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Mainstreaming ecosystem services accounting into conservation policy

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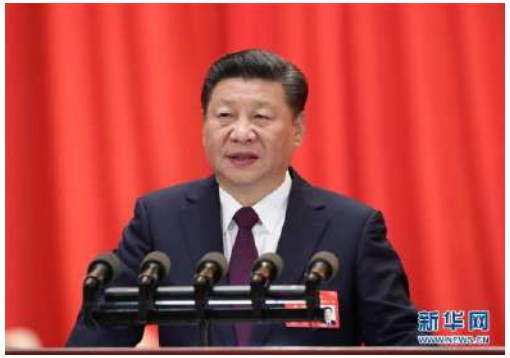
Contents

- Background
- Gross ecosystem product (GEP)
- GEP accounting applications in policy making and innovation
  - ✓ National conservation
  - ✓ Efficiency assessment of ecological compensation
  - ✓ Ecological cooperation of river basin
  - ✓ Evaluation of progress of ecological civilization

Background



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?

绿水青山就是金山银山

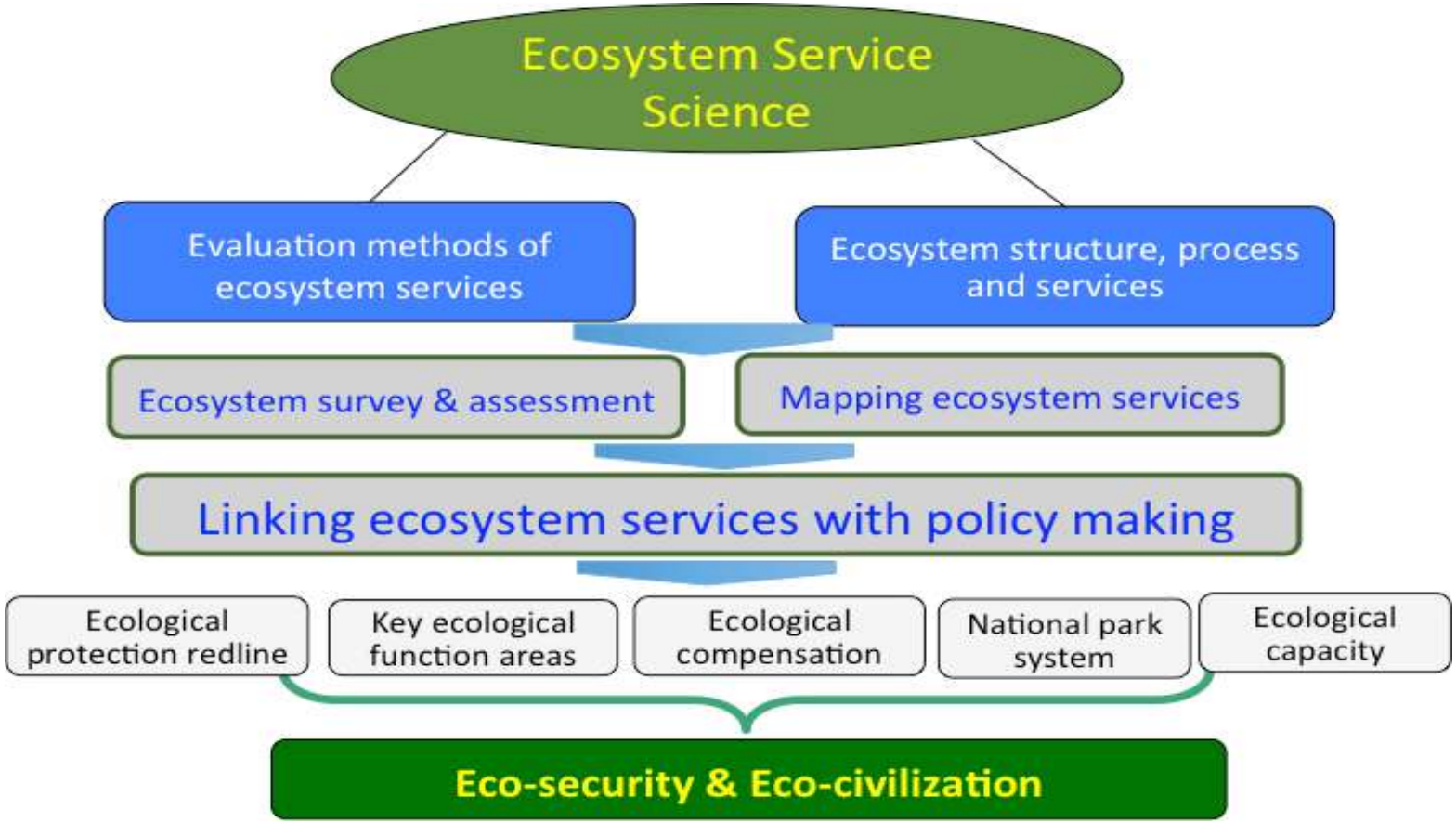
生态系统具有巨大生态价值

生态价值可以带来经济效益

Green mountain and clear water are gold and silver mountains

Ecosystems provide human with valuable ecological products

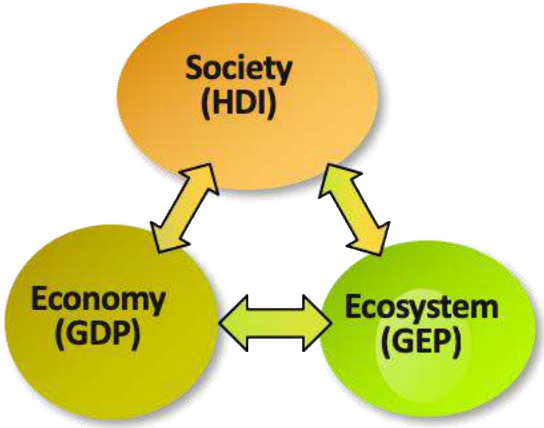
Background


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

Gross ecosystem product (GEP) accounting

Gross Ecosystem Product Accounting

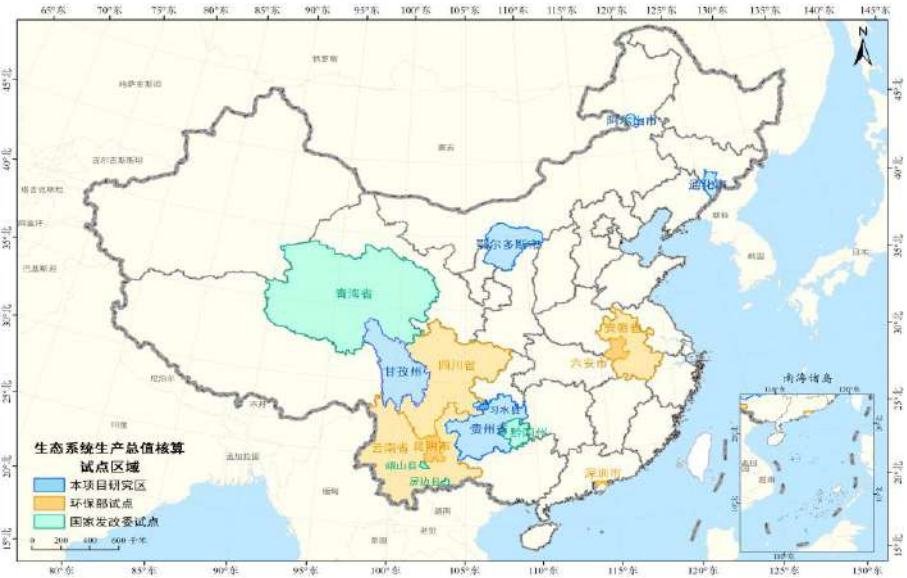
- A region or city is a coupled human and natural system, consisting of social, economic and natural sub-systems.
- China, as well as many other countries, needs a index or system to evaluate:
  - ✓ contribution of ecosystems to human welfare.
  - ✓ effects of natural conservation efforts.
  - ✓ performance of local government or communities in natural conservation, particularly in China.

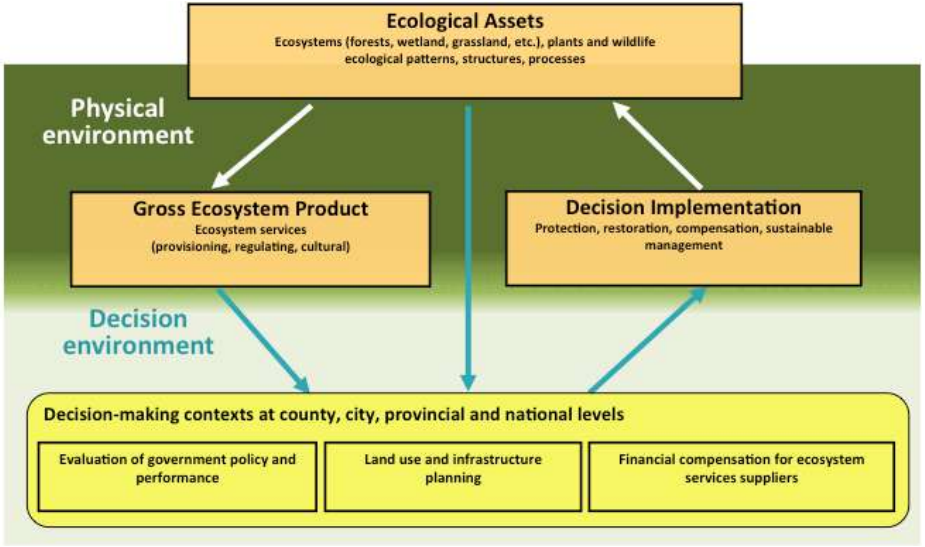


- **G**ross **E**cosystem **P**roduct (**GEP**)
  - ✓ the total value of ecosystem **final goods and services** supplied to human well-being in a region annually, like a country, province/state, county or city.

Gross Ecosystem Product Accounting

- GEP accounting can be a potential tools to link ecosystem service accounting to conservation policy.





- China is studying GEP accounting methods and technical guideline at national, provincial, and county levels.
- Pilot studies were widely distributed in China.

Gross Ecosystem Product Accounting

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
- ✧ 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 accounting based on bio-physical value accounting.

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

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

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

Gross Ecosystem Product Accounting

Ecosystem services

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

Contents

GEP accounting applications in policy making and innovation

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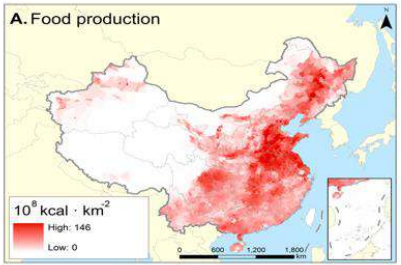
Applications in national conservation policy making

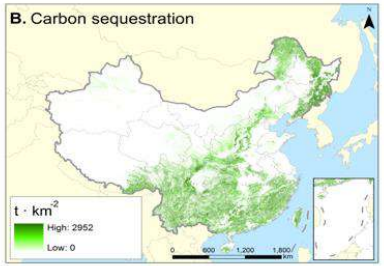
- The information and findings in GEP accounting have been used in supporting national, regional,provincial conservation policy making and environmental management.
  - National and provincial ecological redline planning
  - National key ecological functional region planning
  - National park planning
  - National ecological transfer payment
  - National and provincial natural reserve monitoring
  - Ecological carrying capacity assessment and early warning
- Database: http://www.ecosystem.csdb.cn/: 3T

Identify the crucial areas for conservation

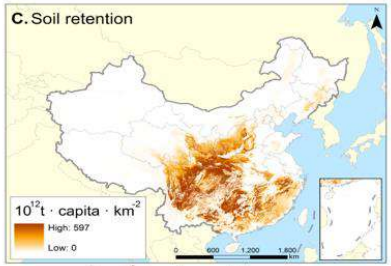
Spatial pattern of ecosystem services



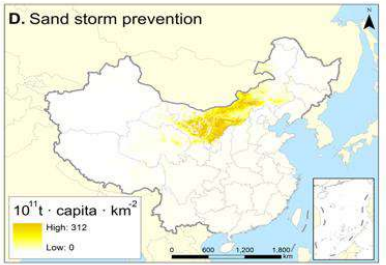
Food production



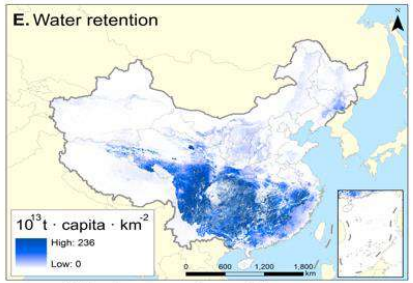
Carbon sequestration



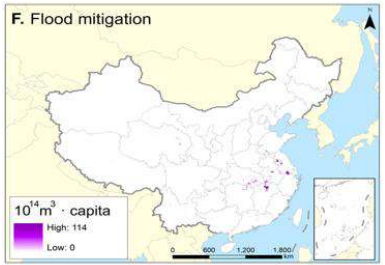
Soil retention



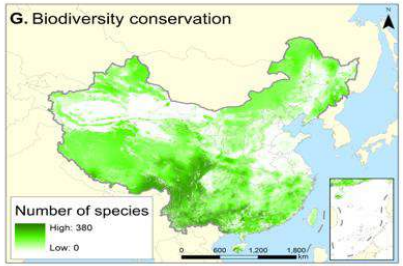
Sand storm prevention



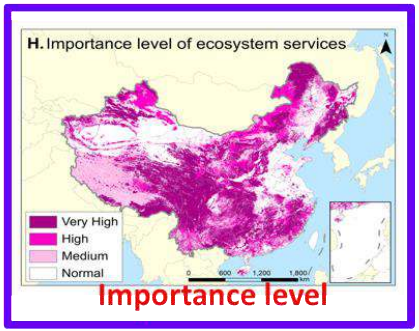
Water retention



Flood mitigation



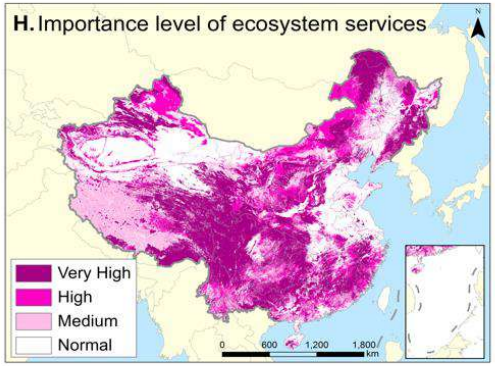
Biodiversity conservation

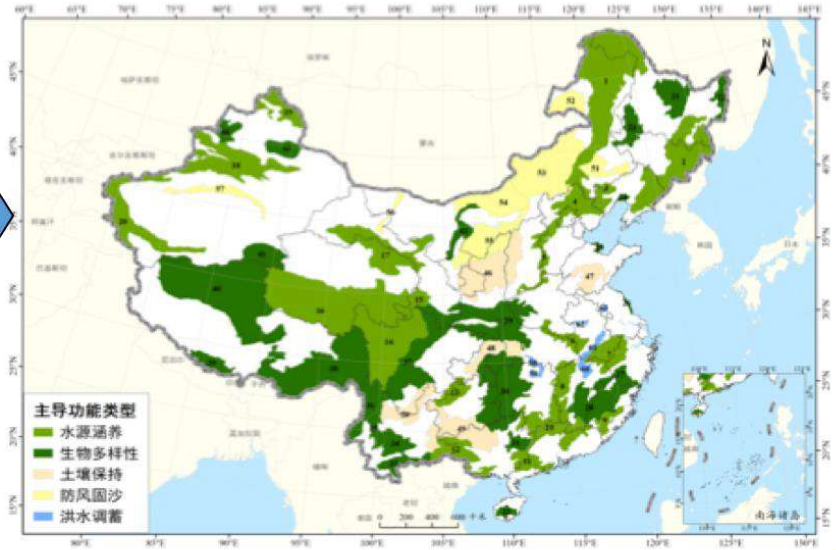


Importance level

Based on spatial patterns of bio-physical value of ecosystem services, we identified the crucial areas for conservation.

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。

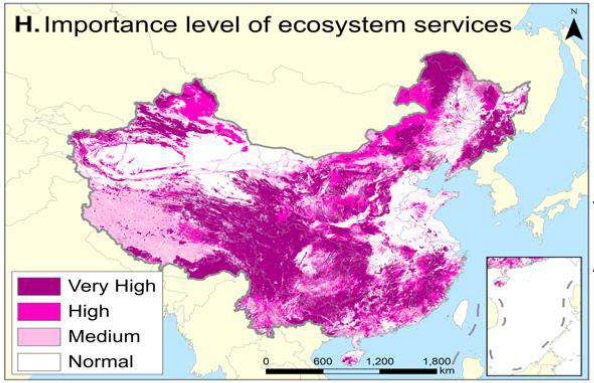
附件：全国生态功能区划（修编版）

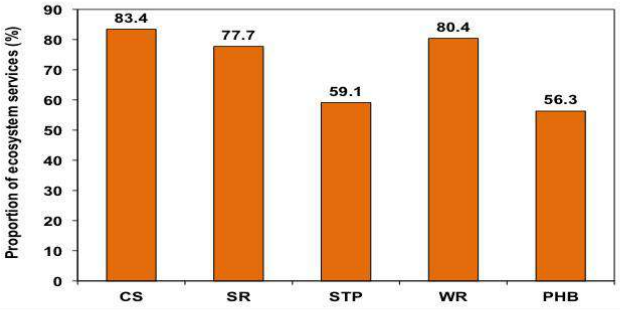
2015 年 11 月 13 日

- 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.

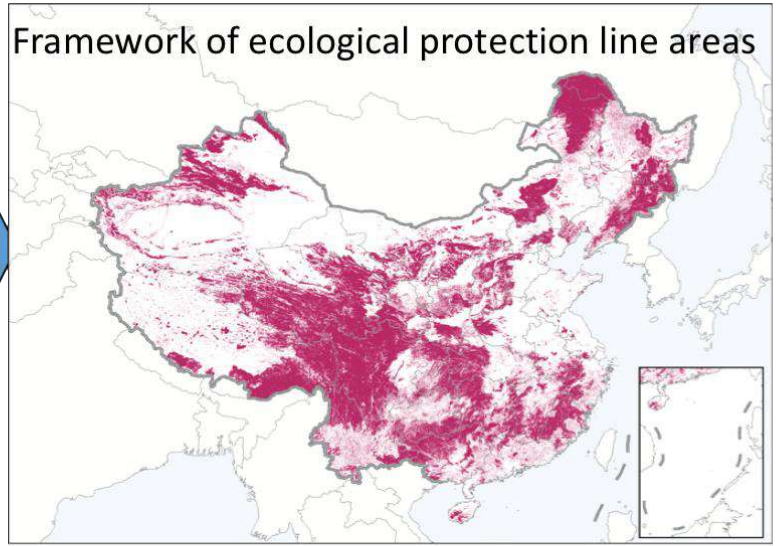
- Water retention
- Biodiversity conservation
- Soil retention
- Sand fixation
- Flood mitigation

Ecological Protection Redline (EPR)

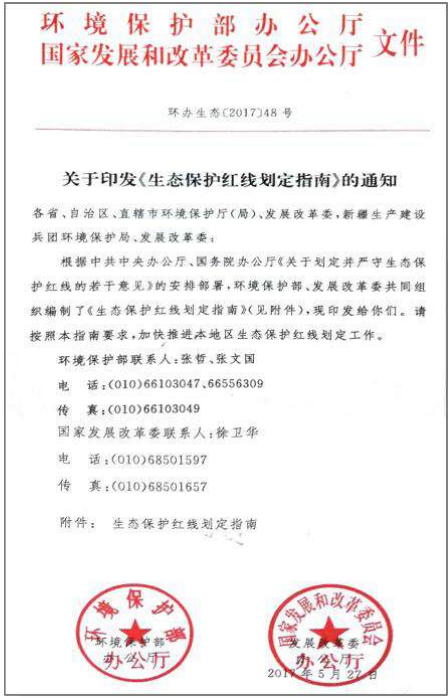




Provision of ecosystem services in EPR Areas (35 %)



- 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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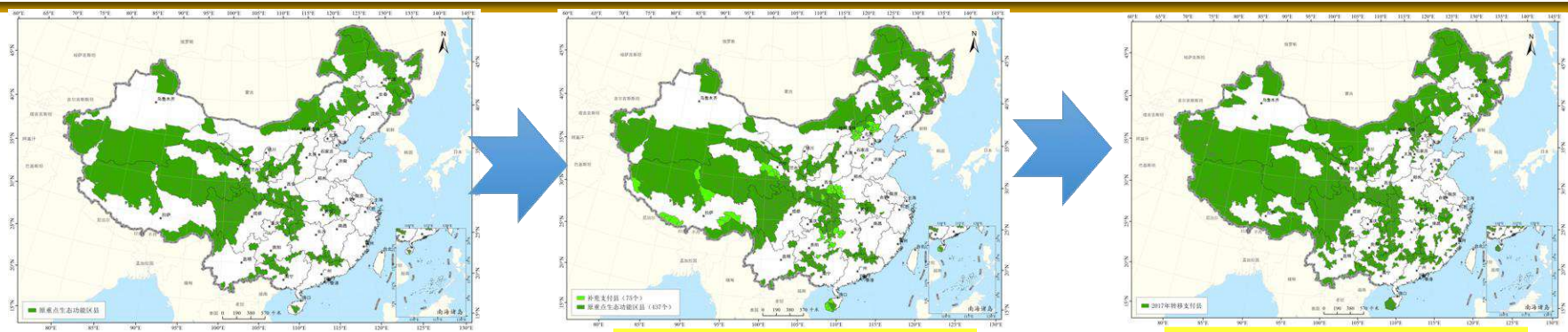
传　真：(010)68501657

附件：　生态保护红线划定指南

环境保护部办公厅
发展改革委办公厅
2017年5月27日

Guideline for ecological redlining by MEP and NDRC

Ecological financial transfer



437 counties in 2010

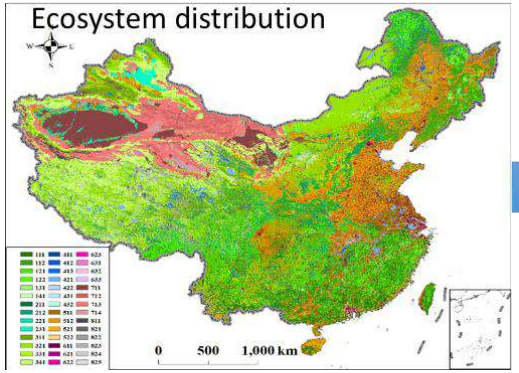
512 counties in 2014

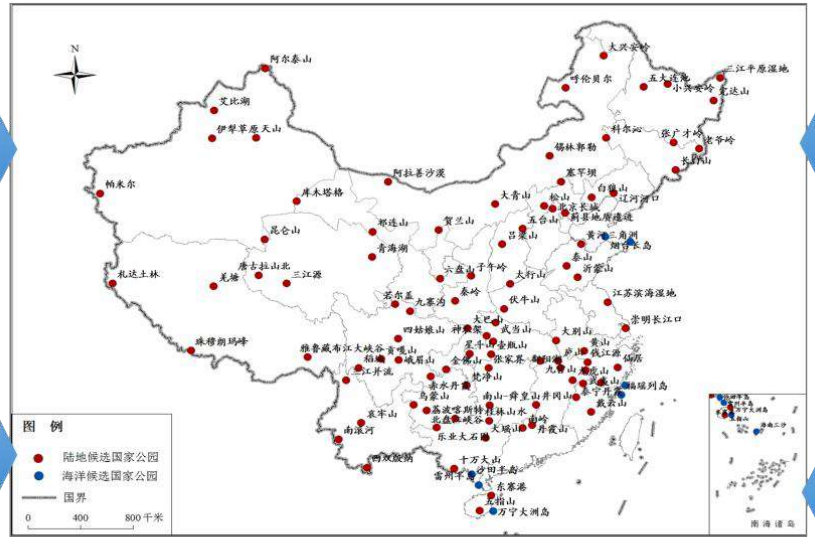
700 counties in 2016

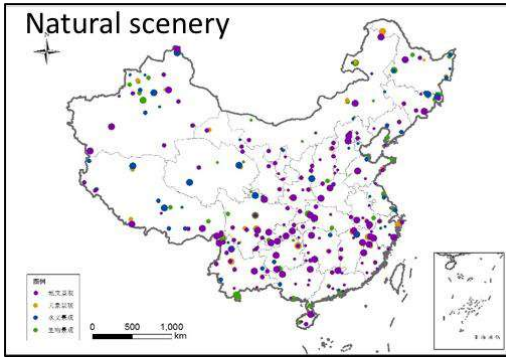
Year	Budgets (billions RMB)	Benefited Counties
2008	6.0	221
2010	24.9	437
2014	48.3	512
2017	62.7	715

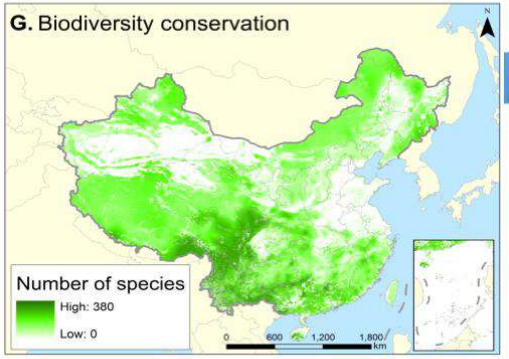
- In order to push conservation in key ecological function areas, Center government launched ecological financial transfer program based on ecosystem service pattern.
- The budget was increased to 62.7 billion yuan in 2017 from 6.0 billion yuan in 2008.

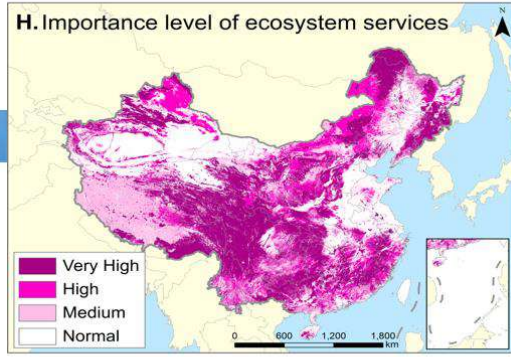
National park system planning







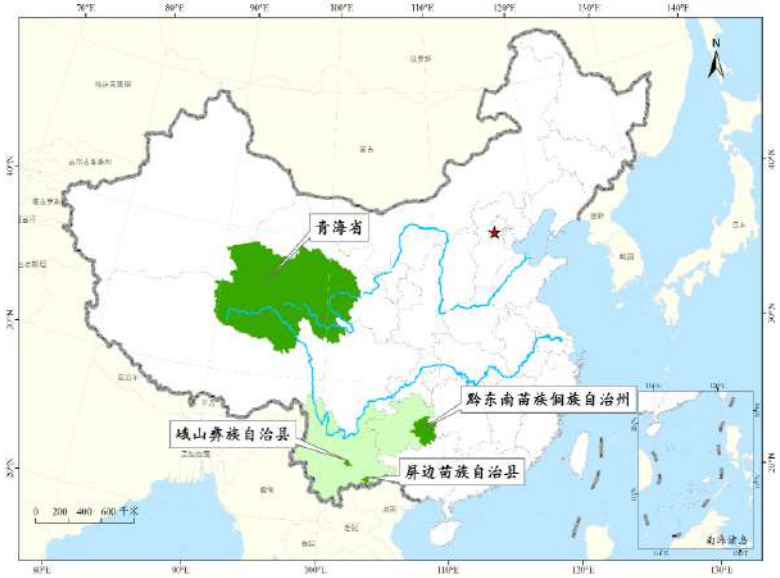




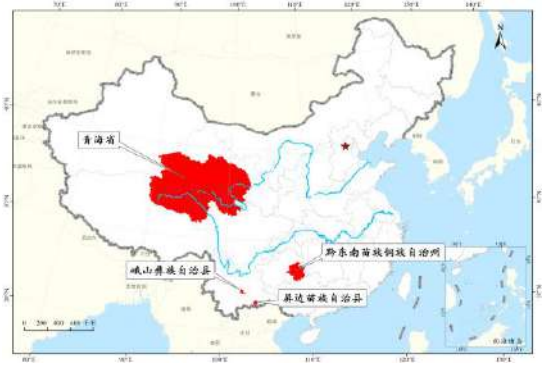
- The national parks were located based on distribution of represented ecosystems, natural landscape, wildlife and ecosystem services.

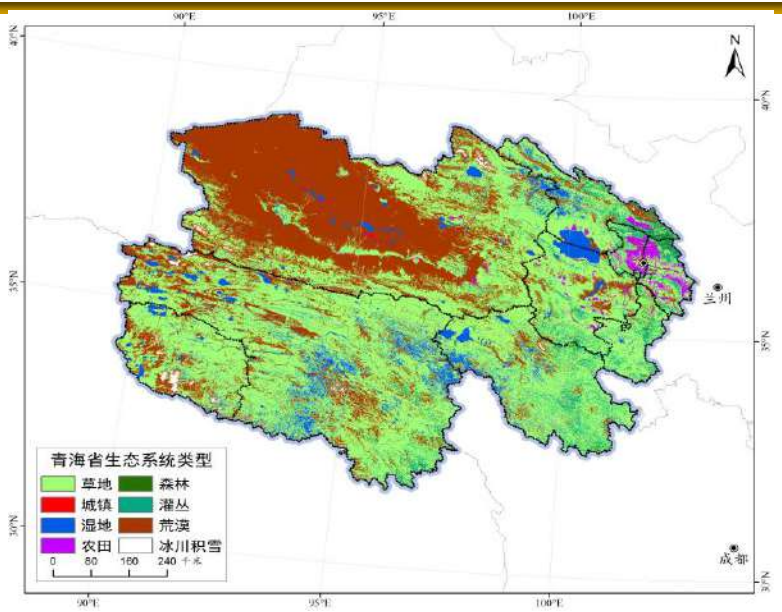
GEP accounting for ecological compensate

In Qinghai province, Qiandongnan city and Eshan county



青海自然环境与经济社会概况





- 青海位于藏高原东北部。
- 面积为70万km^2，人口583万，2017年地区生产总值(GDP)2642.8亿元
- 草地面积，占全省58.3%，荒漠，占27.5%。
- 青海生态区位重要，生态系统水源涵养、生物多样性保护、防风固沙等服务功能巨大
- 我国重要生态功能区与国家生态安全屏障

GEP accounting in Qinghai Province

Ecosystem areas and quality

生态系统类型	合计	优		良		中		差		劣	
		面积	比例（%）	面积	比例（%）	面积	比例（%）	面积	比例（%）	面积	比例（%）
森林	2943.5	1280.2	43.5	94.7	3.2	150.3	5.1	461.7	15.7	956.6	32.5
灌丛	26426.3	3196.5	12.1	1679.3	6.4	4147	15.7	7962.5	30.1	9441	35.7
草地	377374.3	24267.3	6.4	75359.5	20	78927.9	20.9	120562.4	31.9	78257.2	20.7
河流	5254.2	3945.9	75.1	436.1	8.3	541.2	10.3	105.1	2	225.9	4.3
湖泊	14313.8	14313.8									
沼泽	28142.1	28142.1									
荒漠	225707.8	225707.8									

Ecological asset changes in Qinghai

生态资产指数	2010	2000	变化率(%)
森林生态资产	1.89	1.87	1.1
灌丛生态资产	12.61	12.33	2.3
草地生态资产	203.95	179.58	13.6
湿地生态资产	4.9	4.37	12.1
青海生态资产	223.35	198.15	12.7

GEP accounting in Qinghai Province

The value of regulating services of Qinghai Province in 2015

Services	Indicators	Quantification		Value (billion yuan)	Total (billion yuan)
		Quantification	Unit		
Water retention	Amount of water conservation	638.72	10^8 m^3	517.36	517.36
Soil retention	Amount of soil retention	3.91	10^8 m^3	6.99	28.38
	Reduction of nitrogen non-point source pollution	0.08	10^8 t	14.58	
	Reduction of phosphorus non-point source pollution	0.02	10^8 t	6.81	
Sand fixation	Amount of sand fixation	11.74	10^8 t	33.19	33.19
Flood mitigation	Amount of lakes flood mitigation	48.04	10^8 m^3	38.91	60.75
	Amount of reservoirs flood mitigation	11.60	10^8 m^3	9.40	
	Amount of swamps flood mitigation	15.36	10^8 m^3	12.45	
Air purification	Amount of sulfur dioxide absorption	93.63	10^4 t	1.18	1.25
	Amount of nitrogen oxide absorption	4.92	10^4 t	0.06	
	Reduce the amount of industrial dust	2.11	10^4 t	0.003	
Water purification	Reduction in the amount of COD emission	220.39	10^4 t	3.09	3.86
	Reduction in the amount of total nitrogen emission	17.08	10^4 t	0.3	
	Reduction in the amount of total phosphorus emission	17.08	10^4 t	0.48	
Carbon sequestration -oxygen release	Amounts of carbon sequestration	0.2567	10^8 t	9.91	23.57
	Amounts of oxygen release	0.1867	10^8 t	13.66	
Climate regulation	Energy consumption of plant transpiration	6534.60	10^8 kwh	346.33	917.82
	Energy consumption of water surface evaporation	10782.81	10^8 kwh	571.49	
Biological control	Area of pests and diseases occurrence	0.29	10^8 mu	8.85	8.85
Total				1,595.04	1,595.04

GEP accounting in Qinghai Province

Qinghai GEP changes （2000-2015年）

功能类别	2015	2010	2000	2000-2015 (不变价)	
	亿元	亿元	亿元	变化量	变化率
产品提供	453.82	430.94	141.45	253.31	126.3
调节功能	15950.36	14672.9	13318.93	1036.76	7.0
文化功能	744.09	213.06	33.0	697.31	1490.7
合计	17148.27	15316.90	13493.38	1987.38	13.1

Ecological cooperation of river basin:

Beijing-Hebei

Beijing-Hebei ecological cooperation of river basin

Miyun Reservoir catchment

Miyun Reservoir is most important surface water resource

- Area of Catchment: 1.58×10^4 km^2
- Location: Hebei (3/4) , Beijing (1/4)
- Runoff decreased, water quality declined

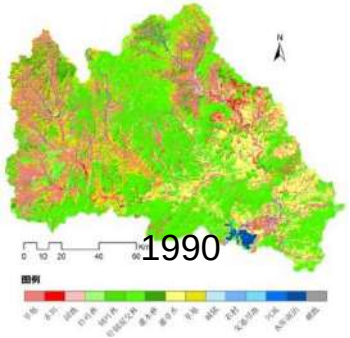
Beijing-Hebei ecological cooperation

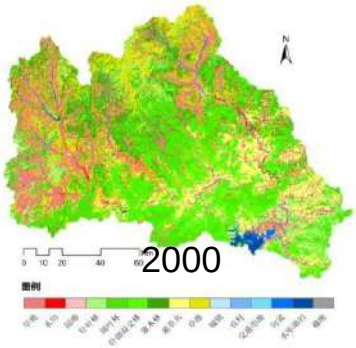
✓Goals: increase water yield; improve water quality

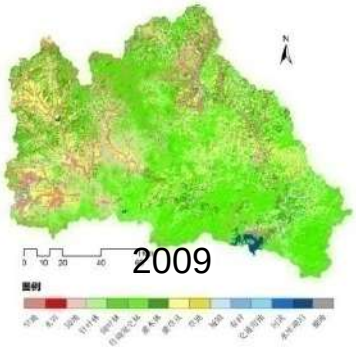
✓Budgets： 60.0 million yuan/yr

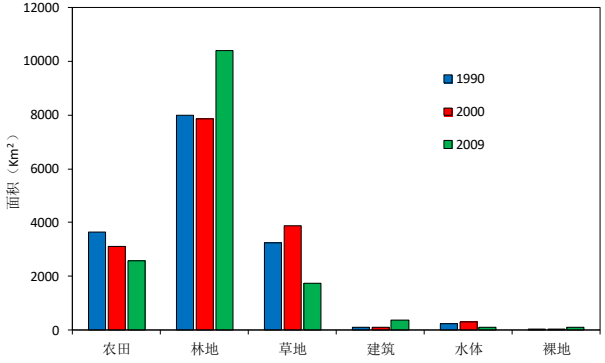
Beijing-Hebei ecological cooperation of river basin

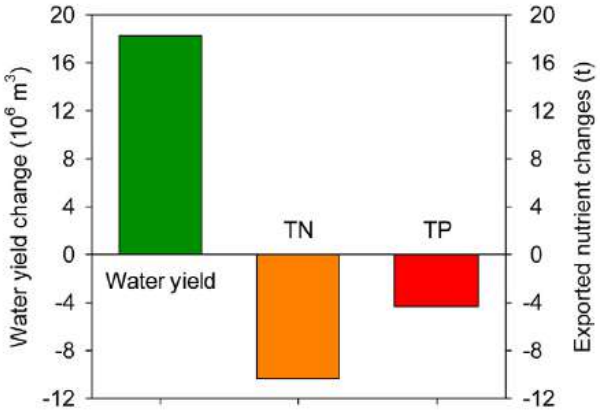
Land use change (1990-2009)











- Forests: increased by30%, built areas: increased 2 times
- Grassland: Decreased by 47%； Ecological cooperation of river basin by 30%；
- Since 2006, the program launched
  - The volume of water flow into reserior increased, and total N and P decreased

Beijing-Hebei ecological cooperation of river basin

Influences on local residents (2006-2010)

Income changes of livelihood

Table 1. Changes in sources of income (yuan per household) between PLDL participants and nonparticipants

Income sources	PLDL participating households	Nonparticipating households	Simple difference	Difference-in-difference (Z_{DID})	Difference-in-difference with matching (Z_{DIDM})
Income sources in 2006 (before PLDL)	A	B	A − B		
All income	13,227	12,816	411		
Agricultural income	5,068	2,293	2,775		
Nonfarm income	1,018	1,824	−806		
Migrant income	6,891	8,424	−1,533		
SLCP income	250	275	−25		
PLDL income	—	—	—		
Income sources in 2010 (after PLDL)	C	D	C − D	(C − D) − (A − B)	
All income	28,419	24,865	3,554	3,143 (1.40)	6,501 (3.21)***
Agricultural income	4,331	3,658	673	−2,102 (−3.27)***	−1,704 (−2.89)***
Nonfarm income	2,490	3,302	−812	−6 (−0.01)	1,048 (1.52)
Migrant income	19,579	17,630	1,949	3,482 (1.80)*	5,396 (2.98)***
SLCP income	250	275	−25	0 (0.00)	−70 (−0.21)
PLDL income	1,768	0	1,768	—	

For DID results, t stats are shown in parentheses. *, **, and *** denote the differences are significant at $P < 0.1$, $P < 0.05$, and $P < 0.01$, respectively. SLCP, Sloping Land Conversion Program.

Agricultural practice changes

Table 2. Changes in agricultural production practices between PLDL participants and nonparticipants

Production activities	PLDL participating households	Nonparticipating households	Simple difference	Difference-in-difference (Z_{DID})	Difference-in-difference with matching (Z_{DIDM})
Production activities in 2006 (before PLDL)	A	B	A − B		
P application, kg/mu	1.98	1.96	0.03		
N application, kg/mu	17.6	12.2	5.4		
Estimated P export, kg/mu	0.022	0.003	0.019		
Estimated N export, kg/mu	0.72	0.38	0.34		
Agricultural intensification, person-days/mu	15.56	11.22	4.34		
Production activities in 2010 (after PLDL)	C	D	C − D	(C − D) − (A − B)	
P application, kg/mu	2.66	2.11	0.55	0.52 (2.28)**	0.51 (2.16)**
N application, kg/mu	20.0	12.5	7.5	2.07 (1.76)*	1.38 (1.12)
Estimated P export, kg/mu	0.005	0.004	0.001	−0.018 (−12.14)***	−0.15 (−10.37)***
Estimated N export, kg/mu	0.62	0.39	0.23	−0.12 (−2.82)***	−0.13 (−3.12)***
Agricultural intensification, person-days/mu	9.15	12.17	−3.02	−7.36 (−6.53)***	−7.40 (−6.66)***

For DID results, t stats are shown in parentheses. *, **, and *** denote the differences are significant at $P < 0.1$, $P < 0.05$, and $P < 0.01$, respectively.

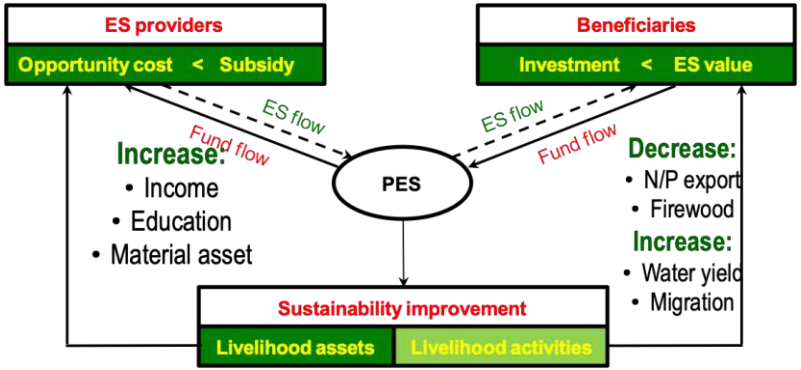
Consumption behavior changes

Table S4. Changes in agricultural consumption practices between PLDL participants and nonparticipants

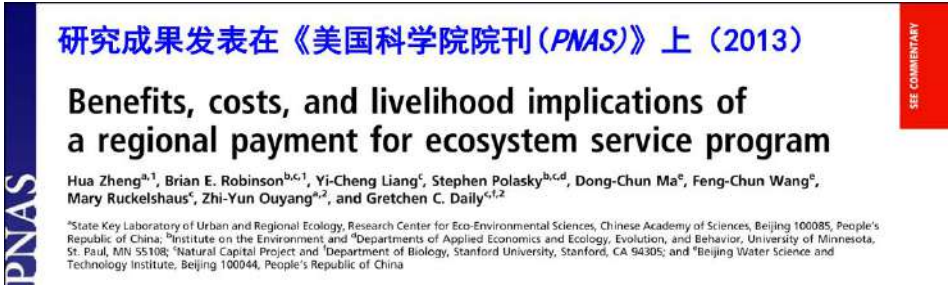
Consumption activities	PLDL participating households	Nonparticipating households	Simple difference	Difference-in-difference (Z_{DID})	Difference-in-difference with matching (Z_{DIDM})
Consumption activities in 2006 (before PLDL)	A	B	A − B		
Education, yuan/hh	2,322	3,449	−1,127		
Natural resources					
Wood, kg/hh	3,008	3,355	−347		
Coal, kg/hh	1,062	1,737	−675		
LPG, kg/hh	98	193	−96		
Material assets					
Motorcycle, #	0.25	0.19	0.06		
Television, #	0.90	1.08	−0.17		
Refrigerator, #	0.28	0.46	−0.18		
Washing machine, #	0.37	0.53	−0.16		
Consumption activities in 2010 (after PLDL)	C	D	C − D	(C − D) − (A − B)	
Education, yuan/hh	3,139	3,218	−79	1,048 (1.74)*	1,054 (1.79)*
Natural resources					
Wood, kg/hh	2,185	2,926	−741	−394 (−1.15)	−282 (−0.82)
Coal, kg/hh	1,944	2,379	−435	240 (0.60)	336 (0.77)
LPG, kg/hh	291	329	−38	57 (0.55)	109 (1.10)
Material assets					
Motorcycle, #	0.49	0.35	0.14	0.08 (1.56)	0.10 (2.08)**
Television, #	1.15	1.26	−0.11	0.06 (0.74)	0.19 (4.22)***
Refrigerator, #	0.63	0.74	−0.11	0.07 (1.28)	0.15 (2.79)***
Washing machine, #	0.68	0.77	−0.09	0.08 (1.44)	0.12 (2.32)**

For DID results, t stats are shown in parentheses. *, **, and *** denote the differences are significant at $P < 0.1$, $P < 0.05$, and $P < 0.01$, respectively. LPG, liquefied petroleum gas.

Beijing-Hebei ecological cooperation of river basin



- Forest expanding resulted in increasing of soil conservation and water quality.
- PLDL program significant improving water yield and water quality.
- PLDL program significant changes household livelihood: more assets and educational expense; more migrating work, less firewood uses.
- This case suggested that a good compensation policy design would help to achieve conservation and income improvement of local residents.


研究成果发表在《美国科学院院刊(*PNAS*)》上（2013）

SEE COMMENTARY

Benefits, costs, and livelihood implications of a regional payment for ecosystem service program

Hua Zheng[a,1], Brian E. Robinson[b,c,1], Yi-Cheng Liang[c], Stephen Polasky[b,c,d], Dong-Chun Ma[e], Feng-Chun Wang[e], Mary Ruckelshaus[c], Zhi-Yun Ouyang[a,2], and Gretchen C. Daily[c,f,2]

[a]State Key Laboratory of Urban and Regional Ecology, Research Center for Eco-Environmental Sciences, Chinese Academy of Sciences, Beijing 100085, People's Republic of China; [b]Institute on the Environment and [d]Departments of Applied Economics and Ecology, Evolution, and Behavior, University of Minnesota, St. Paul, MN 55108; [c]Natural Capital Project and [f]Department of Biology, Stanford University, Stanford, CA 94305; and [e]Beijing Water Science and Technology Institute, Beijing 100044, People's Republic of China

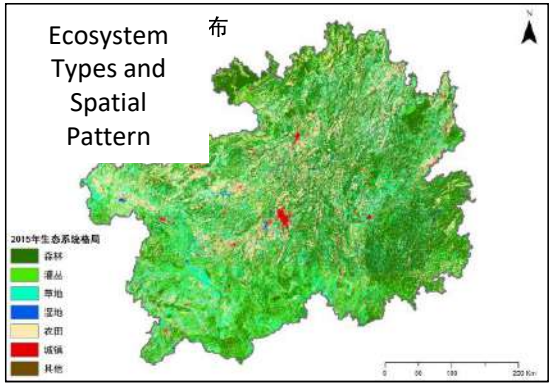
PNAS

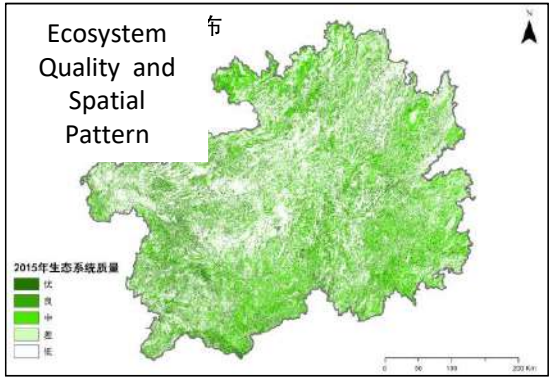
Contents

Progress evaluation of ecological civilization

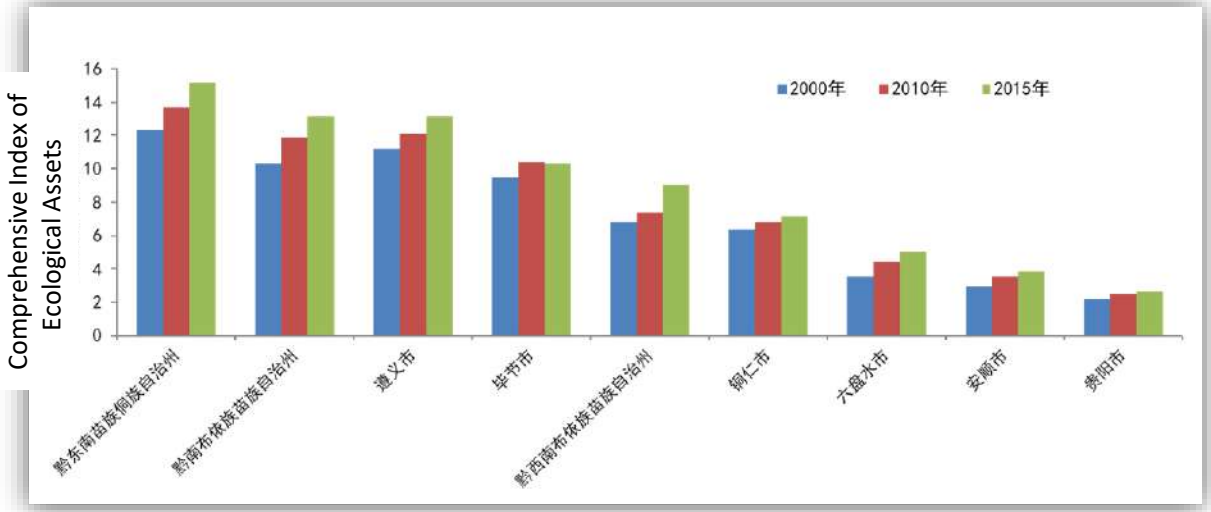
Ecological assets accounting of Guizhou Province

Change of ecological assets





Comprehensive Index of Ecological Assets	2000	2010	2015
	459.78	514.45	562.49



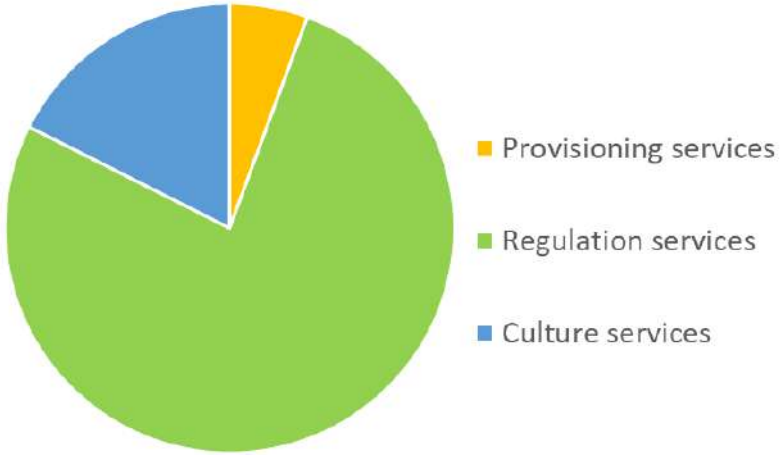
GEP accounting of Guizhou Province

Services	Indicators	Quantification		Value (10^8 yuan)	Total (10^8 yuan)
		Quantification	Unit		
Provisioning service	Amount of ecosystem goods	3258.65	10^4 t	1212.66	1212.66
Water retention	Amount of water conservation	689.84	10^8 m^3	5698.06	5698.06
Soil retention	Amount of soil retention	6.63	10^8 m^3	120.95	203.15
	Reduction of nitrogen non-point source pollution	320.18	10^4 t	56.03	
	Reduction of phosphorus non-point source pollution	93.46	10^4 t	26.17	
Flood mitigation	Amount of reservoirs flood mitigation	649.55	10^8 m^3	5365.26	5365.26
Air purification	Amount of sulfur dioxide absorption	16.3	10^4 t	22.14	23.15
	Amount of nitrogen oxide absorption	7.51	10^4 t	0.95	
	Reduce the amount of industrial dust	4.06	10^4 t	0.06	
Water purification	Reduction in the amount of COD emission	16.3	10^4 t	2.28	2.86
	Reduction in the amount of total nitrogen emission	1.26	10^4 t	0.23	
	Reduction in the amount of total phosphorus emission	1.26	10^4 t	0.35	
Carbon sequestration -oxygen release	Amounts of carbon sequestration	182.44	10^4 t	182.33	596.12
	Amounts of oxygen release	5539.01	10^4 t	413.79	
Climate regulation	Energy consumption of plant transpiration and water evaporation	18024.79	10^8 kwh	4422.75	4422.75
Biological control	Area of pests and diseases occurrence	55989.04	km^2	265.8	265.8
Culture service	Amount of tourists	-	-	3788.86	3788.86
Total				21578.67	21578.67

GEP accounting of Guizhou Province

GEP of Guizhou Province: 2157.87 billion Yuan

Ecosystem services	Monetary value Billion Yuan	Proportion (%)
Provisioning services	121.27	5.62
Regulation services	1657.72	76.82
Culture services	378.89	17.56
GEP	2157.87	100

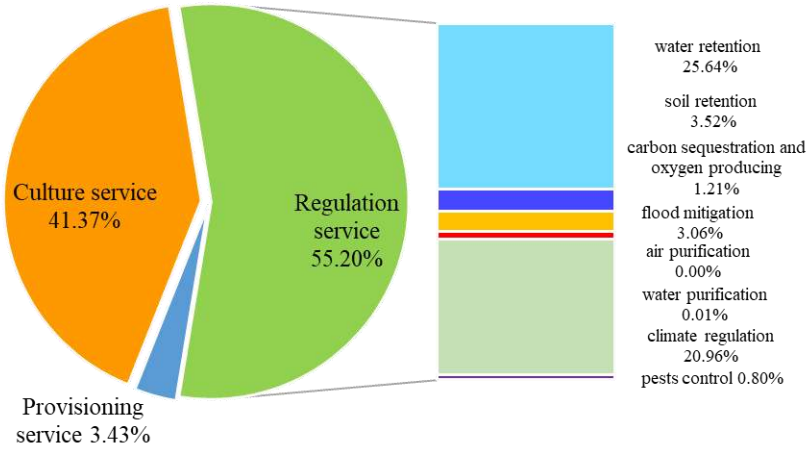


GEP accounting of Lishui City

Ecosystem services	Indicators		Bio-physical value		Monetary value (10^8 Yuan)					
			Amount	Unit	Amount	Proportion (%)	Total	Proportion(%)	Total	Proportion(%)
Provisioning service	Agriculture products		221.06	10^4 t	99.93	2.14	160.29	3.43	160.29	3.43
	Forestry products	Woods	62.64	10^4 m^3	16.25	0.35				
		Bamboo	4938	10^4 plant						
		Others	55245	t						
	Husbandry products		8.86	10^4 t	19.19	0.41				
	Aquatic products		2.19	t	3.02	0.06				
	Ecological energy		41.34	10^8 kWh	21.91	0.47				
Regulation services	Water retention		142.78	$10^8$$m^3$	1197.92	25.61	1197.92	25.61	2579.49	55.20
	Soil retention	Reduction of sediment	5.29	$10^8$$m^3$	98.11	2.10	164.40	3.51		
		Reduction of pollution-N	258.2	10^4t	45.19	0.97				
		Reduction of pollution-P	75.4	10^4t	21.10	0.45				
	Flood mitigation	Flood mitigation of lakes	0.0039	$10^8$$m^3$	0.03	0.00	143.03	3.06		
		Flood mitigation of reservoirs	17.04	$10^8$$m^3$	142.96	3.06				
		Flood mitigation of swamps	0.0043	$10^8$$m^3$	0.04	0.00				
	Air purification	Purification of sulfur dioxide	1.04	10^4t	0.13	0.00	0.2	0.01		
		Purification of nitrogen oxide	0.42	10^4t	0.05	0.00				
		Purification of industrial dust	0.92	10^4t	0.02	0.00				
	Water purification	Purification of COD	2.23	10^4t	0.31	0.01	0.37	0.01		
		Purification of TN	0.25	10^4t	0.05	0.00				
		Purification of TP	0.03	10^4t	0.01	0.00				
	Carbon sequestration and oxygen producing		0.02	10^8t	16.10	0.34	56.56	1.21		
			0.05	10^8t	40.46	0.87				
	Climate regulation	Climate regulation of plants	1701.42	10^8kwh	901.75	19.28	979.53	20.94		
		Climate regulation of water	146.75	10^8kwh	77.78	1.66				
	Pests control		0.12	10^8 mu	37.48	0.80	37.48	0.80		
Culture services	Natural landscape		2840.21	10^4 person	1933.11	41.33	1933.11	41.33	1933.11	41.37
GEP					4672.89	100.00	4672.89	100.00	4672.89	100.00

GEP accounting of Lishui City

- GEP of Lishui City is 467.29 billion Yuan
  - Regulation service: 257.95 billion Yuan
  - Culture service: 193.31 billion Yuan
  - Provisioning service: 16.03 billion Yuan



GEP accounting of Lishui City

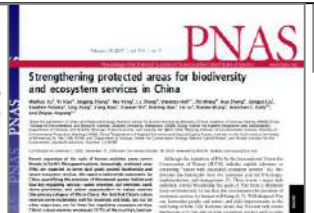
✦Changes of GEP of Lishui City

Ecosystem services	2017 (billion Yuan)	2006 (billion Yuan)	2006-2017	
			Change (billion Yuan)	Change ratio (%)
Provisioning services	16.03	8.07	5.73	55.6%
Regulation services	257.95	190.95	32.32	14.33%
Culture services	193.31	10.61	178.95	1246.37%
GEP	467.29	209.63	217	86.7%

生态系统评估与保护政策创新

- The methods and findings were published in *Science, PNAS, Nature series, Ecology Letters, Frontier in Ecology and Environt Sciences, and Biological conservation,…*

Science, 2016



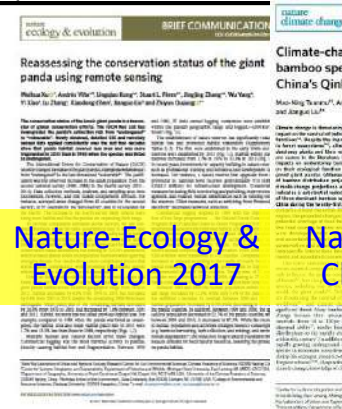
PNAS, 2017

PNAS, 2017

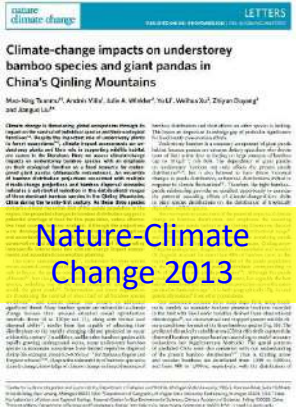
PNAS, 2015

PNAS, 2013

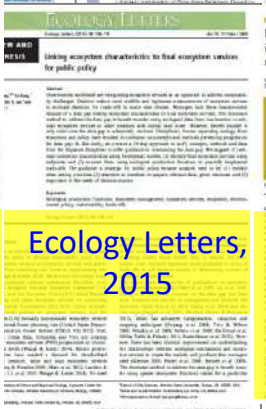
PNAS, 2007



Nature-Ecology & Evolution 2017



Nature-Climate Change 2013

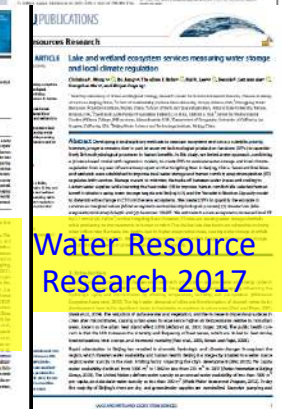


Ecology Letters, 2015

Frontier in Ecology and Environt Sciences, 2016

Wetlands, 2015

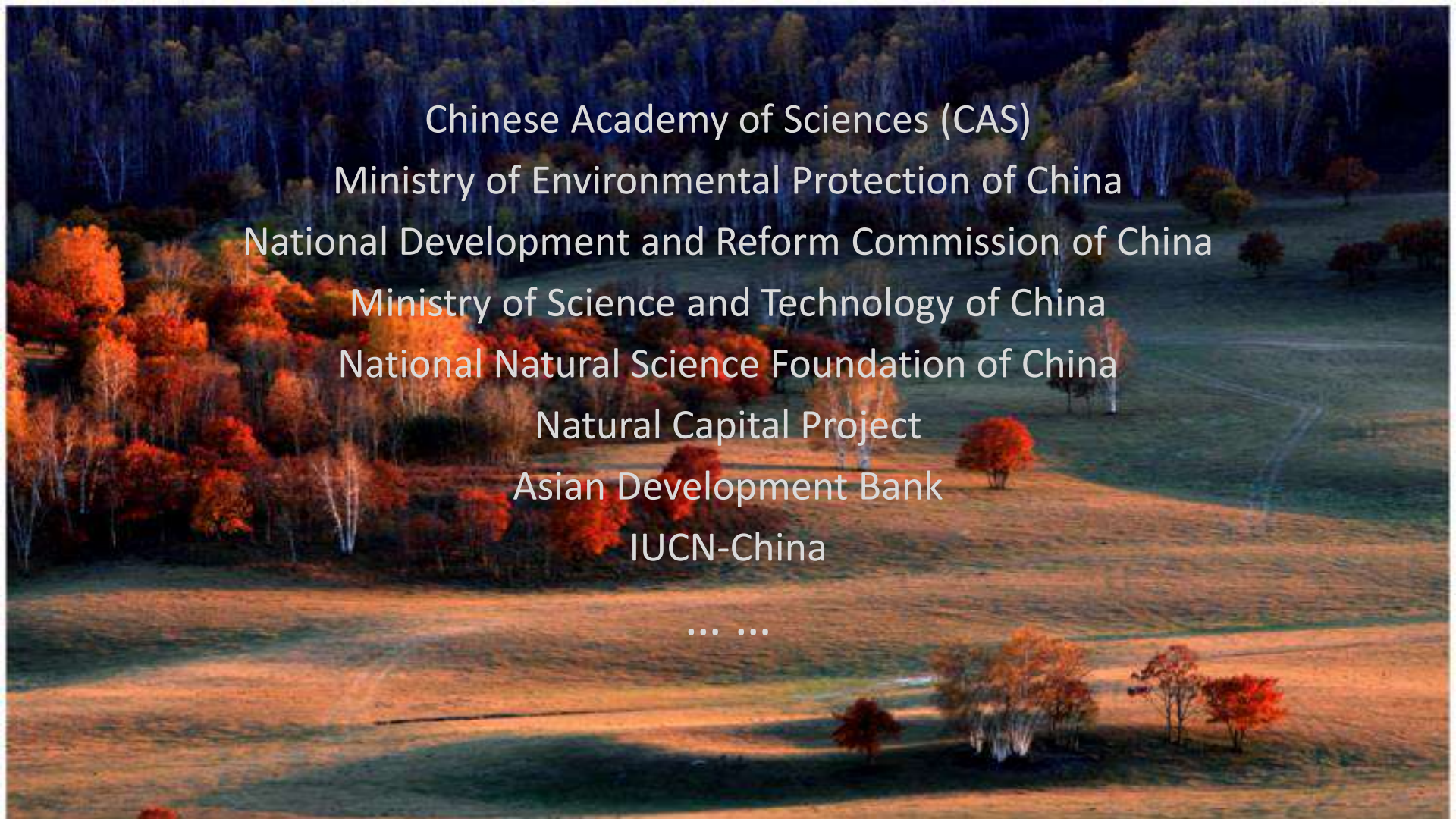
Biological conservation, 2017



Water Resource Research 2017

GEP核算与生态保护政策创新

- GEP accounting can be a useful tools to evaluate
  - ✓ Ecosystem status
  - ✓ Ecological benefits for human being
  - ✓ Effectiveness of conservation（policy, ecological compensation,..)
  - ✓ Regional linkages between regioans
  - ✓ Ecological civilization progress, with GDP
- Data from existing monitor and statistics can basically support GEP accounting system in provincial, municipal and county scales.
- Next
  - ✓ To improve GEP and ecological asset accounting index system and methods
  - ✓ Strengthen the sharing from environmental, hydrological, forest, meteorological and statistical data, improving the eco-environmental monitoring system


Chinese Academy of Sciences (CAS)
Ministry of Environmental Protection of China
National Development and Reform Commission of China
Ministry of Science and Technology of China
National Natural Science Foundation of China
Natural Capital Project
Asian Development Bank
IUCN-China
… …

Thanks !