Fourth Global Forum on Natural Capital Accounting for Better Policy

Mainstreaming ecosystem services and biodiversity into Conservation Policy in China

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Contents

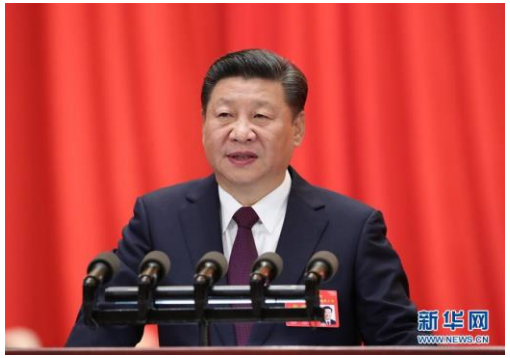
- Background
- China ecosystem survey and assessment
- Mapping ecosystem services of China
- Linking ecosystem services to policy-making
- Investment in natural capital
- GEP accounting

Background

China's environment is facing increasing challenges from

- ✧ Huge population: 1.38 billion
- ✧ Fast urbanization: Urban rates 59 % in 2018, 36% in 2000
- ✧ Massive natural resource exploitation
  - Coal mining: 3.7 billion tons
  - Fresh water withdrawn: 326.3 billion M^3
- ✧ Ecosystem service decline and wildlife habitat lost
  - Soil erosions and and rocky desertification,
  - Frequency of sandstorm, flooding
- ✧ Vicious-circle of ecosystem degradation and poverty

Background



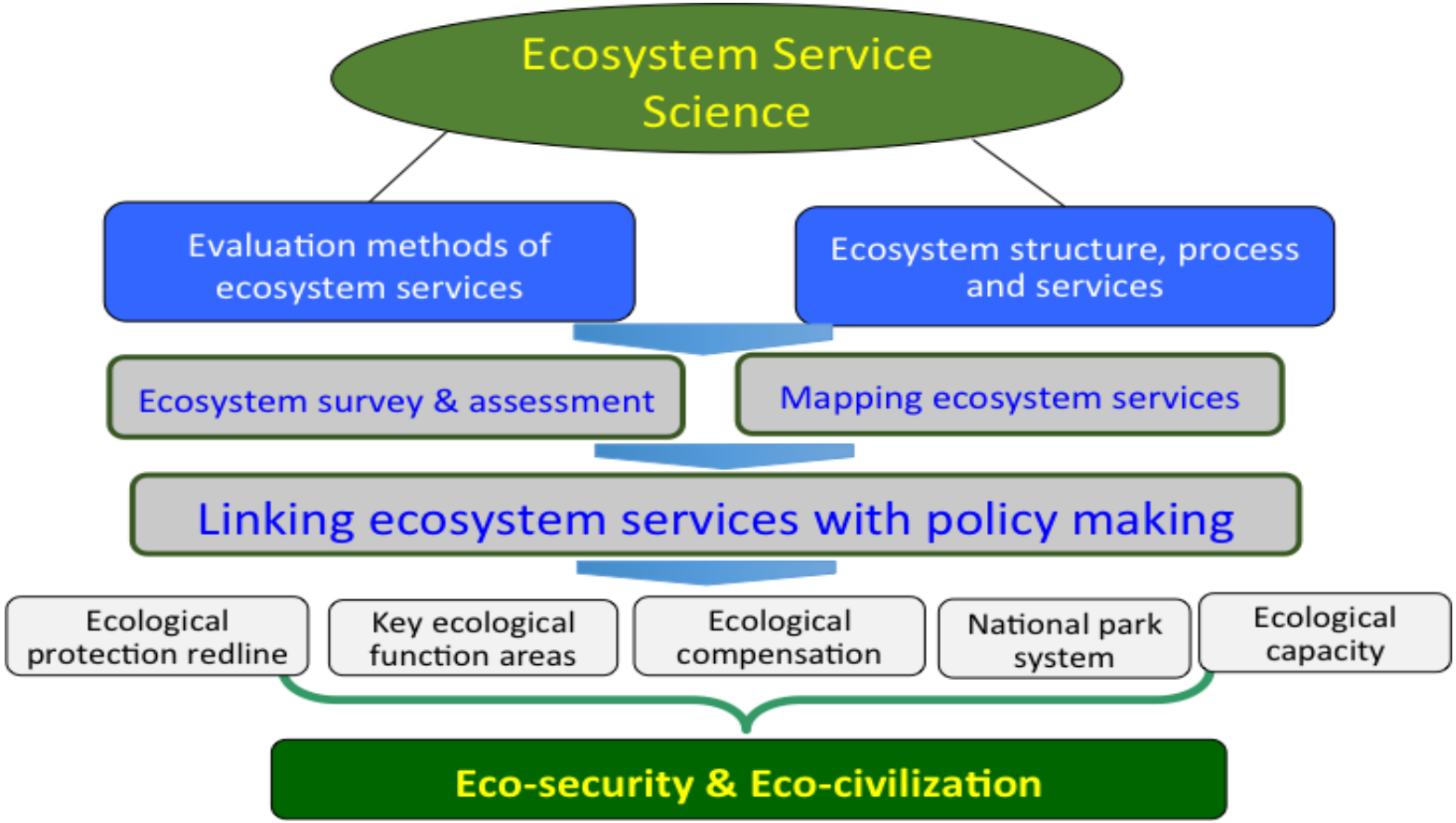
In both 18th and 19th National Congress of the Communist Party declared China's Dream

- ✧ Harmonizing people and nature
- ✧ Building the ecological civilization of the 21st century

Key issues: how to coordinate conservation and development ?

- ✓ Where we must protect to ensure sustainable supply of ecosystem services?
- ✓ How to achieve natural capital conservation & poverty alleviation?
- ✓ How to evaluate the development achievements, not only GDP?

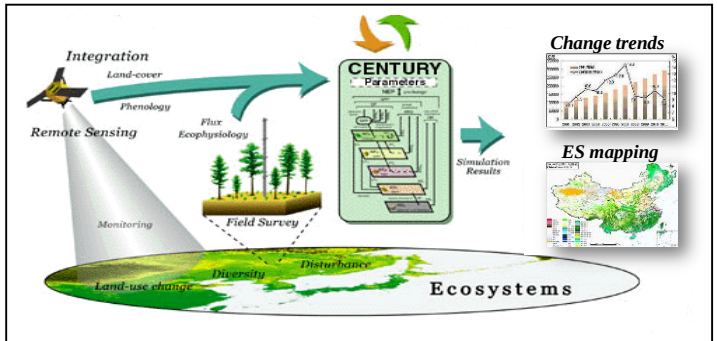
Background

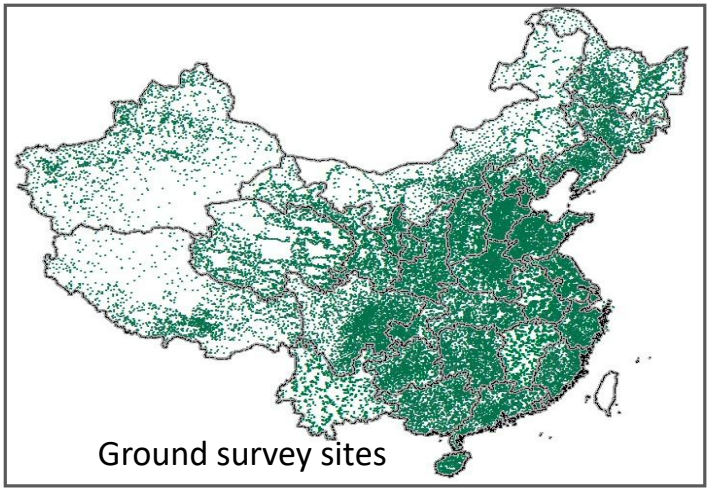

Ecosystem Service Science
Evaluation methods of ecosystem services
Ecosystem structure, process and services
Ecosystem survey & assessment
Mapping ecosystem services
Linking ecosystem services with policy making
Ecological protection redline
Key ecological function areas
Ecological compensation
National park system
Ecological capacity
Eco-security & Eco-civilization

China ecosystem survey and assessment

China ecosystem survey and assessment

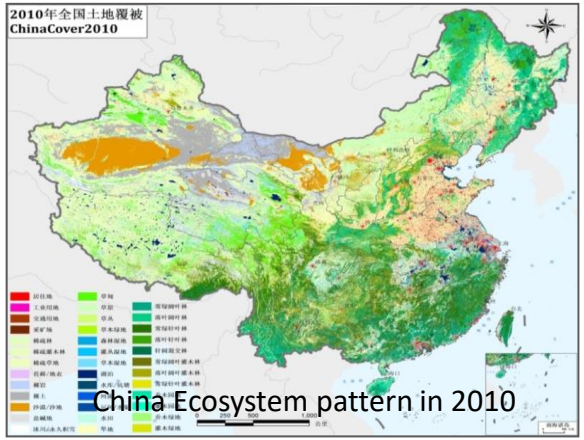
- Scales: Provincial (31)—Regional—National scales
- Remote sensing data: 21,808 images for 2000, 2005, 2010, 2015
- Ground survey sites: 114,500
- Model: InVEST and others
- Goals: Build an overall image of ecosystem status of China
  - ✓ Ecosystem distribution and patterns
  - ✓ Ecosystem quality and their changes
  - ✓ Ecosystem services and their changes
  - ✓ Identify crucial areas for ecosystem services



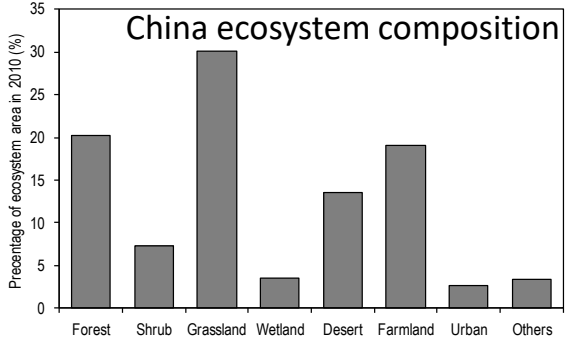


China ecosystem patterns and changes

China ecosystem composition and patterns



China Ecosystem pattern in 2010

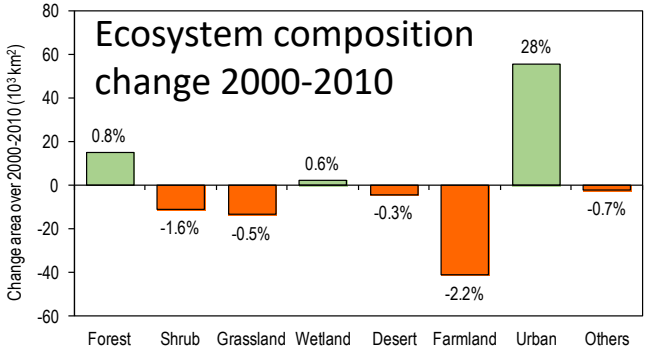


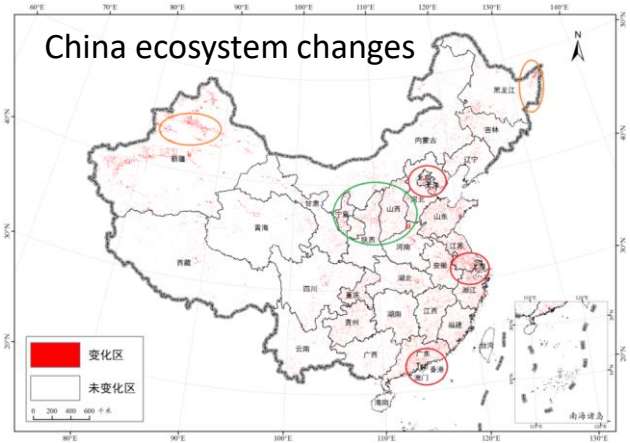
Ecosystem types	Areas (km^2)	Percentages (%)
Forests	190.83	20.17
Shrubs	69.23	7.32
Grassland	283.68	29.98
Wetland	35.61	3.76
Desert	127.73	13.50
Cropland	181.59	19.19
Urban	25.41	2.69
Others	32.02	3.38

Grassland, forest, cropland and desert were made of 82.8% of total area of China

China ecosystem patterns and changes

Changes of ecosystem composition and pattern





Urbanization regions: Yangtze river delta, Jing-Jin-Ji, Zhujiang river delta, Liaodong peninsula, Shangdong peninsula

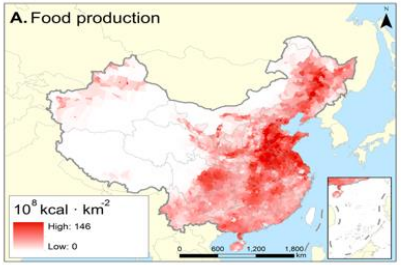
Cropland expansion region: North-eastern plain, DaxinganLing, in North-eastern China, Oasis surroundings in Xingjiang, Coastal regions in northern Jiangsu.

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

Mapping ecosystem services of China

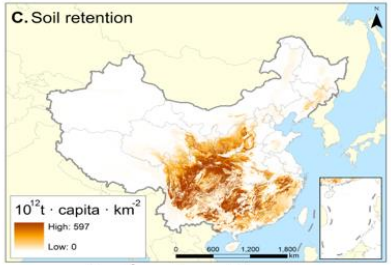
- Food production
- Water retention
- Soil retention
- Sand storm prevention
- Carbon sequestration
- Flood mitigation
- Biodiversity conservation

Ecosystem service mapping

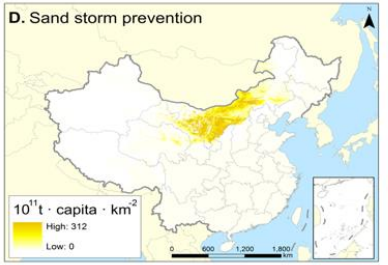


Food production

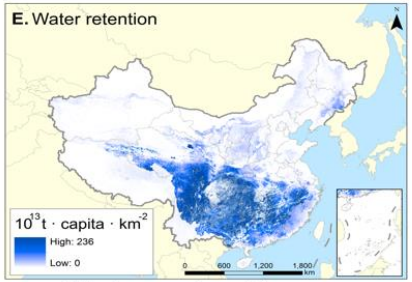
Carbon sequestration



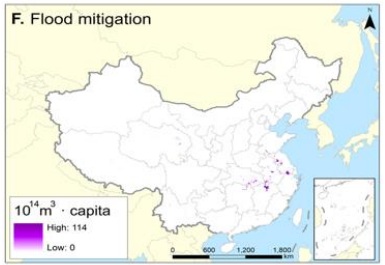
Soil retention



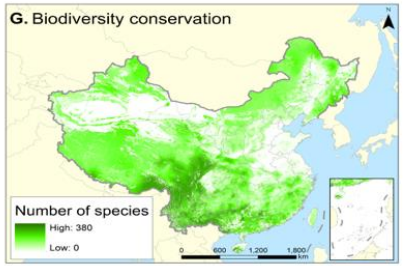
Sand storm prevention



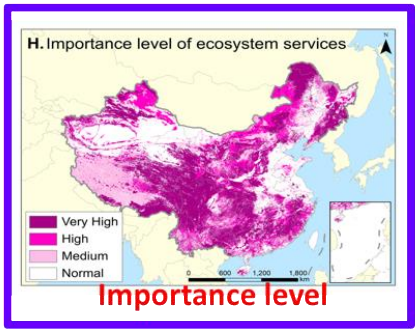
Water retention



Flood mitigation

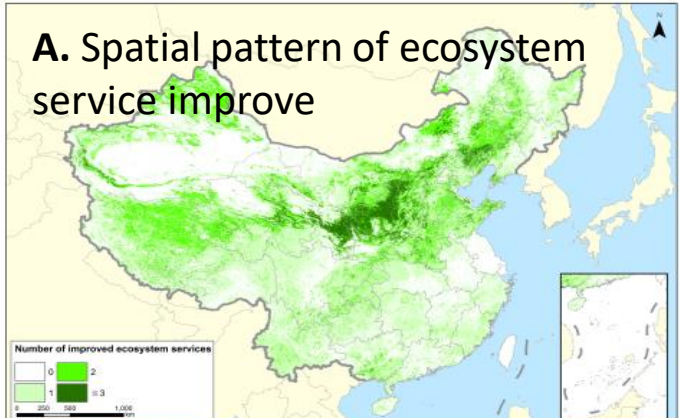


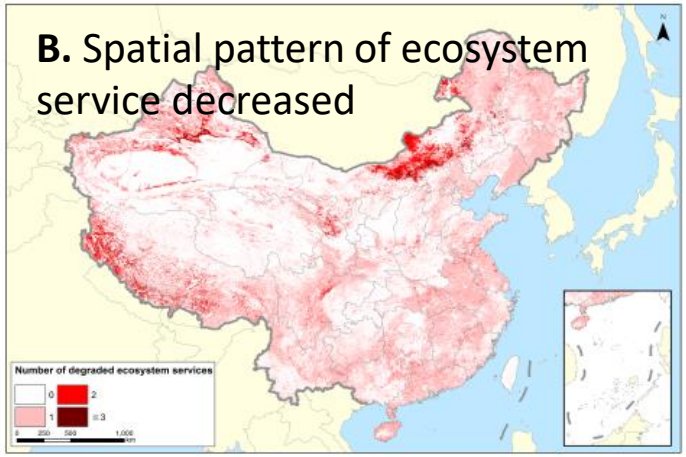
Biodiversity conservation



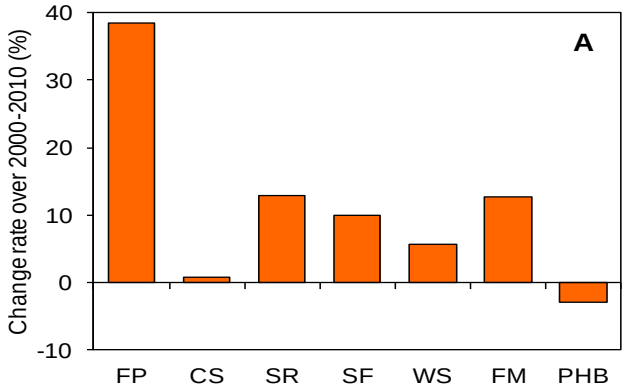
We translated biophysical supply of ecosystem services into importance of service provision by weighting supply by the number of people affected.

Changes of ecosystem service pattern in China





All ecosystem services evaluated increased between 2000 and 2010, with the sole exception of habitat provision for biodiversity.



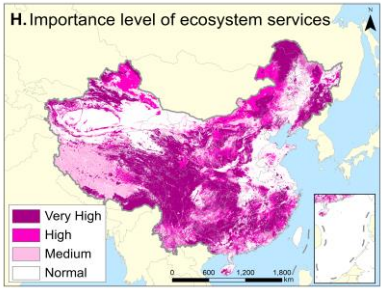
FP: Food production, CS: Carbon sequestration, SR: Soil retention, SF: Sand fixation, WS: Water supply, FM: Flood mitigation, PHB: provision of habitat for biodiversity.

Linking ecosystem services to policy making

- Identify crucial areas of ecosystem services
- Figure out conservation gabs
- Initiate and supporting new conservation policy

Linking ecosystem services to policy making

Identify crucial areas of ecosystem services in China

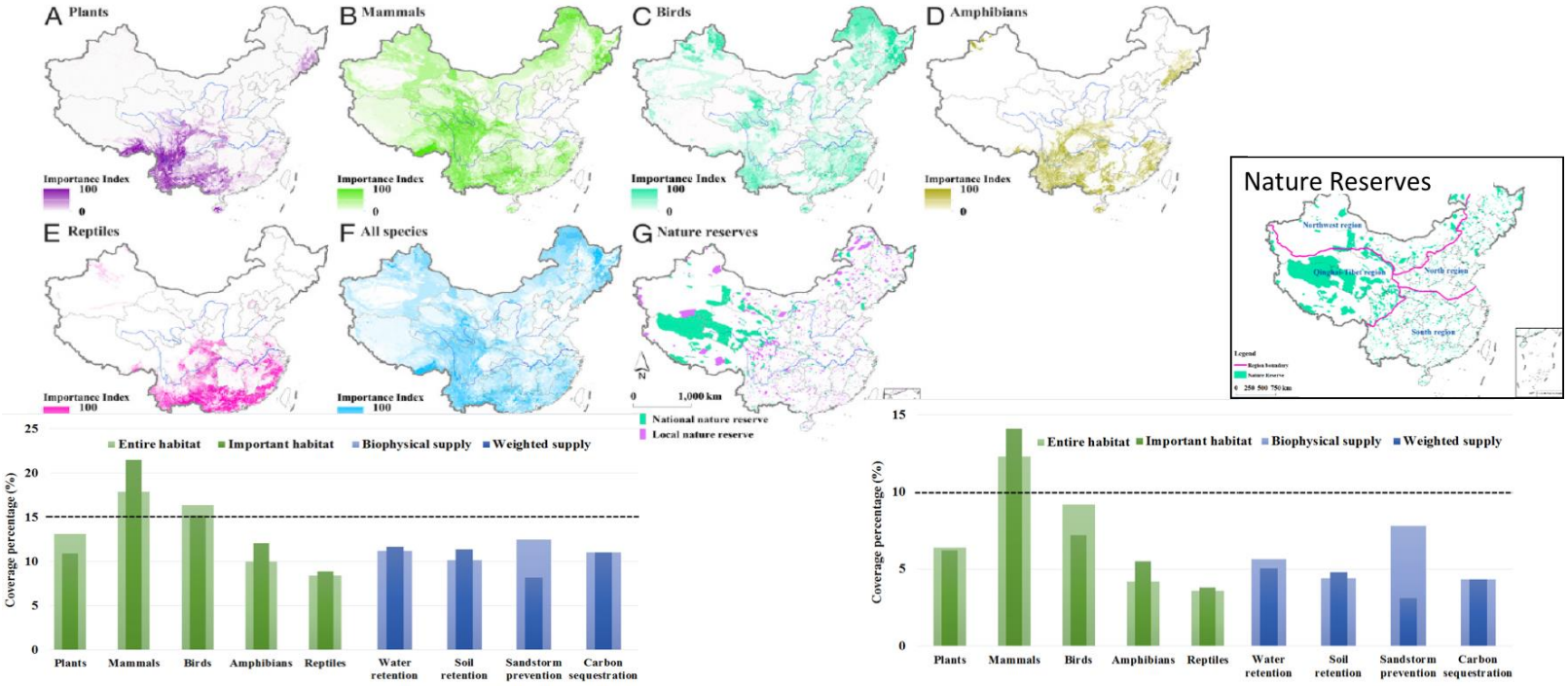


Importance	Land area		Soil retention	Water retention	Sand storm prevention	Biodiversity conservation
	10^4km^2	%	%	%	%	%
Very high	343.6	35.8	66.3	60.8	37.3	51.8
High	204.6	21.3	22.0	21.8	27.0	24.1
Medium	161.2	16.8	9.1	11.9	19.2	19.2
Normal	246.8	25.7	2.5	5.4	16.5	4.9

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

Linking ecosystem services to policy making

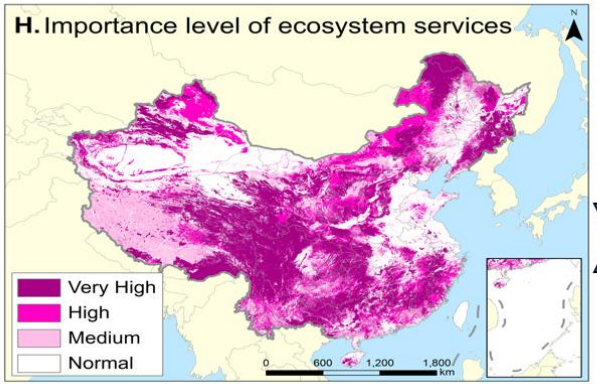
Figure out conservation gabs

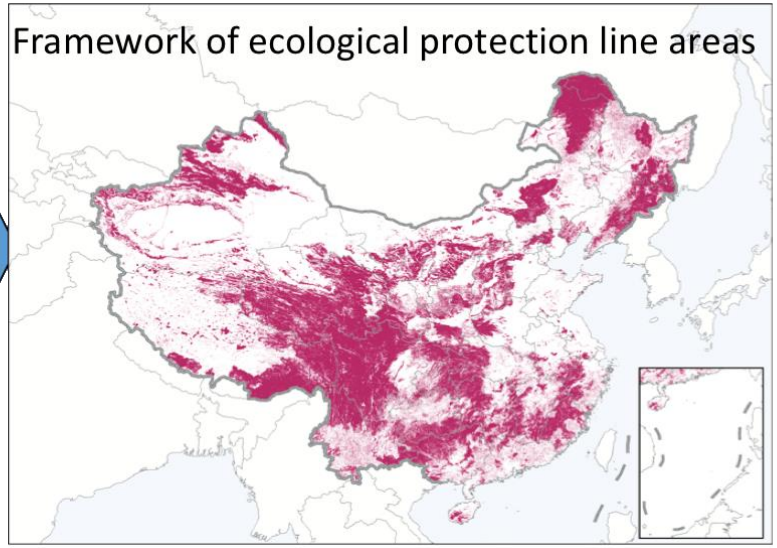


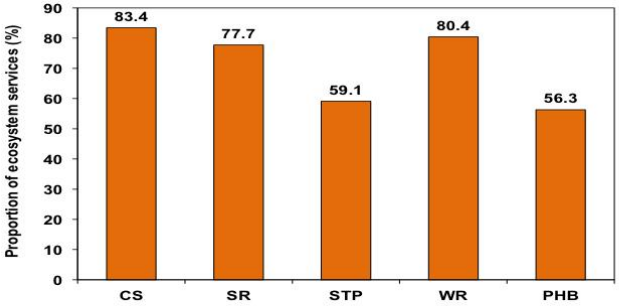
Protected Areas not well match with biodiversity and ecosystem service pattern

Linking ecosystem services to policy making

Ecological Protection Redline

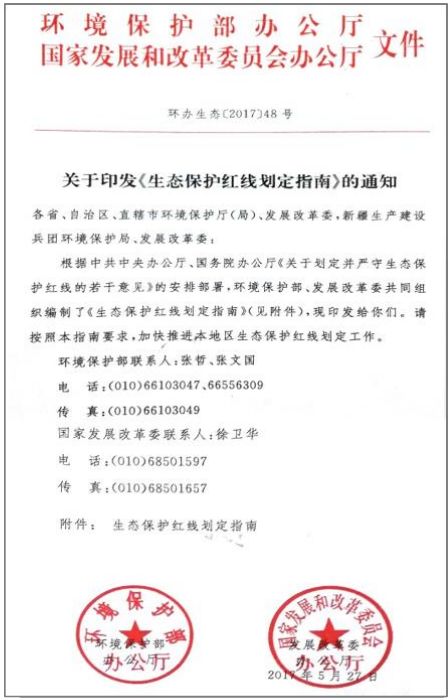






Provision of ecosystem services in EPR Areas (35 %)

- 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

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国家发展改革委联系人：徐卫华

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附件：　生态保护红线划定指南

环境保护部办公厅

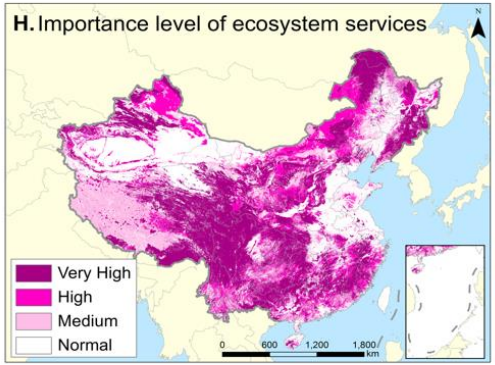
国家发展和改革委员会办公厅

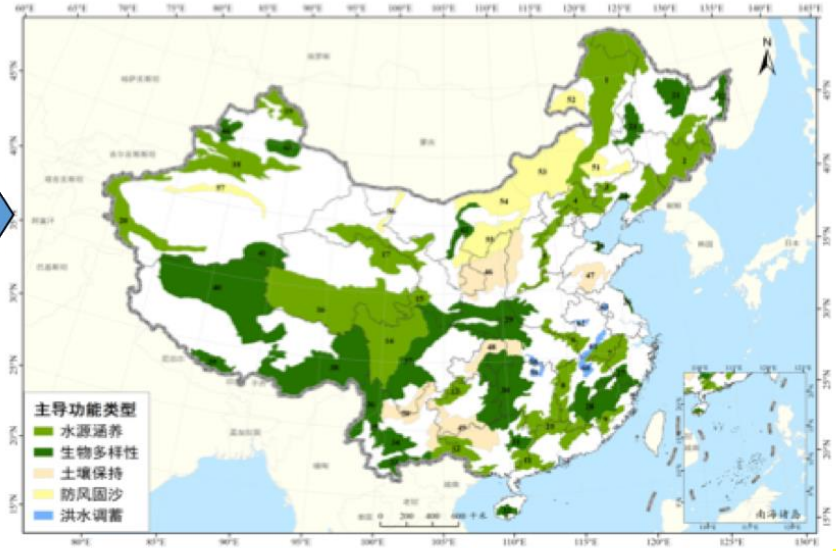
2017年5月27日

Guideline for ecological redlining by MEP and NDRC

Linking ecosystem services to policy making

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。

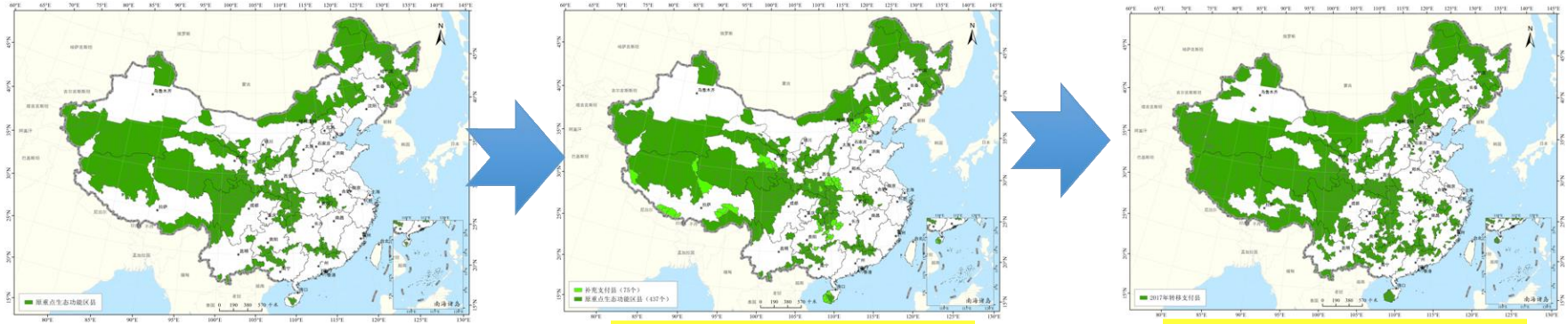
附件： 全国生态功能区划（修编版）

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

Linking ecosystem services to policy making



437 counties in 2010

512 counties in 2014

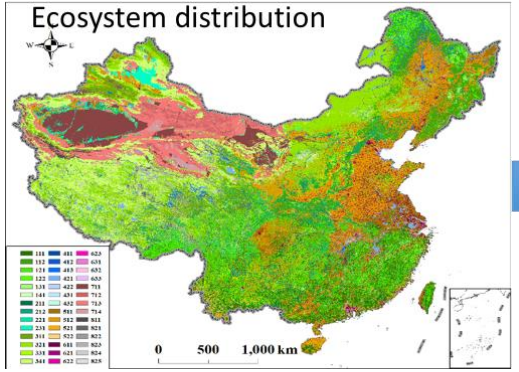
700 counties in 2016

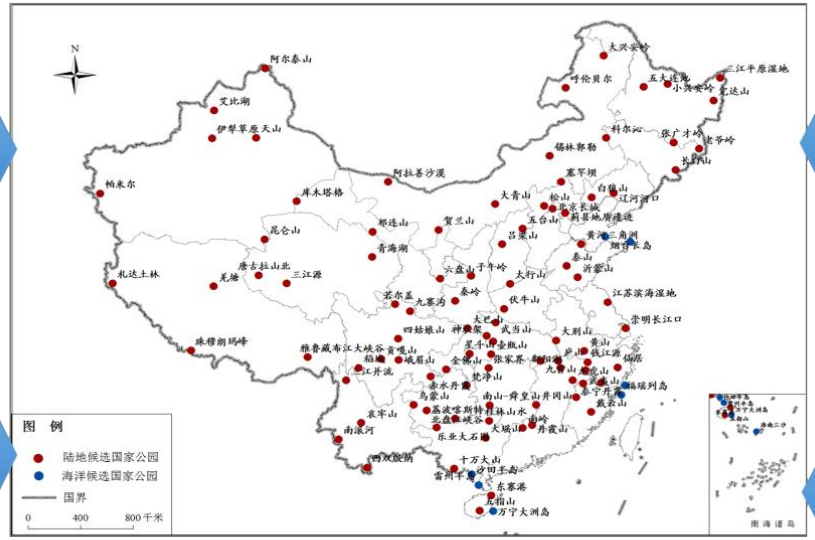
Year	Budgets (billions RMB)	Benefited Counties
2008	6.0	221
2010	24.9	437
2014	48.3	512
2017	62.7	715

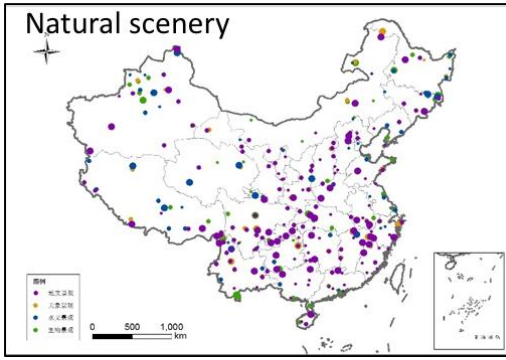
- In order to push conservation in key ecological function areas, Center government launched ecological financial transfer program based on ecosystem service pattern.
- The budget was increased to 62.7 billion yuan in 2017 from 6.0 billion yuan in 2008.

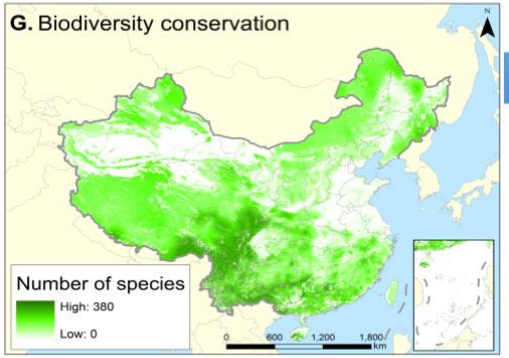
Linking ecosystem services to policy making

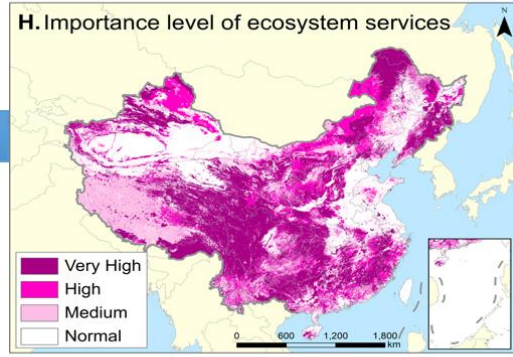
National park system planning









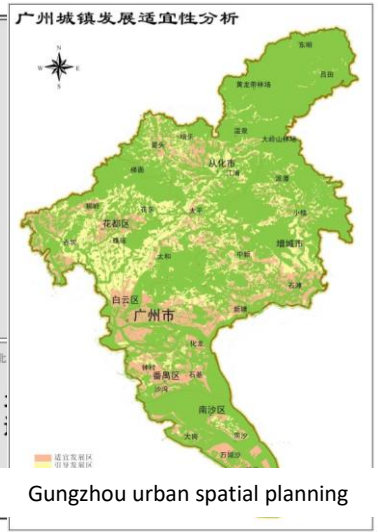


- The national parks were located based on distribution of represented ecosystems, natural landscape, wildlife and ecosystem services.

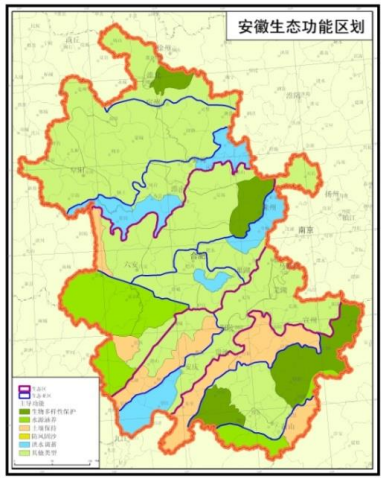
Applications in local governments

- ✧ All provinces in China have mapped ecosystem services, and identified local ecosystem function conservation areas.
- ✧ Ecosystem service spatial patterns were the basis for urban master planning and regional land use planning in many cities, as Beijing, Guangzhou

Bejing urban spatial planning



Gungzhou urban spatial planning



Anhui province eco-service zoning

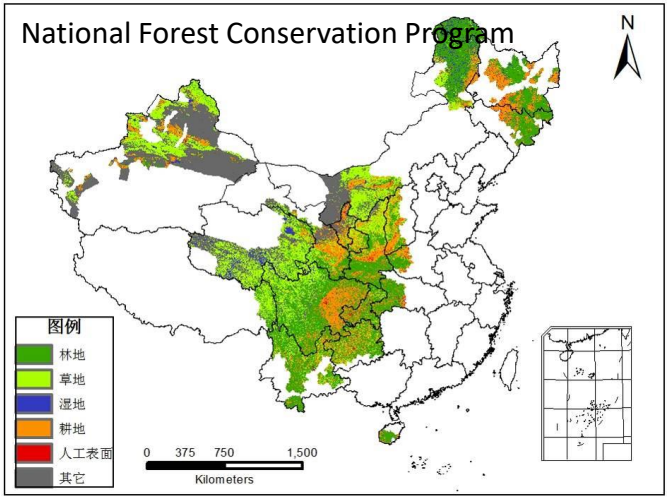
Investment of natural capital

Investment of natural capital in China

China has made great efforts in ecosystem conservation and restoration

- ✧ Sloping Lands Conversion Program targeting forest /Grassland restoration (SLCP-F)(1999-)
- ✧ National Forest Conservation Program (NFCP) (1998-)
- ✧ Three-North Shelter Forest Program (TNSFP)(1978-)
- ✧ Public ecological forest conservation program (2004-)
- ✧ Ecological financial transfer program (2008-)
- ✧ Regional ecological restoration program(2002-)

Investment of natural capital in China

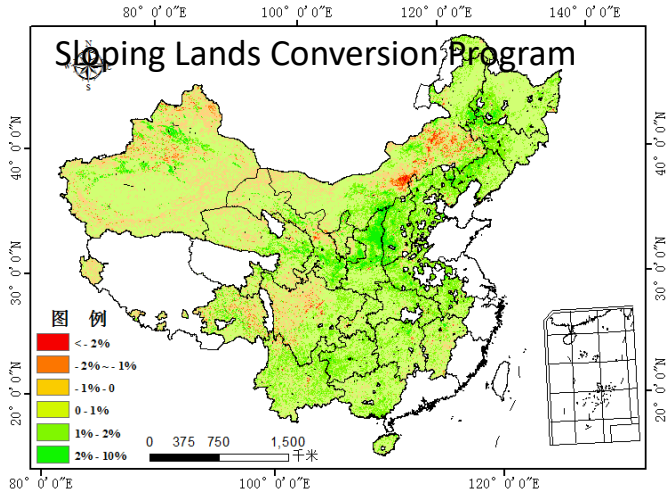


National Forest Conservation Program (NFCP)

- 901 counties in 18 provinces
- Protected forests: 0.12 billion hectares
- Budgets: 360 billion RMB

Sloping Lands Conversion Forest/Grassland Program

- 2279 counties in 25 provinces
- Investment: > 400 billion RMB
- Returned cropland: 9.0 million hectares
- Benefited household: 32 million.



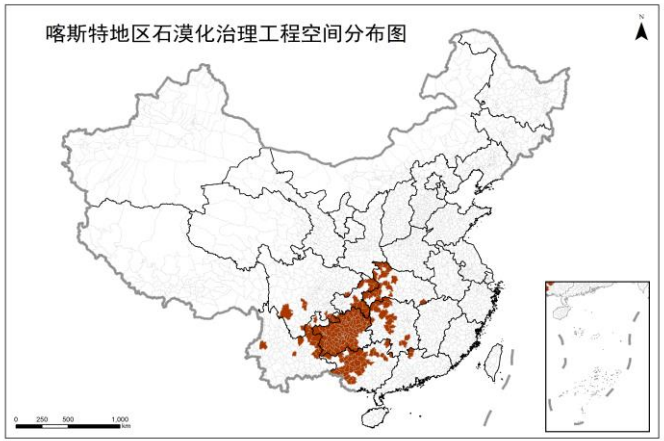
Investment of natural capital in China

Three north green belt project

Three north green belt project

- 13 provinces，551counties
- Investment: > 45 billion RMB
- Reforestation: 29.19 million hectares

Karst region ecosystem restoration project



Karst region ecosystem restoration project

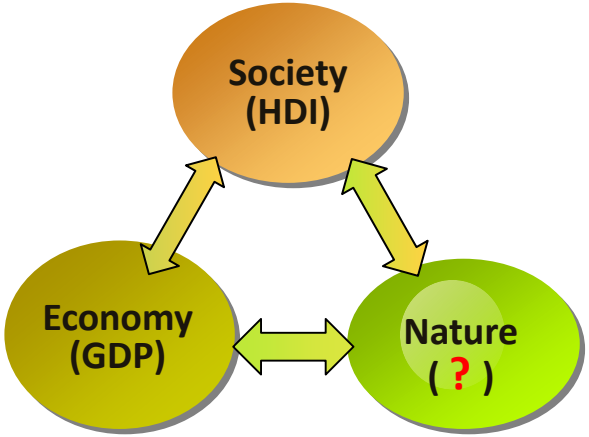
- 300 counties in 5 provinces
- Protected forests: 0.12 billion hecta
- Budgets: 11.9 billion RMB
- Benefited people: 51.96 million people

Gross Ecosystem Product (GEP)

Background

Region is a coupled nature-economic-social system

- Economy: GDP is widely used to measure economic system performance.
- Society: HDI(Human development index) is used to measure social development status based on health, education and living-standard since 1991.
- Nature: currently we do not have widely used index to measure its contribution to human welfare.



Concept of GEP

Gross Ecosystem Product, GEP

- Gross Ecosystem Product (GEP) is the total value of final ecosystem goods and services supplied to human well-being in given region annually, like a county, or a province, a county.
- Ecosystem asset (EA) is the natural asset that provides ecosystem goods and services.
- **Ecosystems:**
  - Natural ecosystem: forests grasslands, wetland, desert, marine, …
  - Managed ecosystem: cropland, orchards, aquaculture farms, urban green-space, …
  - Wildlife,

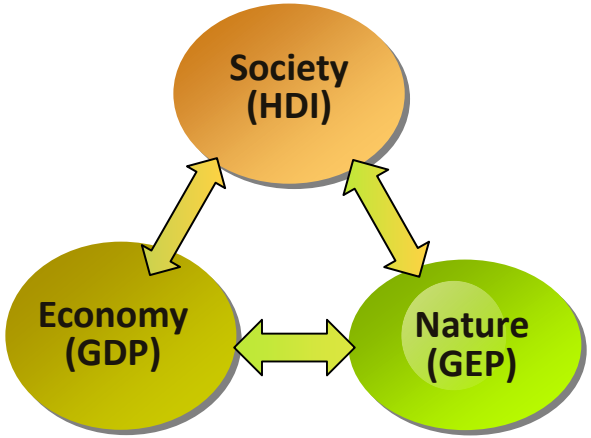
Concept of GEP

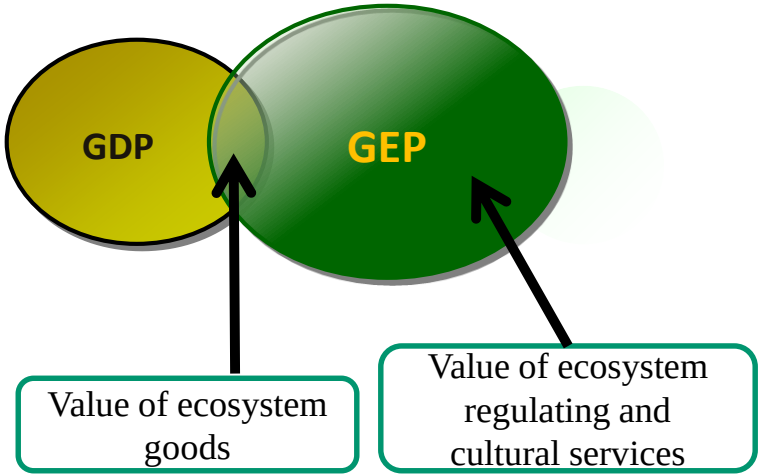
Purposes of GEP accounting

- ✧ Assessment/description of ecosystem status
- ✧ Evaluation of the contribution of ecosystems to human welfare
- ✧ Assessment of effectiveness of conservation efforts
- ✧ Evaluation of performance of local governments or communities in natural conservation, particularly in China
- ✧ Reveal the ecological linkages among regions
  - ✓ Ecological dependency
  - ✓ Ecological supporting

Concept of GEP

- GDP, HDI, and GEP





- GEP, GDP and Green GDP
  - ✓ GEP, The goods and services provided by ecosystems.
  - ✓ GDP, the goods and services provided by economic systems.
  - ✓ Green GDP, the GDP minus natural and environmental costs,

GEP and SEEA-EEA

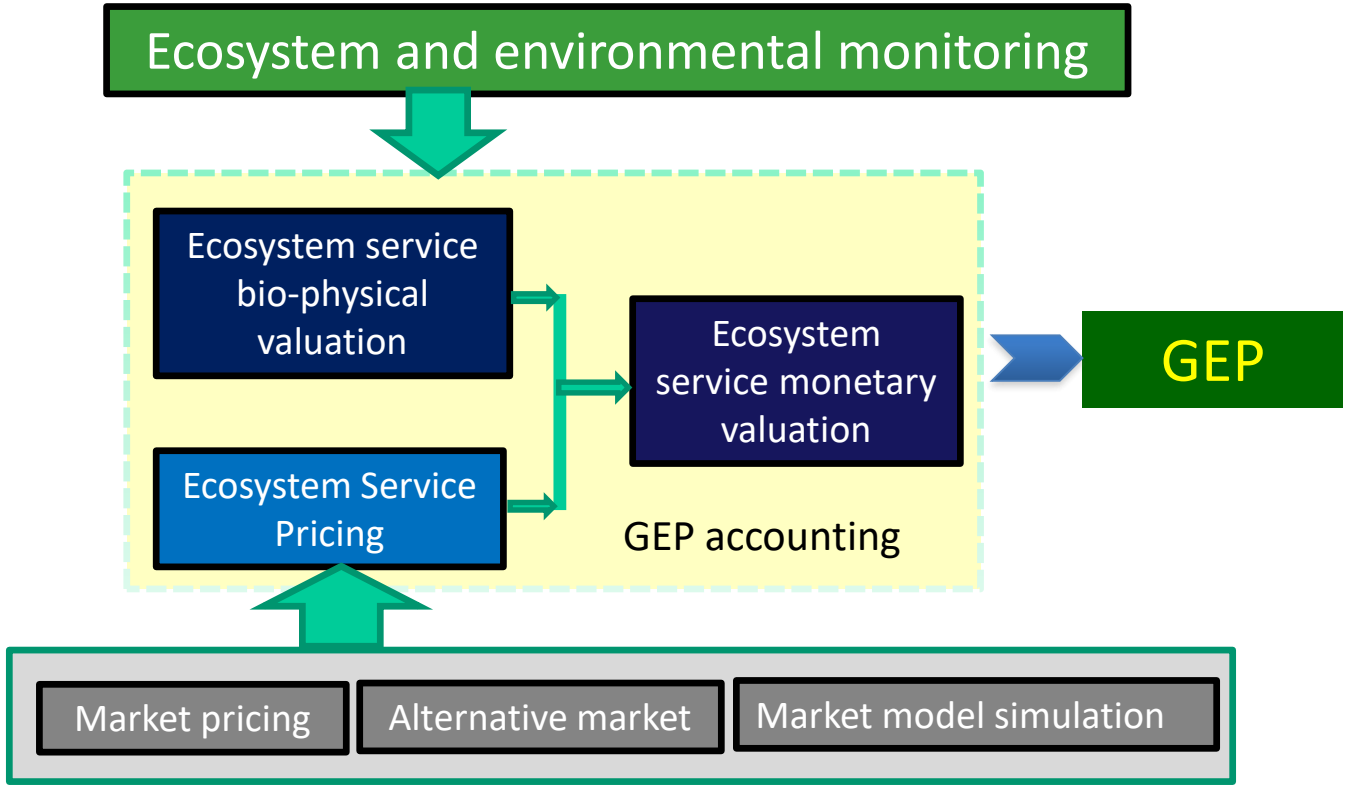
		GEP	SEEA-EEA
Similarity	Basic ideas	Valuing the contribution of nature to human wellbeing	
	Accounting principles	Ecosystem products and services	
	Main contents	Flows of value (ecosystem material products, regulating services, and cultural services) and stocks (ecosystem asset)	
	Methods	Similar methods for regulating and cultural services	
Difference	Definition	The aggregated value of ecosystem products and services in given region.	Comprehensive framework for valuing ecosystem services
	Attributes	A comprehensive indicator to measure the contribution of nature to human wellbeing	Technical guideline for valuing ecosystem products and services
	Index	Ecosystem products including the materials from both natural and managed ecosystems	Ecosystem products including the materials only from natural ecosystems
	Policy implementation	An indicator to evaluate performance of conservation policies and efforts	A technical guideline to evaluate performance of conservation policies and efforts
	Calculation methods	There are some different calculation methods for individual services, eg, ecosystem material products, water retention, EA.	

GEP accounting methods

The principles of GEP accounting

- Use value of ecosystem services
  - ✓ Direct use value: food, bio-energy, water resource,
  - ✓ Indirect use value: water retention, soil retention, pollutant purification, climate regulation
- The value of final eco-services
  - ✓ Ecosystem goods, regulating services, cultural services
- The bio-physical value accounting
  - ✓ Amount of food production, amount of water retention, amount of soil retention,
- The monetary value accounting
  - ✓ The economic value of ecosystem services

GEP accounting methods



GEP accounting methods

✦ Accounting of economic values of ecosystem services

✓ GEP: the total economic value of ecosystem provision (EPV), Ecosystem regulating services (ERV) and cultural services (ECV) in the given area annually.

$$\mathrm{GEP} = EPV + ERV + ECV$$

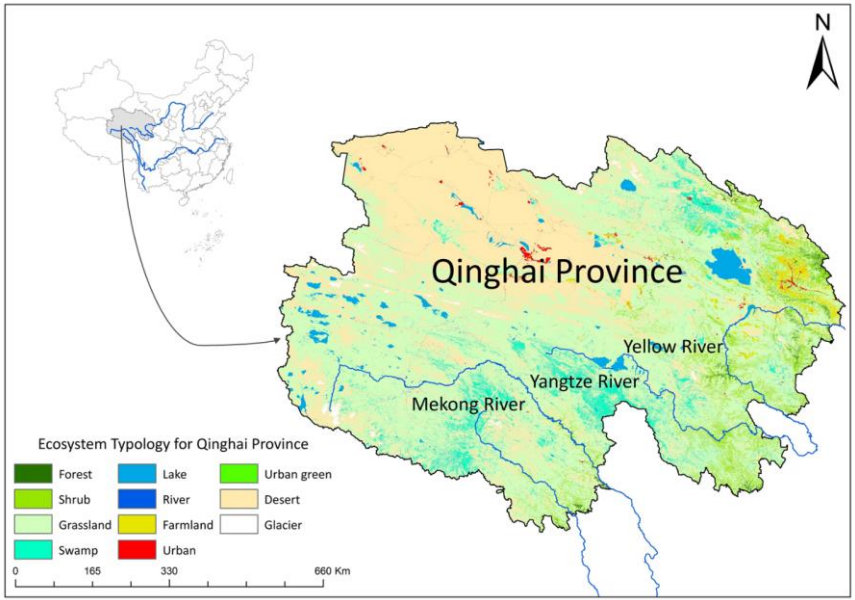
$$\mathbf{GEP} = \sum_{i=1}^{n} \boldsymbol{EP_i} \times \boldsymbol{P_i} + \sum_{j=1}^{m} \boldsymbol{ER_j} \times \boldsymbol{P_j} + \sum_{k=1}^{l} \boldsymbol{EC_k} \times \boldsymbol{P_k}$$

GEP accounting methods

Ecosystem services

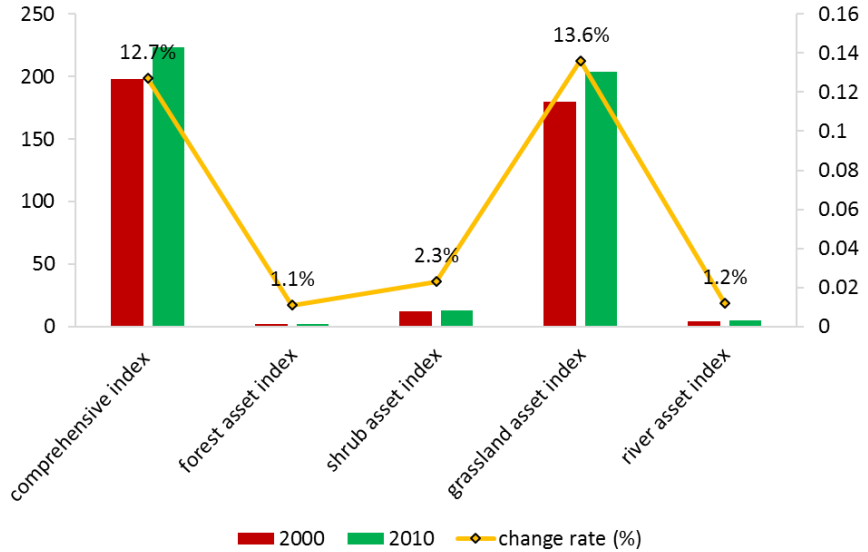
Categories	Goods and services (examples)
Ecosystem goods	Food: grain, vegetable, fruits, meat, milk, egg, fish,
	Materials: wood, fiber, water, genes,
	Energy: bio-energy(fuelwood), hydro-power, wind energy,
	Others: medicine, seedling, ornament
Regulating services	Regulation services: water conservation, soil conservation, carbon sequestration, climate regulating, pollutant purification, pollination,
	Protecting services: sand storm prevention, flooding mitigation, pest control,
Cultural service	Aesthetic services: recreation and ecotourism
	Cultural value: knowledge, education, arts, spirit

GEP experimental accounting in Qinghai province



GEP and EA accounting of pilot areas

Ecosystem Assets Index and Its Change of Qinghai Province



- The grassland assets index is the highest, indicating that **grassland is main kind of ecological assets** in Qinghai Province.
- Grassland assets index increased the most with 13.6%, because of **grassland quality promotion**;
- Increase rate of river assets index is 12.1%, because of **river quality promotion**.

GEP and EA accounting of pilot areas

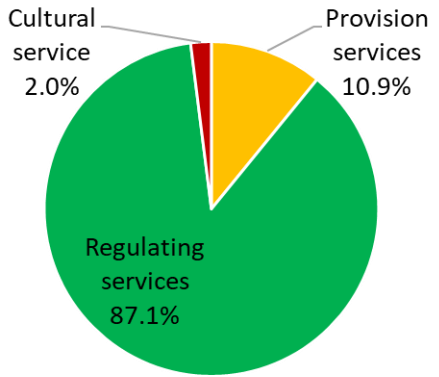
Bio-physical value & monetary value of GEP in Qinghai Province

Types of service	Category of ecosystem services	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	0.5
		Animal husbandry production ($x10^3$t)	724	5.8	0.5
		Fishery production ($x10^3$t)	10.6	0.3	0.0
		Forestry production ($x10^3m^3$)	825	0.7	0.1
		Plant nursery production ($x10^9$)	11	0.7	0.1
		Total		13.1	1.2
	Water supply	Water use in downstream agricultural irrigation ($x10^9$ m^3)		15	1.4
		Water use in households ($x10^9m^3$)		13.8	1.3
		Water use in industry ($x10^9m^3$)		29.2	2.6
		Hydropower production ($x10^9$ kwh)	92	48.8	4.4
		Total		106.7	9.7
Regulating services	Flood mitigation	Flood mitigation ($x10^9m^3$)	0.07	0.03	0.0
	Soil retention and non-point pollution prevention	Retained soil ($x10^9$ t)	0.4	7	0.6
		Retained N ($x10^3$ t)	10	0.02	0.0
		Retained P ($x10^3$t)	0.7	0.002	0.0
	Water purification (wetland)	COD purification ($x10^3$ t)	104.3	0.1	0.0
		NH-N purification ($x10^3$ t)	10	0.02	0.0
		TP purification ($x10^3$ t)	0.9	0.003	0.0
	Air purification	SO_2 purification ($x10^3$ t)	150.8	0.2	0.0
		NO_x purification ($x10^3$ t)	117.9	0.1	0.0
		Dust purification ($x10^3$ t)	246	0.04	0.0
	Sandstorm prevention	Sand retention ($x10^9$t)	0.5	31.7	2.9
	Carbon sequestration	Carbon sequestration ($x10^9$ t)	0.02	4.7	0.4
	Climate regulation	By vegetation (x109 kwh)	653.5	346.3	31.4
		By water surface (x109 kwh)	1078.3	571.5	51.8
		Total		961.715	87.2
Cultural services	Eco-tourism	Tourists（$x10^6$ persons）	23.2	21.6	2.0
		Grand Total		1103.115	100.0

GEP and EA accounting of pilot areas

GEP of Qinghai in 2015：1103.1 Billion

Items	Value (billion yuan)	Ratio (%)
Material services	119.8	10.9
Regulating services	961.7	87.1
Cultural service	21.6	2
Total	1103.1	100.0

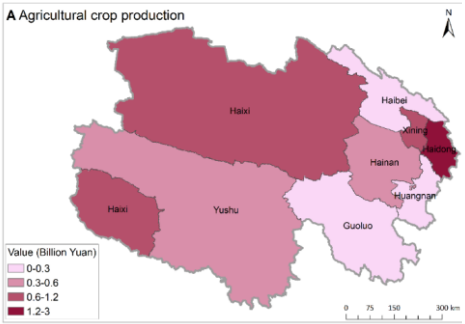


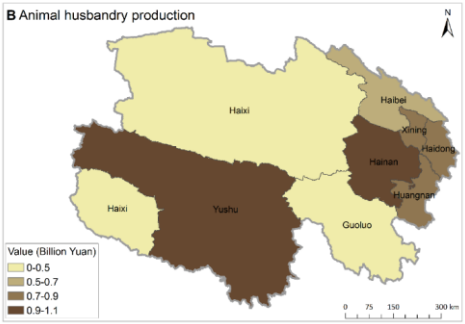
GEP constitute of Qinghai Province in 2015

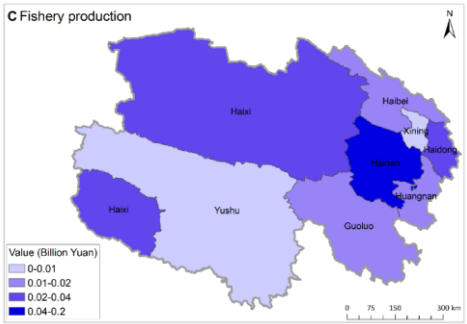
GEP and EA accounting of pilot areas

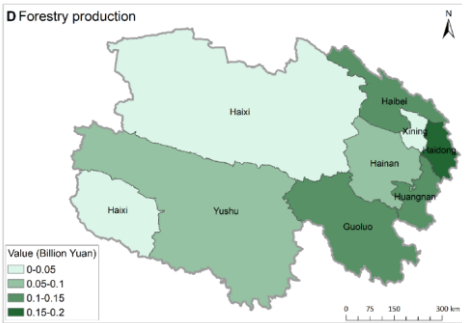
Ecosystem services produced within Qinghai Province

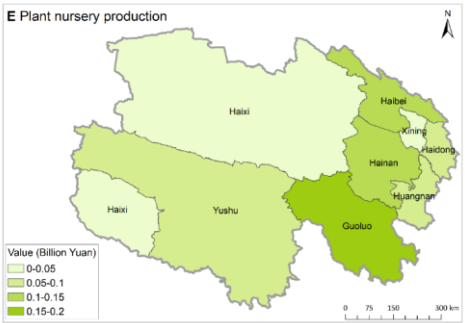
Material services

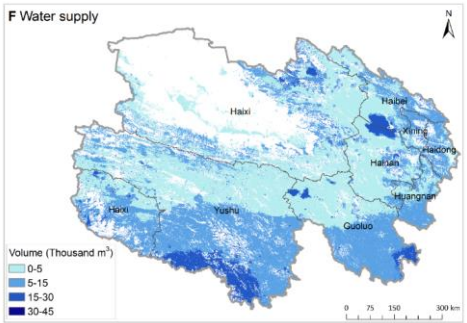








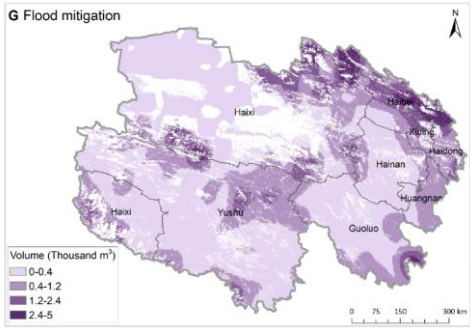


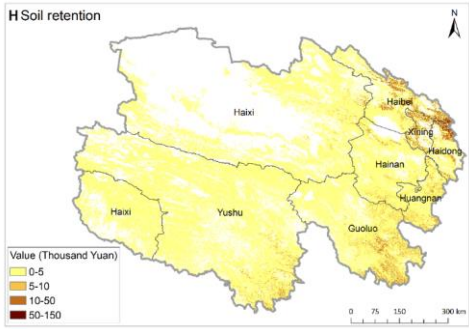


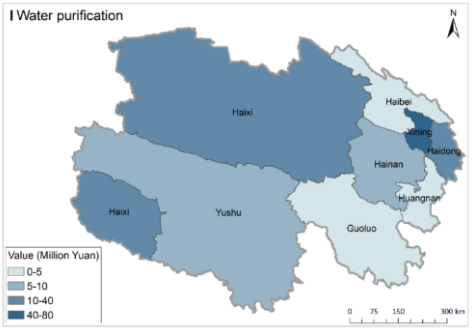
GEP and EA accounting of pilot areas

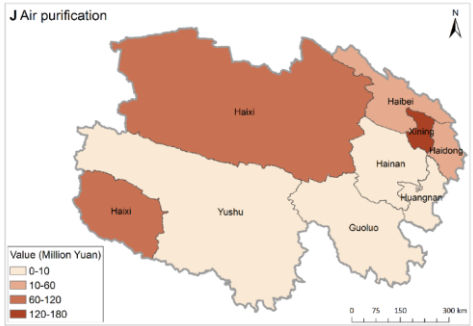
Ecosystem services produced within Qinghai Province

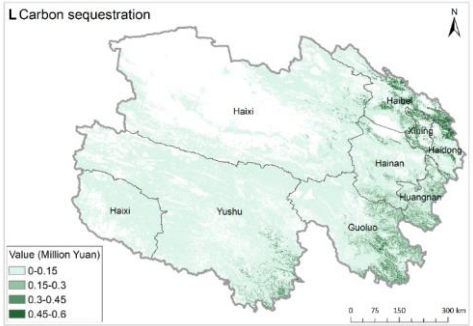
Regulating services





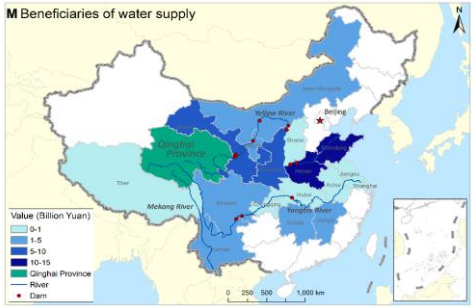






GEP and EA accounting of pilot areas

The location of beneficiaries in recipient provinces



GEP and EA accounting of pilot areas

Changes of the GEP in Qinghai Province (2000–2015)

Services	2015 (Billion Yuan)	2000 (Billion Yuan)	2000–2015 (constant price)
			Rate of change (%)
Provisioning services	119.8	50.3	138.2
Regulating services	961.72	945.09	1.8
Culture services	21.6	3	620.0
GEP	1,103.12	998.39	10.5

Conclusion

- China has made big efforts to apply ecosystem service evaluation and mapping in conservation policies.
- Ecosystem service evaluation can be powerful and useful tools to support conservation policy making and innovation.
- China is developing GEP accounting for evaluation of effectiveness of ecological compensation, conservation efforts.
- **Opportunity**
  - ✓ Urban ecological restoration: ecosystem service orientation
  - ✓ Coastal management
  - ✓ Marketing mechanism for ecosystem services.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