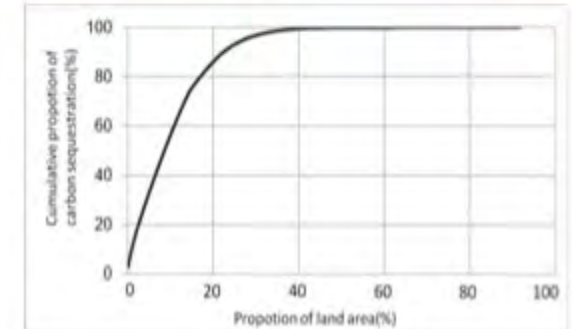
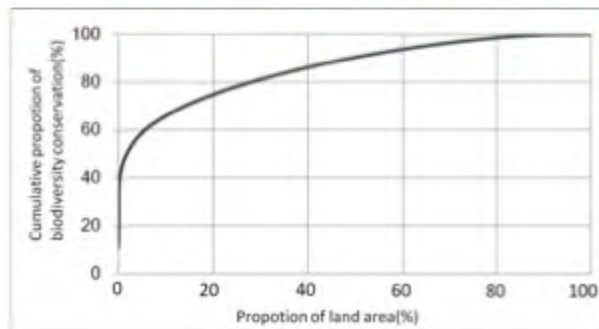
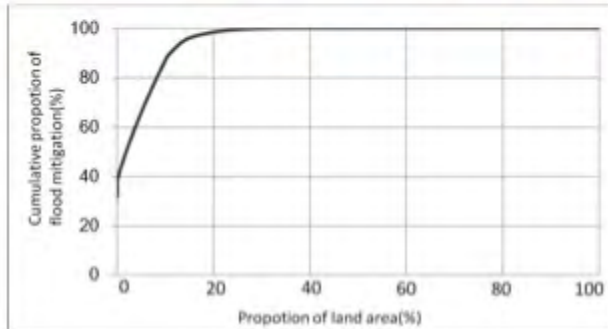
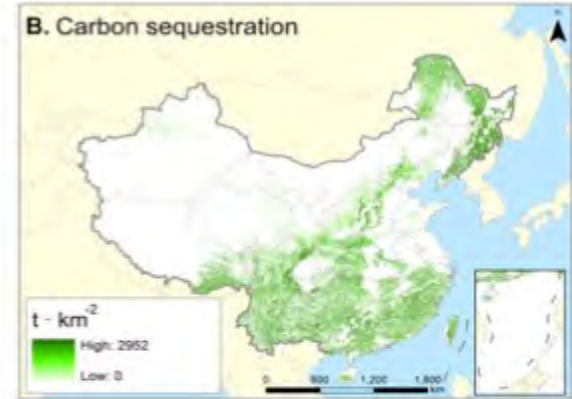
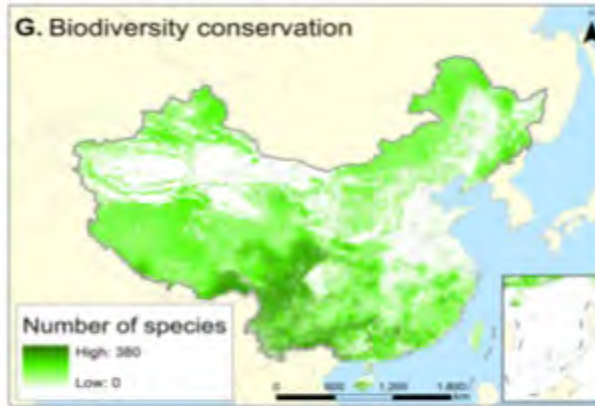
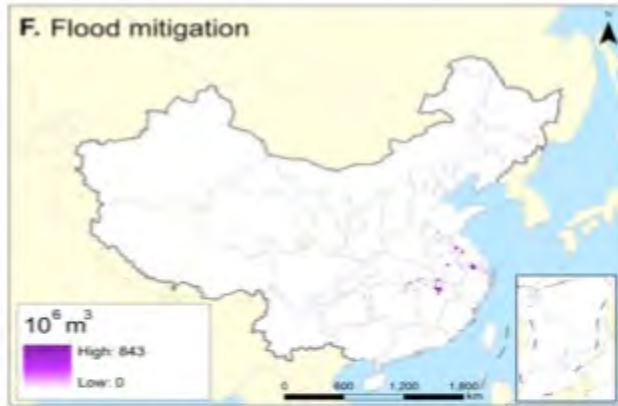
Mapping ecosystem services of China

Ecosystem service pattern in China

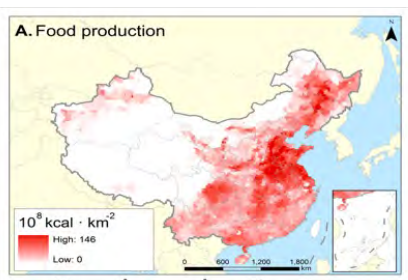


Mapping ecosystem services of China

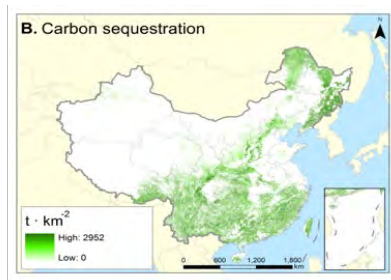
Ecosystem service pattern in China



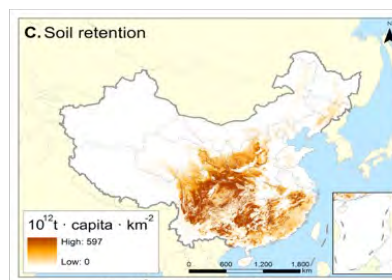
Spatial pattern of ecosystem services



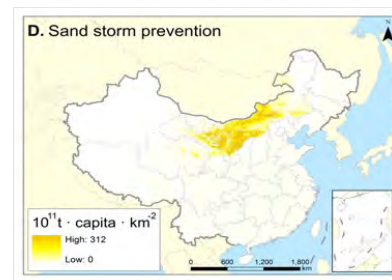
Food production



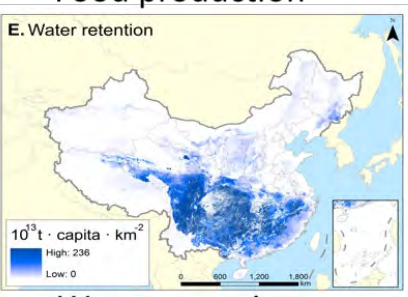
Carbon sequestration



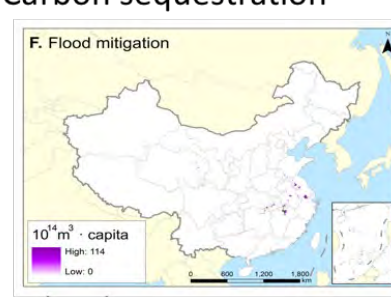
Soil retention



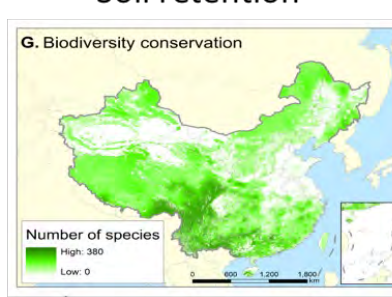
Sand storm prevention



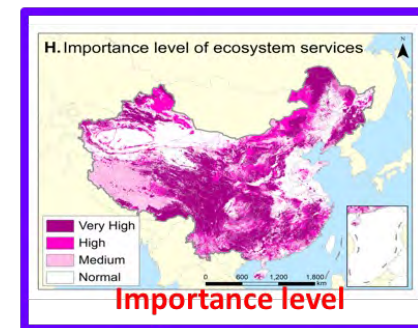
Water retention



Flood mitigation

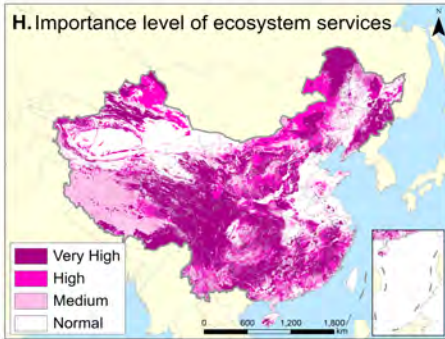


Biodiversity conservation



We translated biophysical supply of ecosystem services into importance of service provision by weighting supply by the number of people affected.

Identify crucial areas of ecosystem services in China

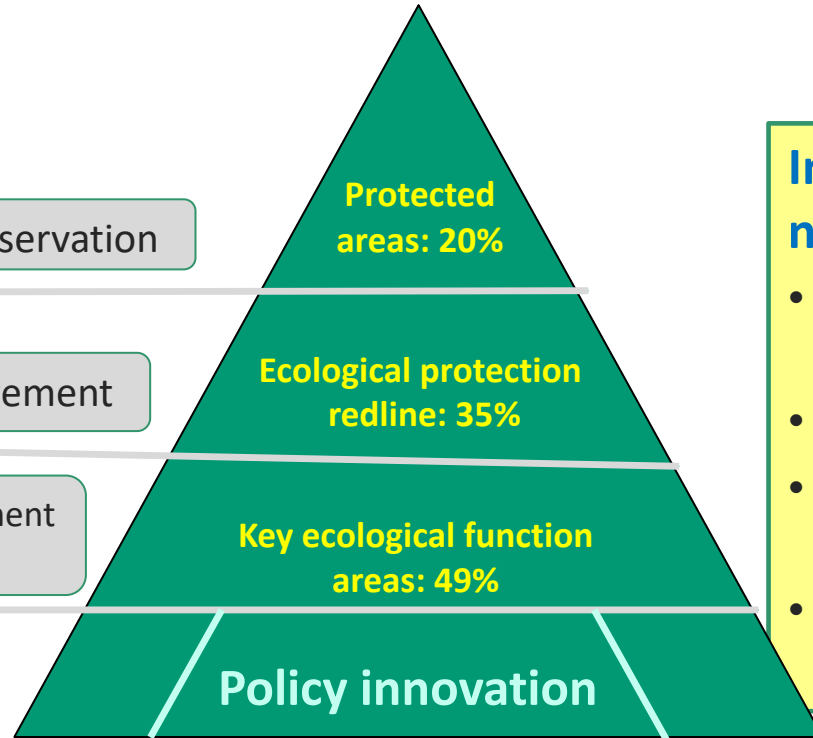


Importance for Eco- Service	Land area		Soil retention	Water retention	Sandstorm prevention	Biodiversity conservation
	10 ⁴ km ²	%	%	%	%	%
Very high	343.6	35.8	66.3	60.8	37.3	51.8
High	204.6	21.3	22.0	21.8	27.0	24.1
Medium	161.2	16.8	9.1	11.9	19.2	19.2
Normal	246.8	25.7	2.5	5.4	16.5	4.9

✧ The table showed that about 35% of land with high level of ecological importance provide about 60% of regulating ecosystem services.

Integrating biodiversity and natural capital into policy innovation

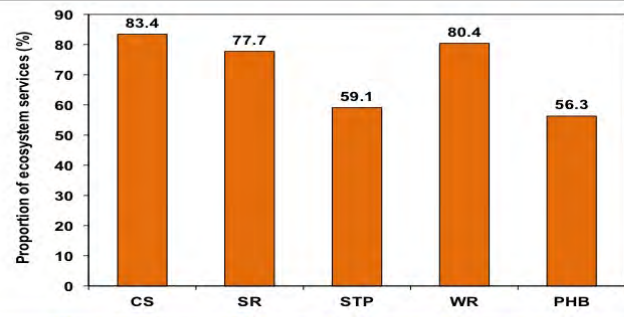
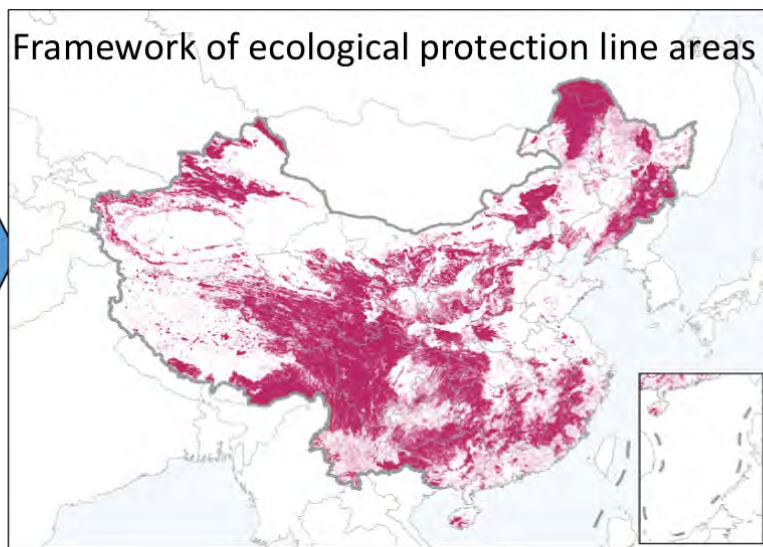
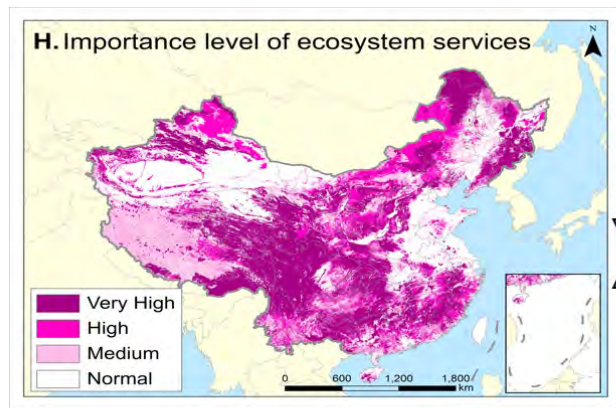
Integrating natural capital into policy innovation



Investment transformation for natural capital

- Ecological financial transfer for key ecological function areas:
- Natural forest conservation
- Cropland return to forests and grassland
- Regional ecosystem restoration projects: Sanjiangyuan, Karst region

Planning Ecological Protection Redline



Provision of ecosystem services in
EPR Areas (35 %)

- ✦ The very high important areas are planned as Ecological Protection Redline (EPR) to protected strictly for providing ecosystem services and wildlife habitat
- ✦ EPR: 35 % of China

环境保护部办公厅
国家发展和改革委员会办公厅 文件

环办生态[2017]48号

关于印发《生态保护红线划定指南》的通知

各省、自治区、直辖市环境保护厅(局)、发展改革委,新疆生产建设兵团环境保护局、发展改革委:

根据中共中央办公厅、国务院办公厅《关于划定并严守生态保护红线的若干意见》的安排部署,环境保护部、发展改革委共同组织编制了《生态保护红线划定指南》(见附件),现印发给你们。请按照本指南要求,加快推进本地区生态保护红线划定工作。

环境保护部联系人:张哲、张文国

电话:(010)66103047、66556309

传真:(010)66103049

国家发展改革委联系人:徐卫华

电话:(010)68501597

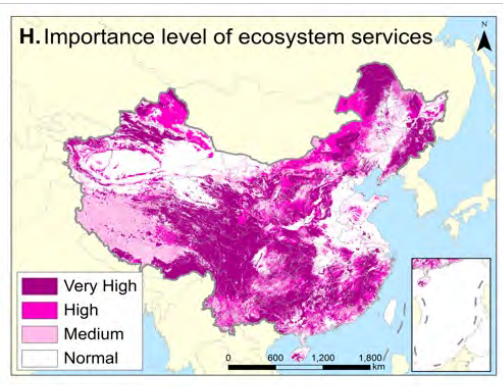
传真:(010)68501657

附件: 生态保护红线划定指南



Guideline for ecological
redlining by MEP and
NDRC

Identify ecosystem function conservation areas



中华人民共和国环境保护部 中国科学院 公告

2015年 第61号

为落实《环境保护法》《中共中央关于全面深化改革若干重大问题的决定》《中共中央 国务院关于加快推进生态文明建设的意见》等关于加强重要区域自然生态保护、优化国土空间开发格局、增加生态用地、保护和扩大生态空间的要求，环境保护部和中国科学院在2008年印发的《全国生态功能区划》基础上，联合开展了修编工作，形成《全国生态功能区划（修编版）》，现予以发布。

附件：全国生态功能区划（修编版）



2015年11月13日

- ✦ 63 areas with critical ecosystem services were identified as **Ecosystem function conservation areas (EFCAs)** released in **2015** by MEP and CAS.
- ✦ Total 63 EFCAs, 49% of China.

- Water retention
- Biodiversity conservation
- Soil retention
- Sand fixation
- Flood mitigation

Ecological financial transfer program



437 counties in 2010



512 counties in 2014

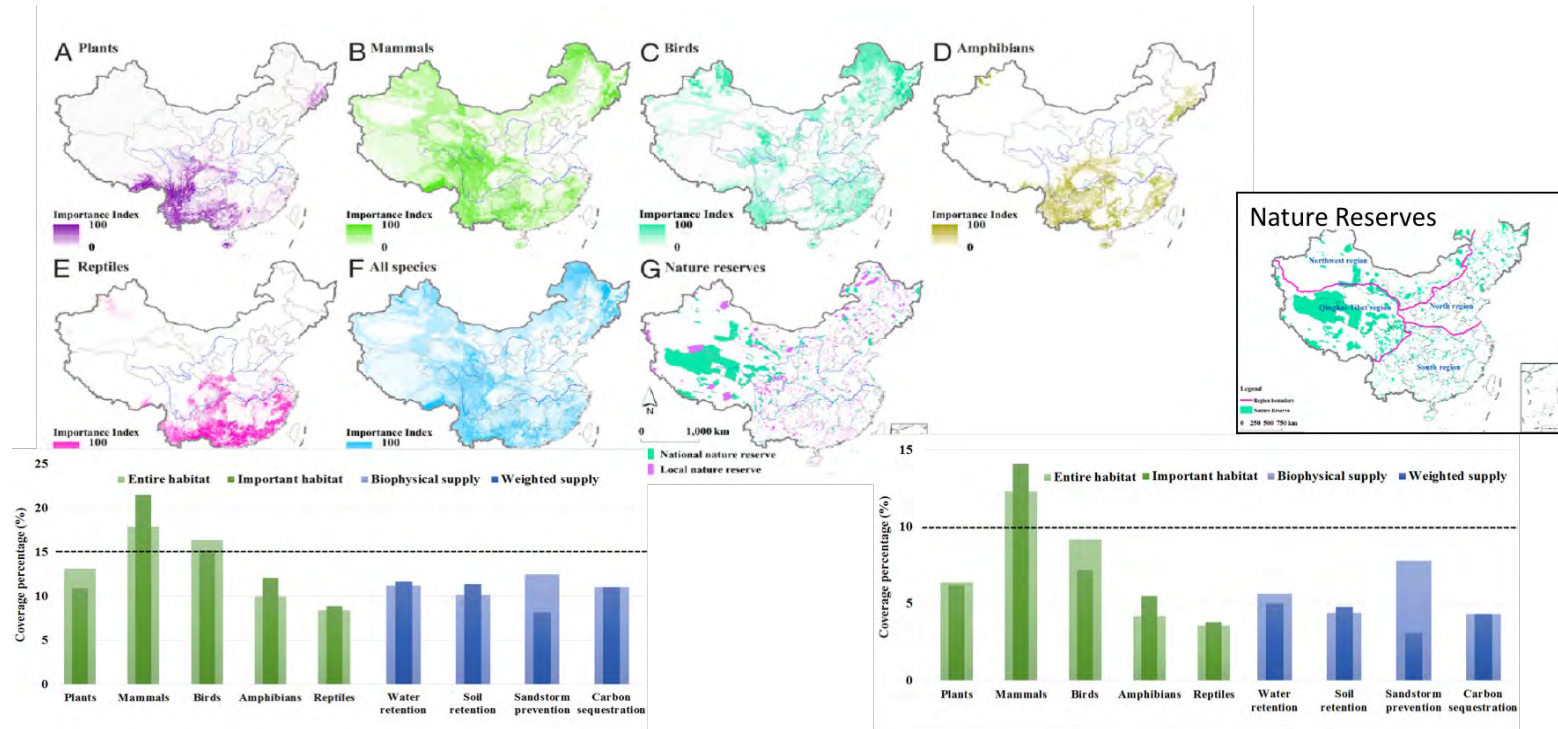


715 counties in 2018

Year	Budgets (billions RMB)	Benefited Counties
2008	6.0	221
2010	24.9	437
2014	48.3	512
2022	79.4	715+

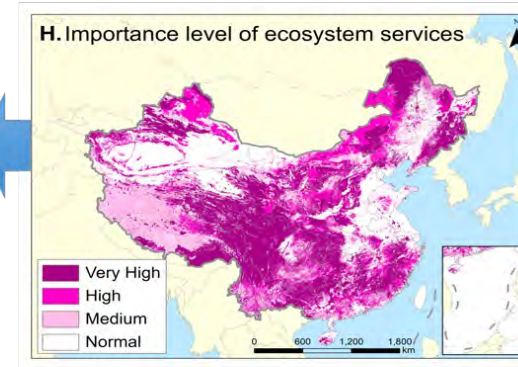
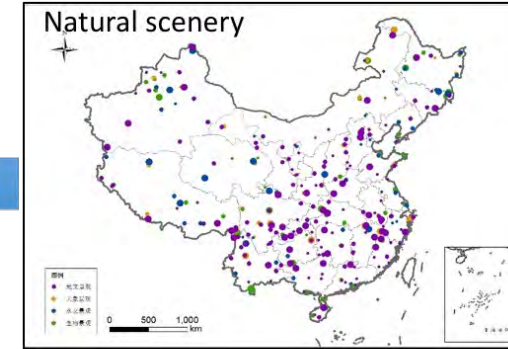
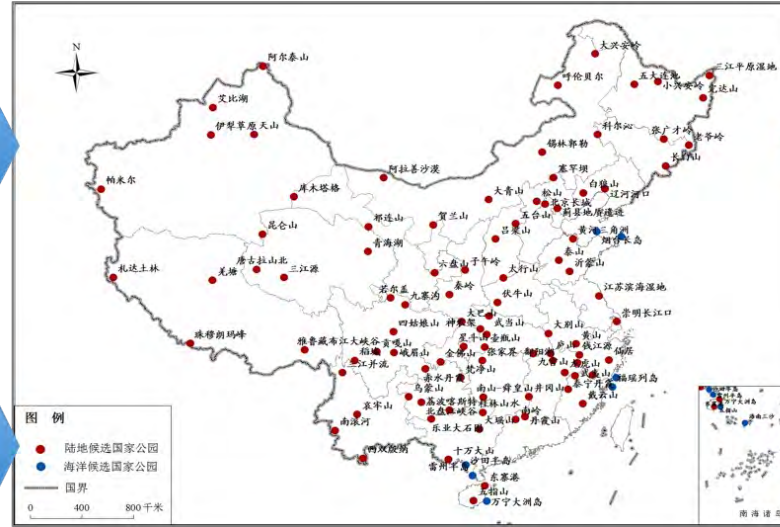
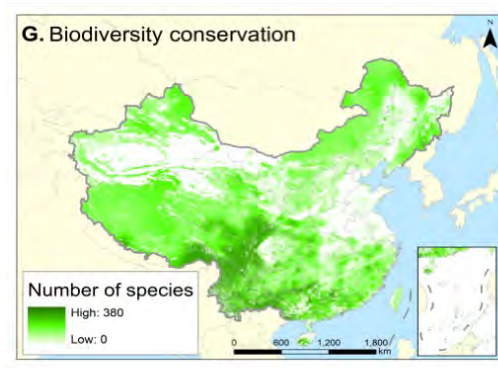
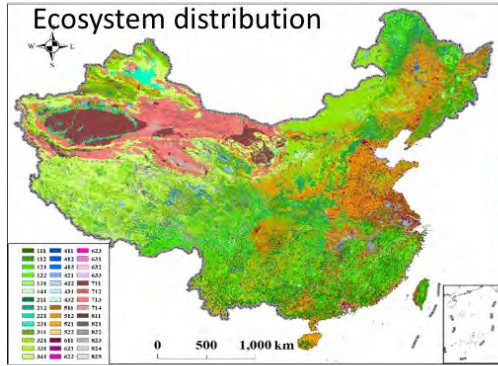
- ✦ To push conservation in key ecological function areas, the central government launched ecological financial transfer programs based on ecosystem service pattern.
- ✦ The budget was increased to 79.4 billion yuan in 2022 from 6.0 billion yuan in 2008.

Figure out conservation gabs



Protected areas are not well matched with wildlife habitat and ecosystem service pattern

Layout of the national park system



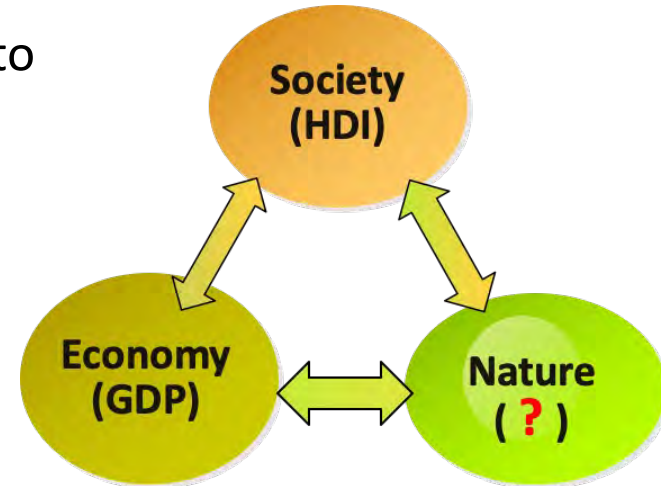
- ✦ The national parks were located based on distribution of represented ecosystems, natural landscape, wildlife and ecosystem services.

Gross Ecosystem Product (GEP)

—to evaluate and track the progress of
nature's contribution to people

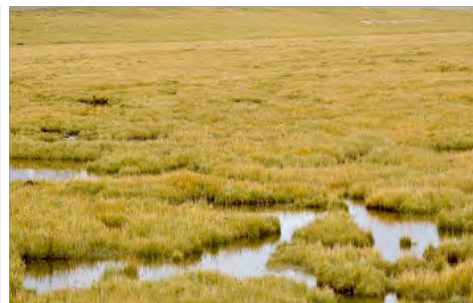
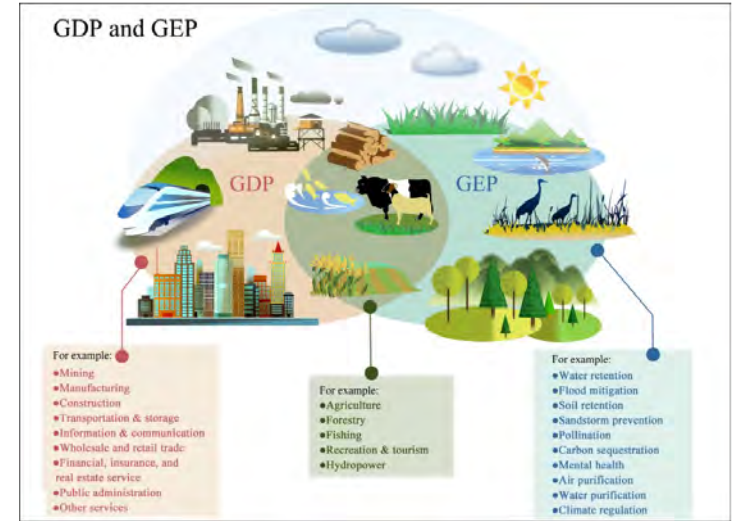
We need a metric to measure nature's contribution to people

- ✧ **Economy:** GDP (Gross Domestic Product) is widely used to measure economic system performance.
- ✧ **Society:** HDI (Human Development Index) is used to assess social development status based on health, education, and income.
- ✧ **Nature:** currently we do not have a widely used indicator to measure its contribution to human wellbeing.



Gross Ecosystem Product, GEP

- ✦ GEP is the aggregated value of final ecosystem goods and services supplied annually to people in given region, such as a country, a province, or a county.



Criteria for GEP accounting

✧ Measure the use value of ecosystem services

- ✓ Direct use value: e.g., food, bio-energy, water resources
- ✓ Indirect use value: e.g., water retention, soil retention, pollutant purification, climate regulation

✧ Measure value of final ecosystem services

- ✓ Material services (ecosystem goods), regulating services, and non-material services

✧ Measure biophysical value first

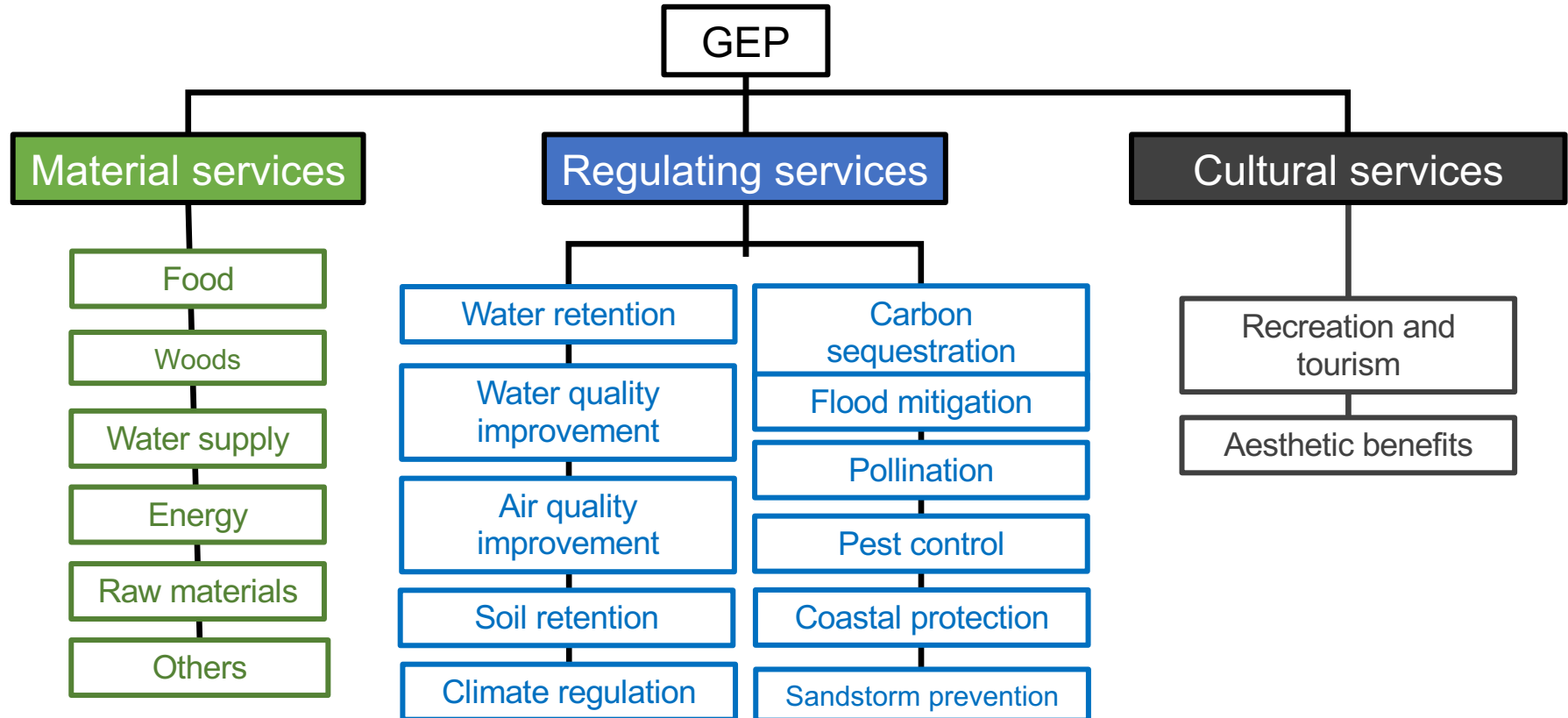
- ✓ E.g., amount of food production, amount of water purification, amount of flood protection

✧ Then, measure monetary value (value added per unit x quantity)

- ✓ The economic value of ecosystem services



Ecosystem services in GEP accounting

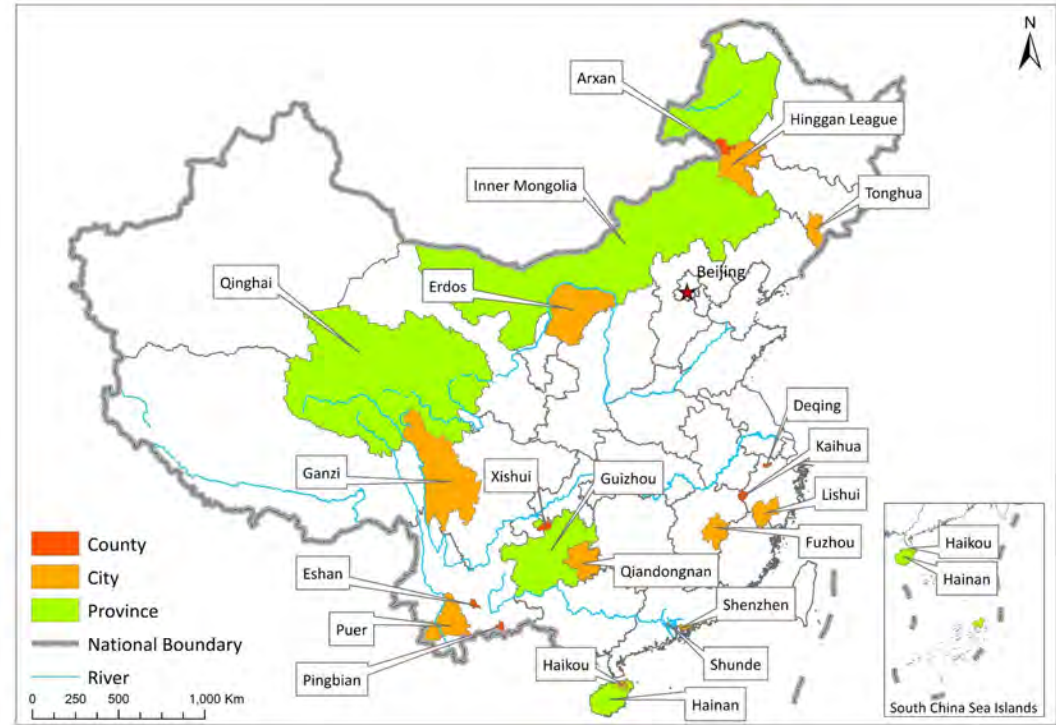




GEP pilot accounting

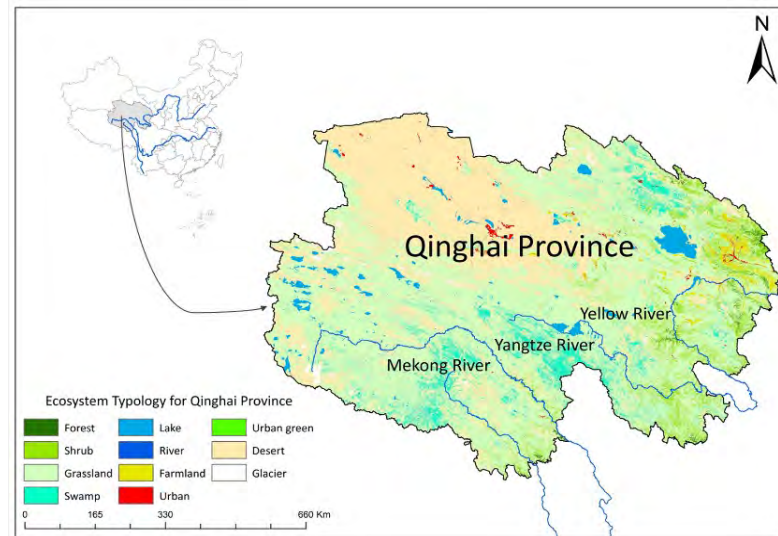
Pilot GEP accounting in China

- ✓ 5 provinces
- ✓ 20+ cities/prefectures
- ✓ 100+ counties



Qinghai Province

- ✓ Located in western China, east of Tibetan Plateau
- ✓ Known as the “water tower” of East and Southeast Asia, source of the Yellow, Yangtze and Mekong Rivers
- ✓ Dominant ecosystem type is grassland, including alpine meadows and alpine steppe
- ✓ Global hotspot for biodiversity, home of many endangered species such as the Tibetan antelope, snow leopard, wild yak, black-necked crane and snowcock



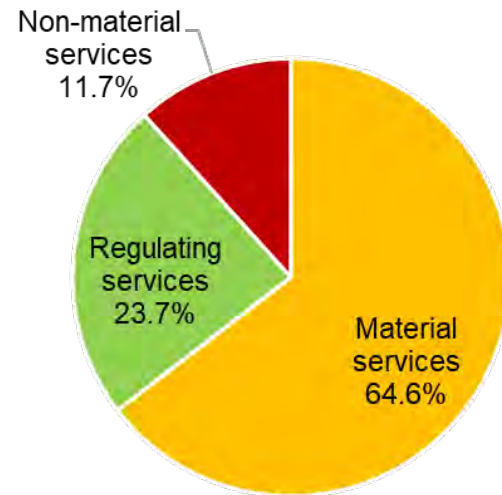


GEP pilot accounting-Qinghai

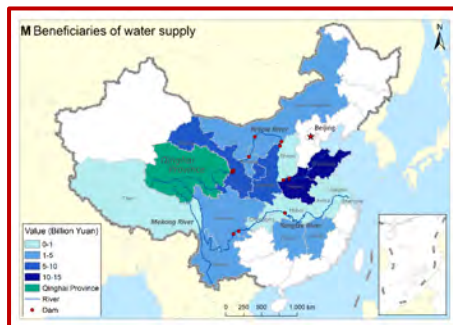
Types of ES	Category of ES	Accounting items	2015		
			Bio-physical quantity	Monetary value(Billion Yuan)	% of total value
Material services	Production of ecosystem goods	Agricultural crop production (x10 ³ t)	3091.2	5.6	3.0
		Animal husbandry production (x10 ³ t)	724	5.8	3.1
		Fishery production (x10 ³ t)	10.6	0.3	0.1
		Forestry production (x10 ³ t)	10.4	0.7	0.4
		Plant nursery production (x10 ⁹)	11	0.7	0.4
	Water supply	Water use in downstream agricultural irrigation (x10 ⁹ m ³)		15	8.1
		Water use in households (x10 ⁹ m ³)		13.8	7.4
		Water use in industry (x10 ⁹ m ³)		29.2	15.8
		Hydropower production (x10 ⁹ kwh)	92	48.8	26.3
Regulating services	Flood mitigation	Flood mitigation (x10 ⁹ m ³)	0.07	0.03	0.02
	Soil retention and	Retained soil (x10 ⁹ t)	0.4	7	3.8
	Non-point pollution prevention	Retained N (x10 ³ t)	10	0.02	0.01
		Retained P (x10 ³ t)	0.7	0.002	0.001
	Water purification	COD purification (x10 ³ t)	104.3	0.1	0.1
		NH-N purification (x10 ³ t)	10	0.02	0.01
		TP purification (x10 ³ t)	0.9	0.003	0.001
		SO ₂ purification (x10 ³ t)	150.8	0.2	0.1
	Air purification	NO _x purification (x10 ³ t)	117.9	0.1	0.1
		Dust purification (x10 ³ t)	246	0.04	0.02
	Sandstorm prevention	Sand retention (x10 ⁹ t)	0.5	31.7	17.1
	Carbon sequestration	Carbon sequestration (x10 ⁹ t)	0.02	4.7	2.5
Cultural services	Eco-tourism	Tourists (x10 ⁶ persons)	23.2	21.6	11.7
Grand Total				185.4	100.0

GEP of Qinghai in 2015: 185.5 billion yuan

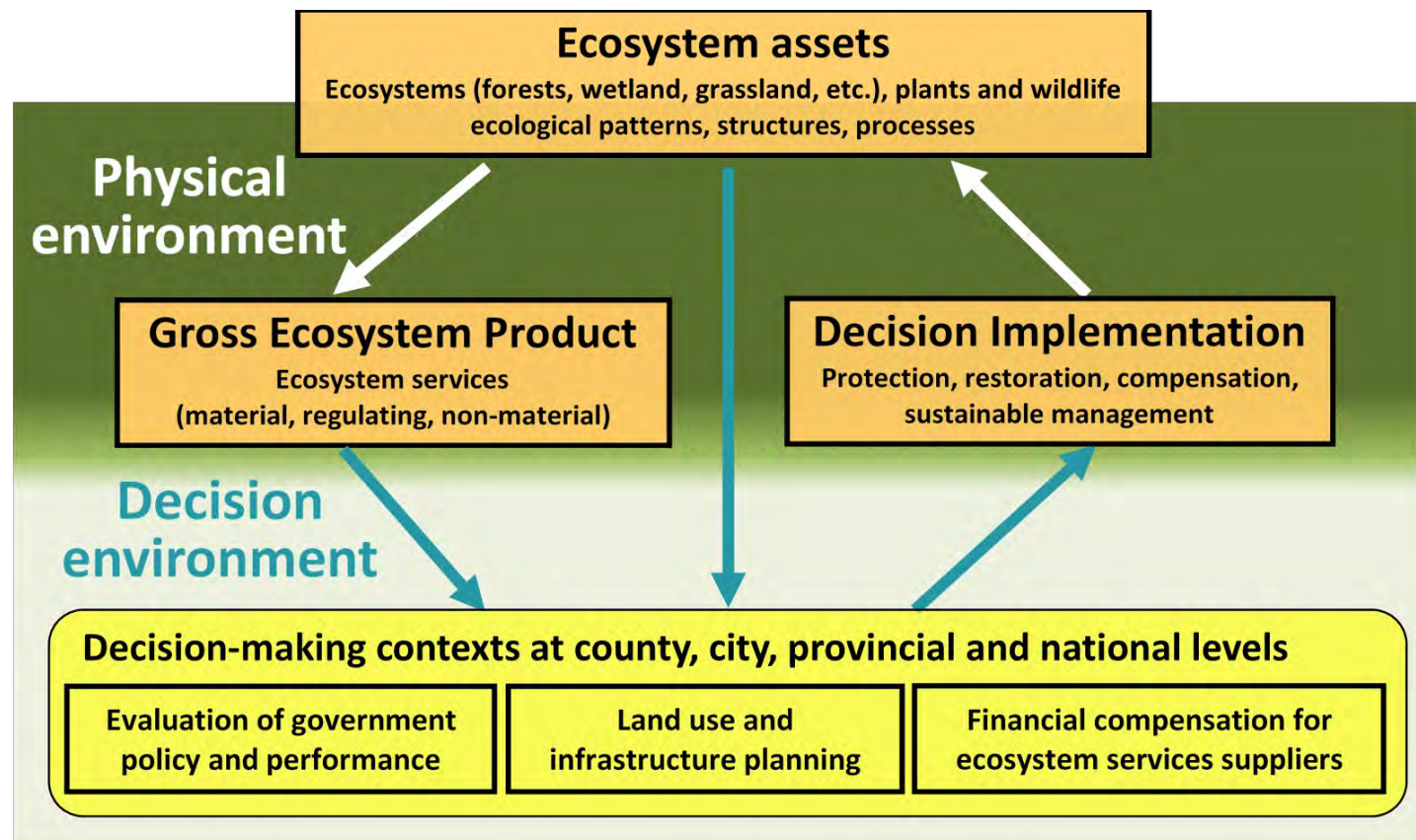
Items	Value (billion yuan)	Ratio (%)
Material services	119.8	64.6
Regulating services	43.9	23.7
Cultural services	21.6	11.7
Total	185.6	100.0



Beneficials of ecosystem services supplied by Qinghai



Applications of GEP accounting



Applications of GEP accounting

Applications of GEP in key realms ~

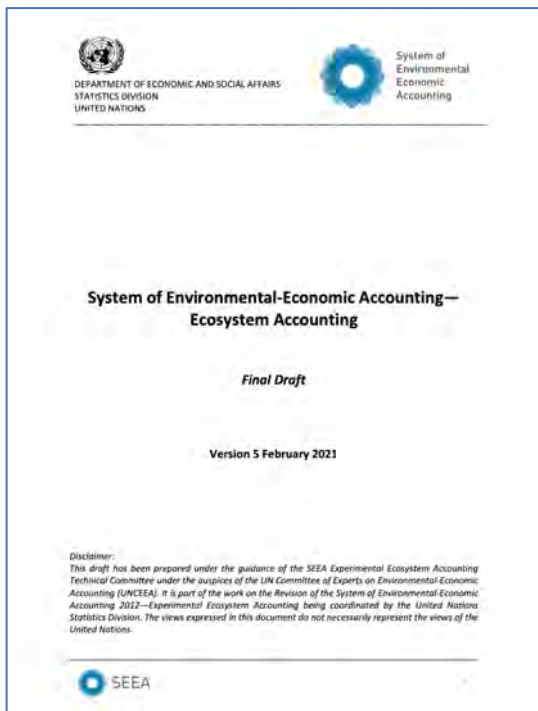
by central government, provinces, cities, companies

- ✦ **NDRC, MEE, Inner-Mongolia, Guizhou, Qinghai, Zhejiang, Shenzhen, Shunde, Tonghua:** Evaluating government policy and **performance in conservation**.
- ✦ **Lishui, Pu'er, Zhejiang:** Providing the basis for determining **financial compensation** for the provision of ecosystem services.
- ✦ **Shenzhen, Zhuhai :** Evaluating **sustainable development** (harmony of people and nature).
- ✦ **Zhejiang, Lishui, Fuzhou, Alibaba:** Bringing the value of ecosystem services and trends into public and private sector decision making and **investment** plan.
- ✦ **Qinghai, Ganzi:** Measuring **nature's contribution to people**, and to other parts of China.
- ✦ **NDRC and NSB** with related governmental agencies are preparing **Guideline of GEP Accounting**, which hopefully will be released soon.



Applications of GEP accounting

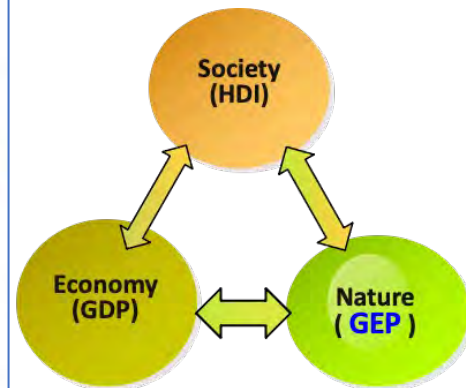
✧ 2021, UN Statistical Commission adopted GEP as a monetary indicator for ecosystem services and ecosystem asset accounting



14.29 Indicators from the monetary ecosystem services flow account and ecosystem asset account.
The monetary ecosystem services flow accounts describe the ecosystem services generated by the ecosystem asset in monetary term. The monetary ecosystem asset account describes the opening and closing monetary value of ecosystem assets over an accounting based on the net present value of the bundles of ecosystem services, under their current use/institutional regime. When compiled for multiple years, the asset account identifies the share of the cost of degradation and /or enhancement (e.g., restoration) of ecosystem assets that can be identified by exchange value.

Table 14.4: Potential indicators on monetary ecosystem services flows account and ecosystem asset accounts

Monetary indicators	Further description	Spatial unit	Disaggregation	Unit of measurement
Gross Ecosystem Product (GEP)	The economic value added of all ecosystem services generated.	Ecosystem accounting area	Ecosystem type, ecosystem services classes	Local currency
Value of ecosystem services linked to industry value added	Value added of industries with direct inputs of ecosystem services	Ecosystem accounting area	Ecosystem type	Percentage
Monetary ecosystem asset value		Ecosystem accounting area	Ecosystem type, per capita by administrative areas, planning areas	Local currency
Ecosystem asset value as a percentage of total national wealth		Ecosystem accounting area	Ecosystem type	Percentage
Cost of degradation		Ecosystem accounting area	Ecosystem type, per capita by administrative areas, planning areas	Local currency



Conclusion

- ✧ Ecosystem service evaluation can be a powerful and useful tool to support conservation policy making and innovation.
- ✧ China has made major efforts to integrate biodiversity and ecosystem services into policy and finance for transformation in China, and resulted in the significant improvement of ecosystem services, and benefits hundreds of million local people.
- ✧ It is just a beginning, natural capital will play a unique role in protected area system building, urban sustainability and investment transformation for nature.



Chinese Academy of Sciences (CAS)
National Development and Reform Commission of China
Ministry of Ecology & Environment of China
Ministry of Natural Resources of China
Ministry of Science and Technology of China
National Natural Science Foundation of China
Natural Capital Project
Asian Development Bank
Local governments of China

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