Gross Ecosystem Product (GEP) accounting and Applications in China

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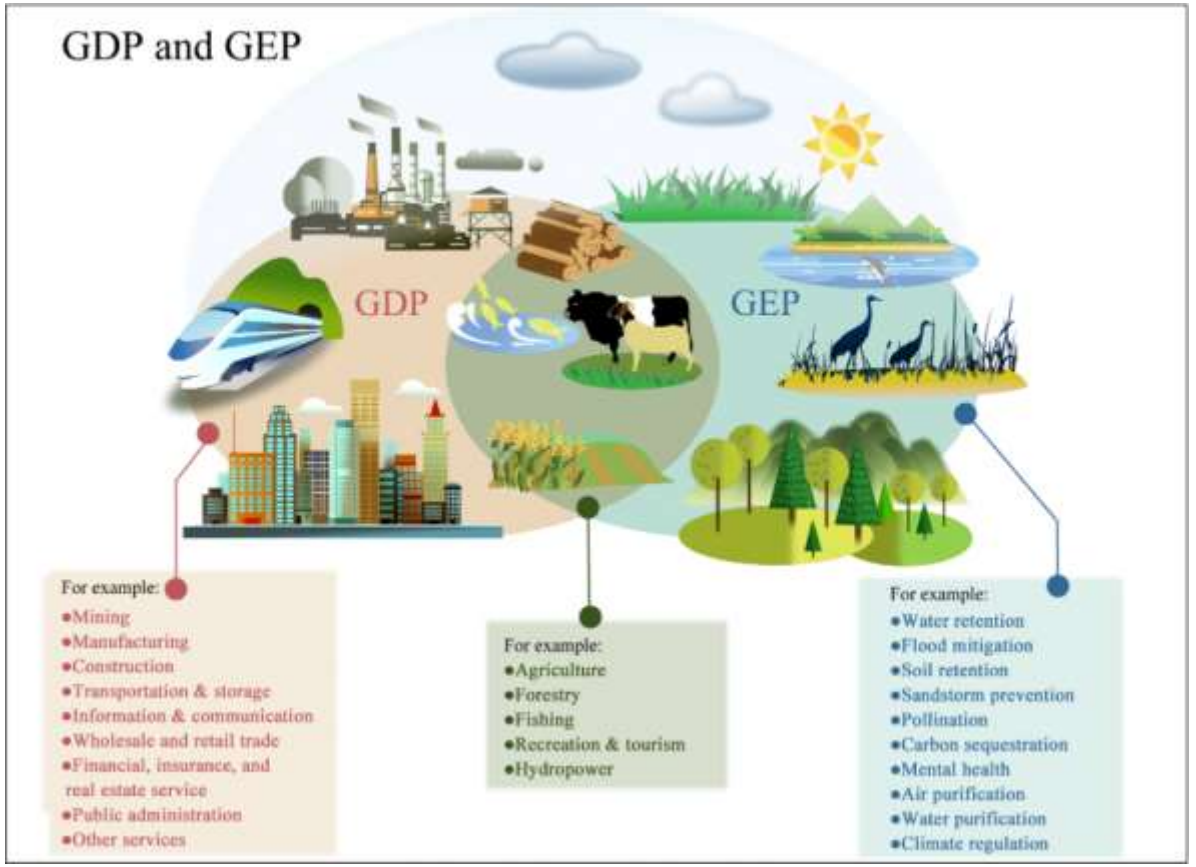
Outline

- What is GEP?
- How to Measure GEP？
- How to Apply GEP？

GEP

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.



Ecosystem asset, EA

- EA is a natural asset providing ecosystem services to people, such as a forest, grassland, wetland, coral reef, farm, city park, and other natural or managed ecosystems.

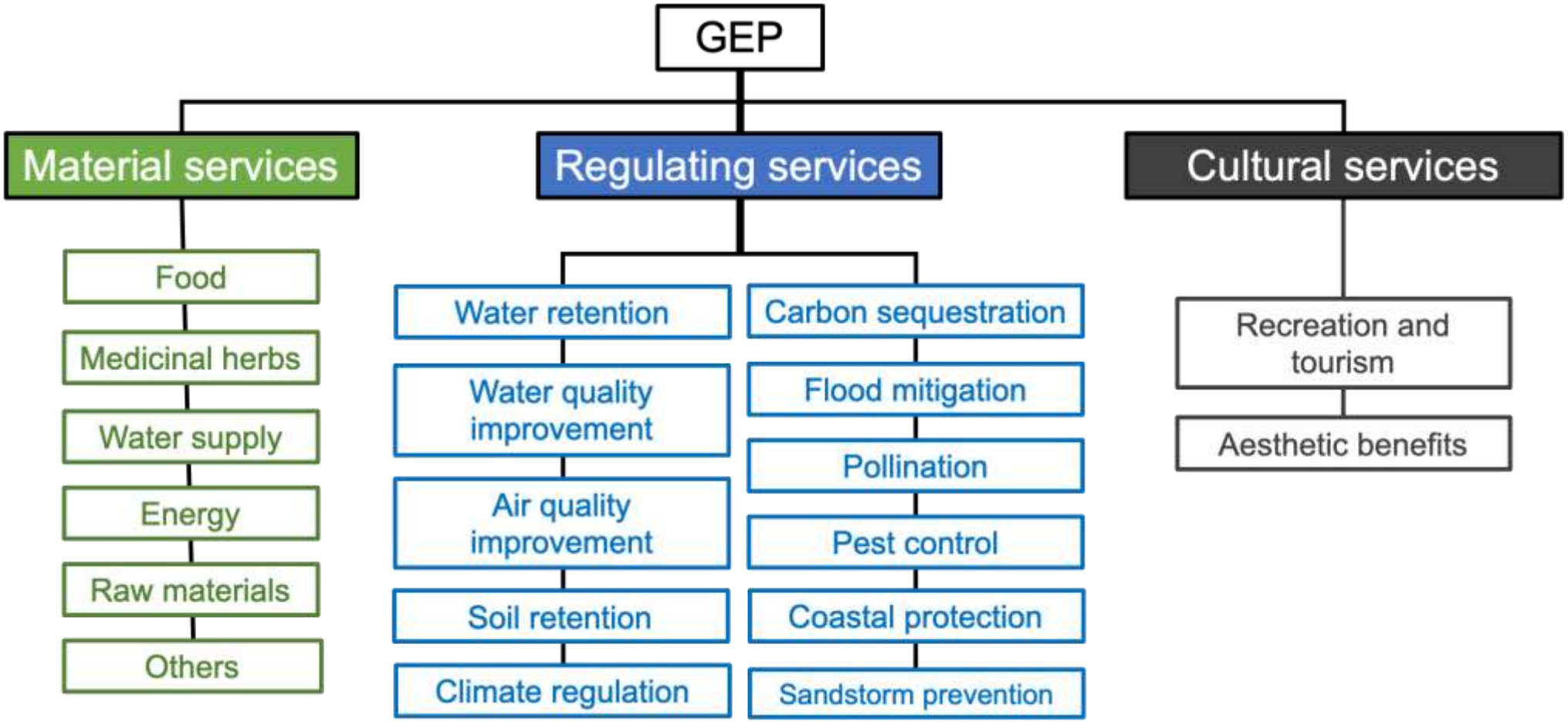
GEP accounting framework

Criteria for GEP accounting

- GEP is a measurement of the aggregate monetary value of ecosystem-related goods and services in the accounted areas
- Measure 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
- First, measure biophysical value (quantity)
  - ✓ E.g., amount of food production, amount of water purification, amount of flood protection
- Second, measure monetary value (value added per unit x quantity)
  - ✓ The economic value of ecosystem services

GEP accounting framework

Ecosystem services in GEP accounting

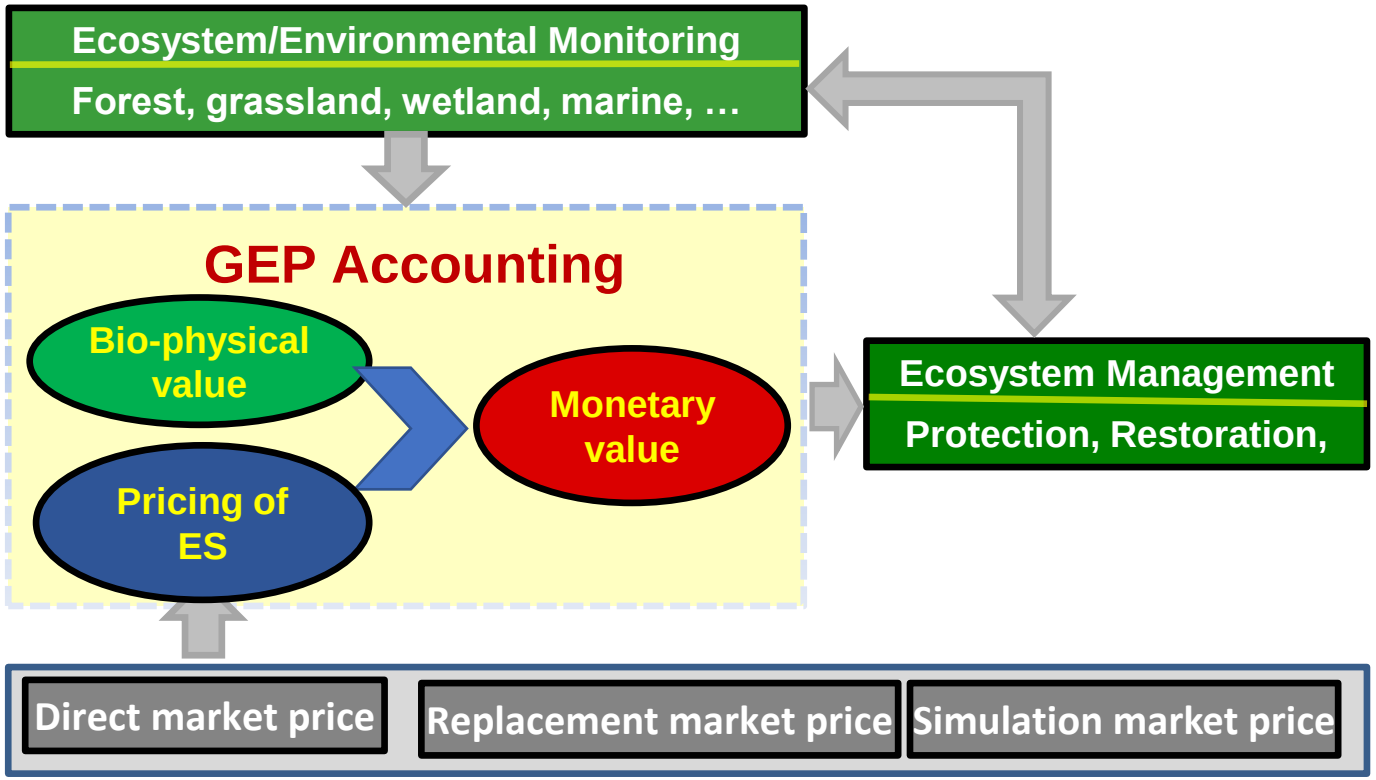


GEP accounting framework

a) Accounting of bio-physical values of ecosystem goods and services

b) Pricing ecosystem goods or services

c) Accounting of economic values of ecosystem goods and services



$$GEP = EMV + ERV + ECV$$

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

EMV: monetary value of ecosystem material services

ERV: monetary value of ecosystem regulating services

ECV: monetary value of ecosystem mon-material (cultural) services.

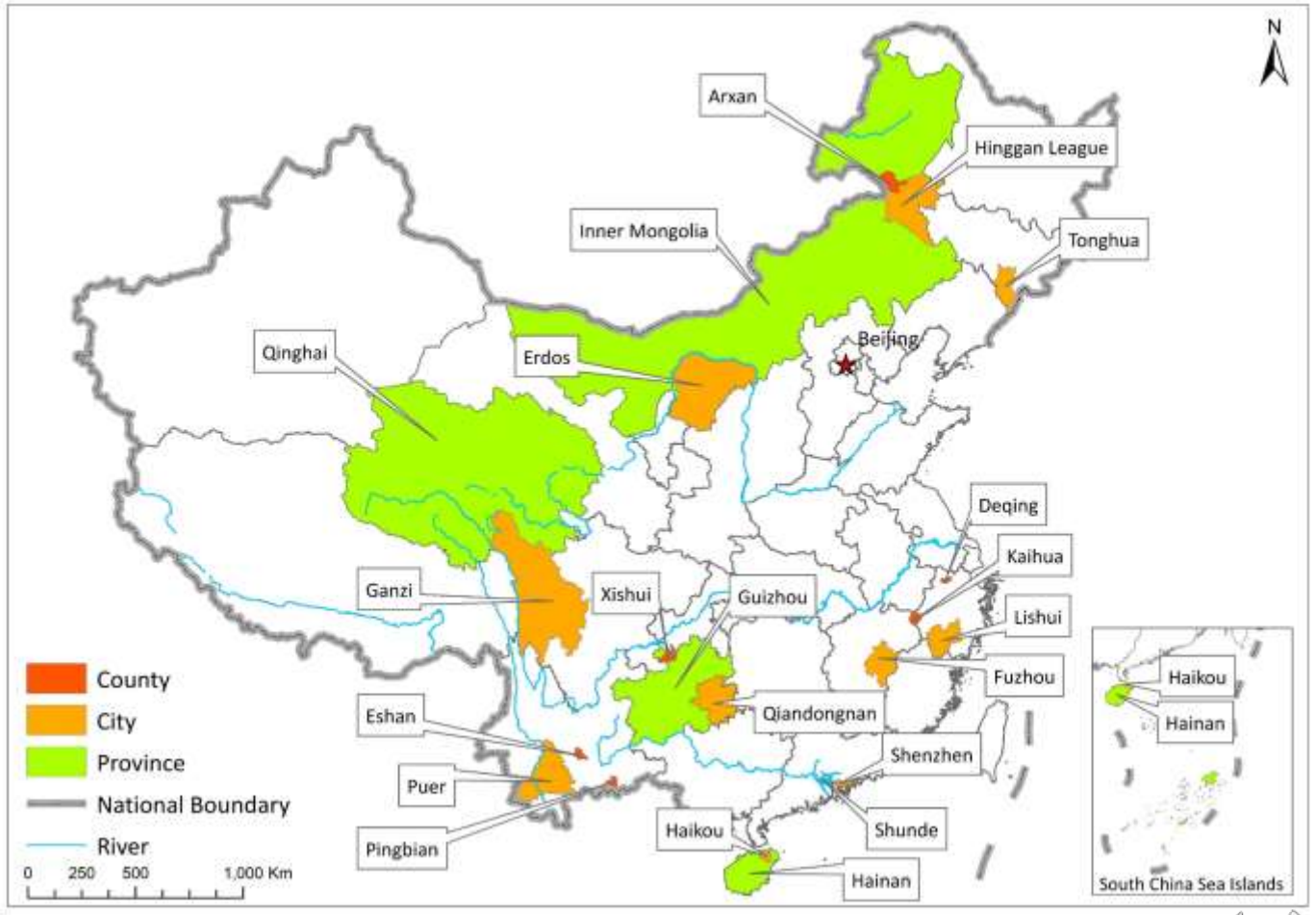
GEP pilot accounting

Pilot GEP accounting in China

- ✓ 4 provinces
- ✓ 10+ cities/prefectures
- ✓ 100+ counties

Supported by SEEA-EA Program

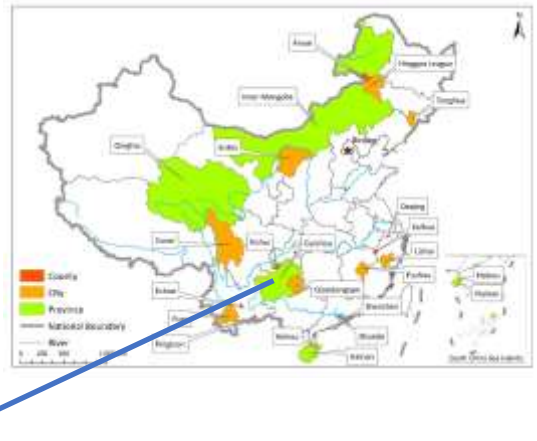
- ✓ Guizhou Province
- ✓ Pu'er city, Yunnan Province
- ✓ Pear River Basin, Guangxi Pro.



GEP pilot accounting-Guizhou

Guizhou Province

- ✓ Located at south-western China
- ✓ 176,100 km^2 area, 36.8 million people
- ✓ Dominant ecosystem type is forest
- ✓ Globally significant area for biodiversity, home of many endangered species, such as gray snub-nosed monkey, black-necked crane.
- ✓ Karst region with highly sensitiveness to rock desertification



GEP pilot accounting-Guizhou

Category	Products	Biophysical value	monetary value (billion yuan)
Agricultural products	Rice (x10^4t)	445.65	118.59
	Wheat (x10^4t)	24.83	4.42
	Corn (x10^4t)	415.43	81.34
	Bean (x10^4t)	15.99	5.98
	Potato (x10^4t)	141.43	35.24
	Rapeseed (x104t)	51.62	22.97
	Peanuts (x104t)	7.68	5.47
	Sugarcane (x104t)	52.24	2.14
	Cigarette (x104t)	37.02	65.90
	Vegetable (x104t)	1202.04	187.52
	Apple (x104t)	1.55	0.78
	Pear (x104t)	18.21	10.87
	Orange (x104t)	20.37	8.15
	Banana (x104t)	0.61	0.37
	Bayberry (x104t)	2.90	2.90
	Kiwifruit (x104t)	1.30	1.04
	Persimmon (x104t)	1.36	1.09
	Tea (x104t)	5.23	10.46
	Total(x104t)	2445.46	565.23

Category	Product	Biophysical value	monetary value (billion yuan)
Husbandry products	beef meat (x10^4t)	11.99	40.77
	lamb meat (x10^4t)	3.40	15.37
	pork meat (x10^4t)	148.09	196.23
	poultry meat (x10^4t)	14.12	50
	Milk (x10^4t)	4.59	9.18
	Egg (x10^4t)	12.51	20.02
	Bee honey (x10^4t)	0.19	0.34
	Others (x10^4t)	0.10	0.95
	Total (x10^4t)	194.99	332.86
Fishery goods	fish (x10^4t)	8.79	13.82

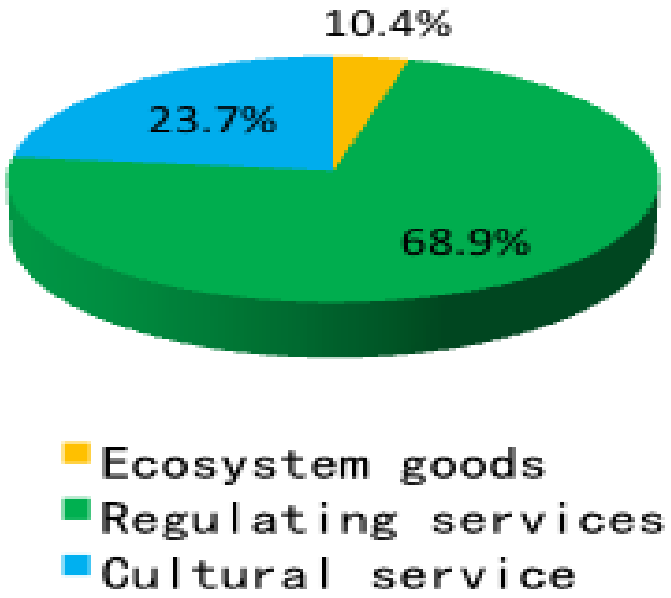
GEP pilot accounting-Guizhou

Regulation Services	Indicators	Biophysical value	monetary value (billion yuan)
Soil retention	Fertilizer conservation (million t)	0.65	1.697
	Silt decreasing (billion m^3)	0.10	0.593
Water retention	water conservation (billion m^3)	86.40	527.898
Flood mitigation	Lake conditioning (billion m^3)	0.08	0.507
	Reservoir conditioning (10billion m^3)	11.76	71.847
C sequestration	C fixation (million t)	368	441.600
Oxygen production	Oxygen production (million t	276	276.000
Air purification	Industrial fumes(million t)	0.25	0.038
	Dusts(million t)	0.09	0.013
Air purification	Industrial wastewater(million t)	32	0.067
	Domestic wastewater(million t)	159	0.332
Climate regulation	Plant heat absorption(MJ)	1.03×10^9	0.131
	Surface water heat absorption(MJ)	4.18×10^{12}	533.6
Pest control	Area of natural forest(km^2)	52151.86	0.091

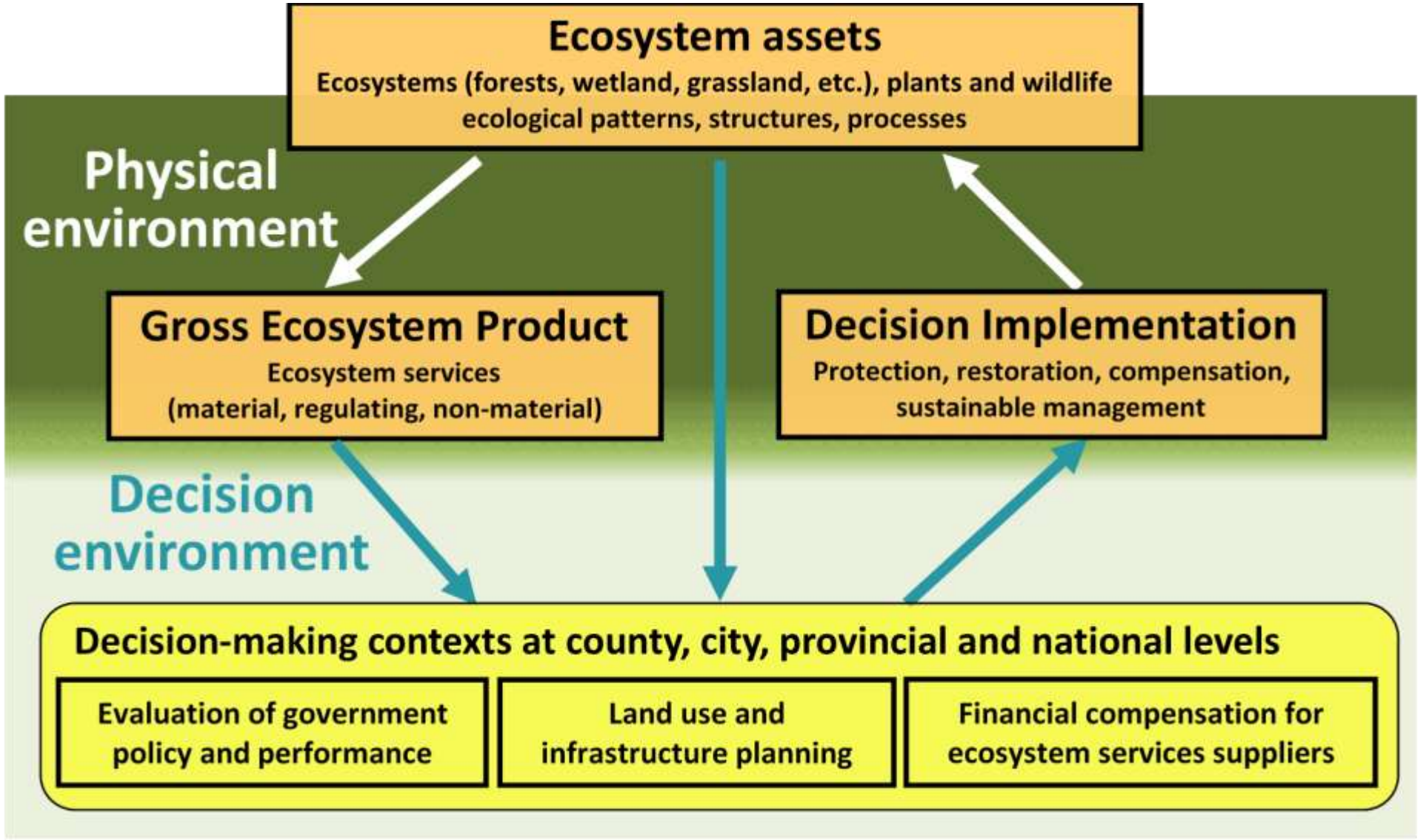
GEP pilot accounting-Guizhou

Guizhou GEP: 2001.346 billion yuan

Categories	Economic values (billion yuan)	Ratio
Ecosystem goods	208.345	10.4
Regulating services	1379.313	68.9
Cultural services	413.688	23.7
Total	2001.346	100



Applications of GEP accounting



Applications of GEP accounting

Applications of GEP in key realms ~ by central government, provinces, cities, companies

- Evaluating government policy and performance in conservation. **NDRC, MEE, Inner-Mongolia, Guizhou, Qinghai, Zhejiang, Shenzhen, Shunde, Tonghua**
- Providing the basis for determining financial compensation for the provision of ecosystem services. **Lishui, Pu'er, Zhejiang**
- Evaluating sustainable development (harmony of people and nature), **Shenzhen, Zhuhai**
- Bringing the value of ecosystem services and trends into public and private sector decision making and investment planning. **Zhejiang, Lishui, Fuzhou, Alibaba**
- Measuring nature's contribution to people, and to other parts of China. **Qinghai, Ganzi**

Applications of GEP accounting

Future arrangements for GEP accounting and applications

- NDRC, NBS with related governmental agencies are preparing **Guideline of GEP Accounting, and Guideline of Ecosystem Asset** and hopefully release soon.
  - CAS-RCEES provided technic support for formation Guideline of GEP and Ecosystem Asset Accounting, and develop **GEP and EA Accounting software**.
  - Based on SEEA-EA framework, and pilot study in Guangxi and Guizhou under project of NCAVES,
- NDRC and NSB will support pilots for **GEP Accounting and Applications in China**
  - Six Mechanisms
    - Mechanism of ecosystem product survey and monitoring
    - Mechanism of GEP / ecosystem asset accounting and applications
    - Marketing mechanism of ecosystem products
    - Mechanism of compensation for ecosystem products
    - Implementation mechanism for value realization of ecosystem products
    - Promotion mechanism for value realization of ecosystem products

Findings and challenges

Findings

- GEP converts ecosystem services into a common monetary metric that is easy to interpret, provides visibility, and gives prominence to the values of nature and their contributions to human well-being.
- GEP can provide decision makers with clear and compelling evidence of the monetary value of ecosystem services.
- GEP can be applied for evaluation of government policy and performance, and land use and infrastructure planning.
- GEP can provide the basis for determining financial compensation for the provision of ecosystem services.
- The Qinghai results demonstrate that it is feasible to produce an estimate of GEP with available data and methods: That is, that there is a tractable approach to producing estimates of GEP, not just in Qinghai but all across China, and indeed for all countries in the world.

Findings and challenges

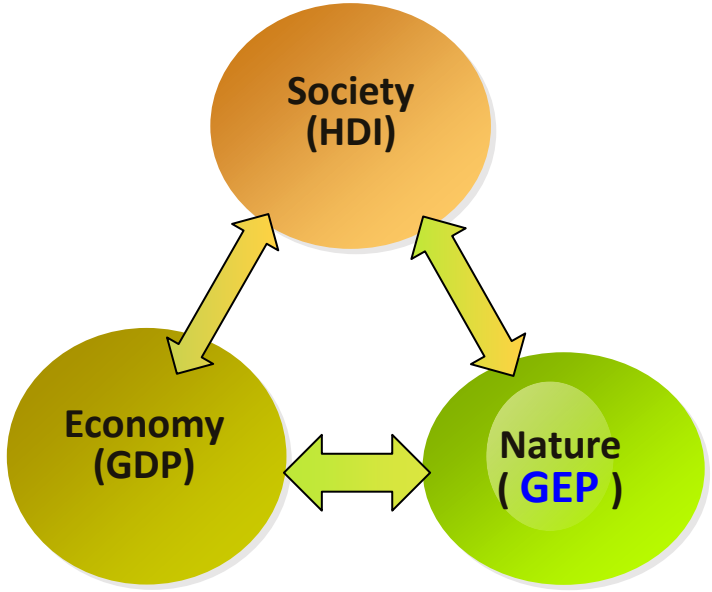
Challenges

- **Data limitations**. Current environmental monitoring systems are not designed for ecosystem service evaluation and accounting.
- **Models** for quantifying many ecosystem services are in early stages of development. Focus initially on a core set of services for which science is advanced and robust.
- **Pricing of ecosystem services**. There are no market prices for most ecosystem services.
- **Accounting value**. Lack of data that allows attribution of value added between nature- and human-contributed inputs.
- **The set of ecosystem services** in pilot GEP accounting in China is incomplete. In Qinghai GEP accounting, for instance, we did not include the value of oxygen generation (O_2 is extremely important in Qinghai and Tibetan Plateau), many human health benefits from nature, and cultural services other than ecotourism.

Findings and challenges

Suggestions

- ✓ Standardize accounting methods to compute GEP inernationally
- ✓ Update existing monitoring system for the purpose of providing data for GEP accounting
- ✓ Pilot GEP accounting in different countries, in pragmatic ways that drive investment in green, inclusive development.



Thanks

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