

Ecosystem Services and Management

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Outline of Presentation



- Concept of Ecosystem Services
- Problems of Ecosystem Degradation and Management
- Ecosystem Management
- International Experiences
- Economic Values of Ecosystem Services
- Objectives, expected outputs and workplan of the CCICED-Task Force



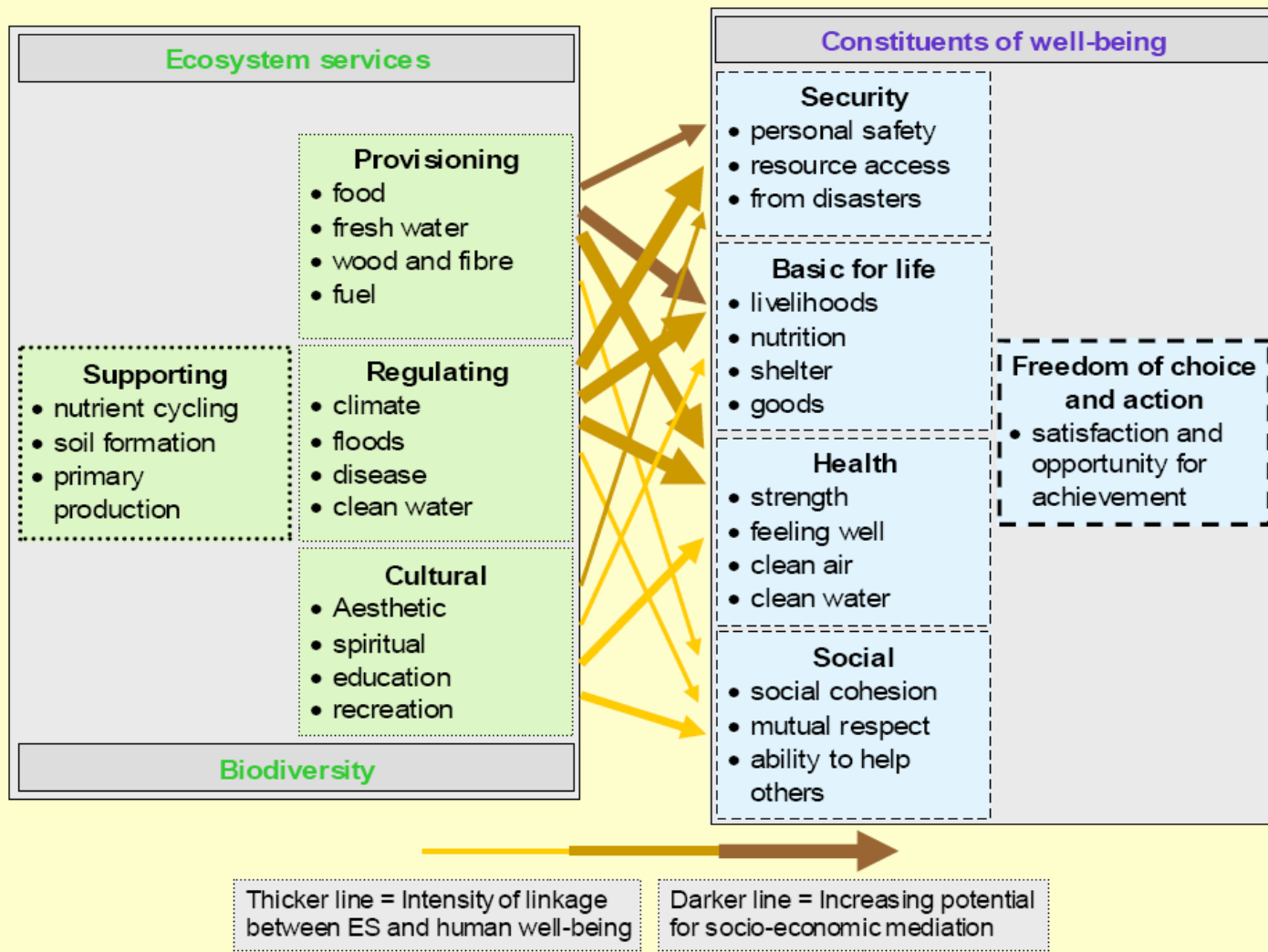
Concept of Ecosystem Services

Ecosystem Services

Ecosystem services

(1) The benefits of humankind from a multitude of resources and processes that are supplied by natural ecosystems (Daily, 1997)

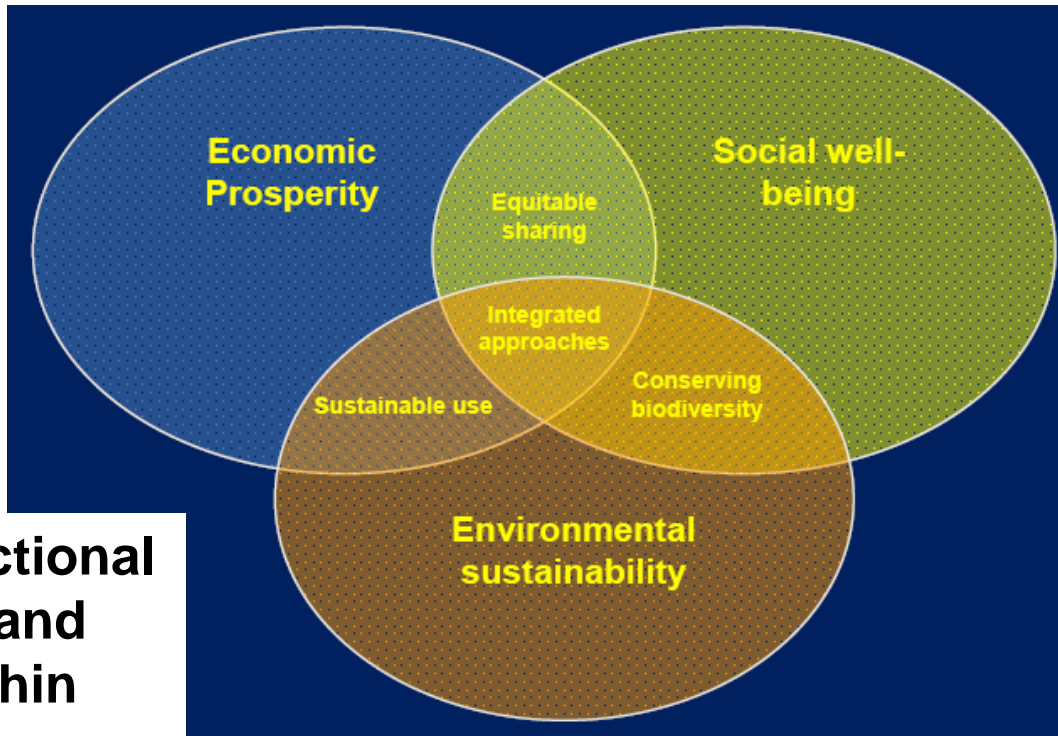
(2) The benefits that people obtain from nature (MA, 2003)



Ecosystem Approaches – I. The CBD Ecosystem Approach

A general framework applicable for managing ecosystem services

5. Ensure intersectoral cooperation



2. Enhance benefit sharing

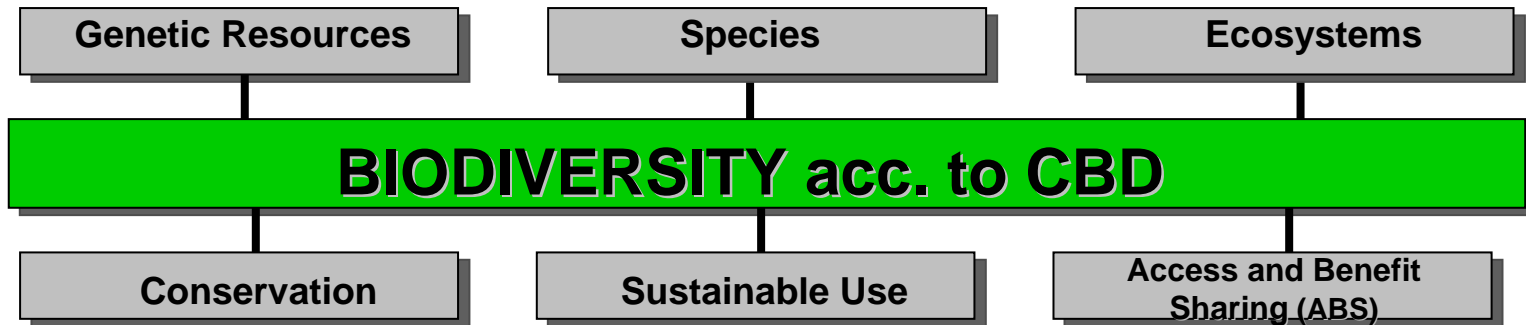
3. Use adaptive management practices

4. Management at appropriate scale and decentralization

1. Focus on functional relationships and processes within ecosystems

Ecosystem Approaches – I. The CBD Ecosystem Approach

Aspects covered by the CBD:



12 Principles of ecosystem approach acc. to CBD:

- (1) The objectives of management are a matter of societal choice
- (2) Management should be decentralized to the lowest appropriate level
- (12) All relevant actors from society and scientific disciplines should be involved

➤ **Socio-economically user-founded concept**

Ecosystem Approaches –

II. The Ecosystem Approach acc. to MEA

...according to the Millenium Ecosystem Assessment (MEA):

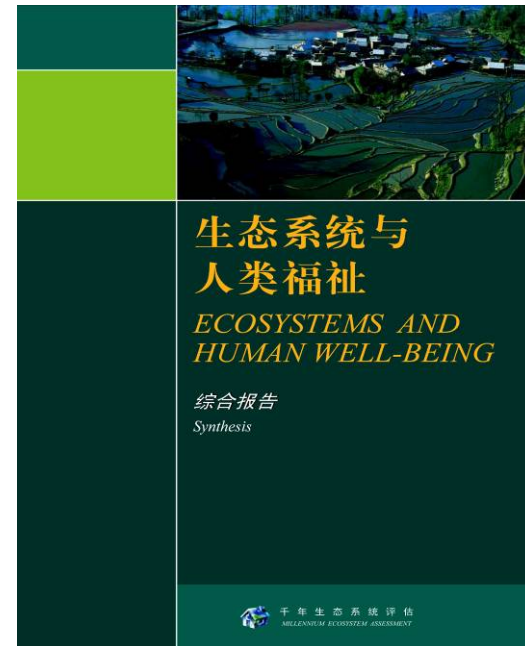
Provisioning services (food, fibre, fresh water)

Cultural services (recreation, aesthetic experiences)

Supporting services (such as soil formation and retention)

Regulation services (regulation of climate, water and some human disease).

➤ **Biophysically founded concept**



Ecosystem Services in Forests, Grassland and Wetland

		<ul style="list-style-type: none"> ◆ Forests ◆ Wetlands ◆ Grasslands 	
<i>Provisioning services</i>			
◆		■	Food, fiber, fuel
◆		■	Biochemicals, natural medicines, pharmaceuticals
◆		■	Ornamental resources
◆	◆	■	Fresh water
◆	◆	◆	Habitat
◆		◆	Livelihood
<i>Regulating services</i>			
◆		■	Air quality maintenance
◆		■	Soil quality maintenance
◆	◆	■	Climate regulation (i.e. carbon storage)
◆	◆	◆	Water regulation (i.e. flood prevention,, aquifer recharge etc.)
◆	◆		Water purification and waste management
◆		■	Temperature regulation, precipitation
◆		(◆)	Erosion control
◆		■	Technology development from nature
◆		■	Regulation of human diseases
◆		■	Biological control and pollination
◆		■	Natural hazards control / mitigation
<i>Cultural services</i>			
◆		■	Cultural diversity, spiritual and religious values, educational values, aesthetic and cultural
◆	◆	■	Recreation and ecotourism
◆		■	Living comfort due to environmental amenities





Ecosystems – Loss, Change and Services

Global Change of Land Use

Actual	2000	2050	Difference
Area	million km ²	million km ²	2000 to 2050
Natural areas	65.5	58.0	-11%
Bare natural	3.3	3.0	-9%
Forest managed	4.2	7.0	70%
Extensive agriculture	5.0	3.0	-39%
Intensive agriculture	11.0	15.8	44%
Woody biofuels	0.1	0.5	626%
Cultivated grazing	19.1	20.8	9%
Artificial surfaces	0.2	0.2	0%
World Total *	108.4	108.4	0%

- **Main losses come from the loss of natural areas and extensive agriculture**

Ecological problems in China

Forest, grassland and wetland cover 63.8% of land territory and play important role in eco-security in China

Area of water and soil loss: **1.65million km²**, account for **17.2%** land territory; annual soil loss : **5billion tons**

Area of desert or in desertification: **1.74mil km²**, still increasing

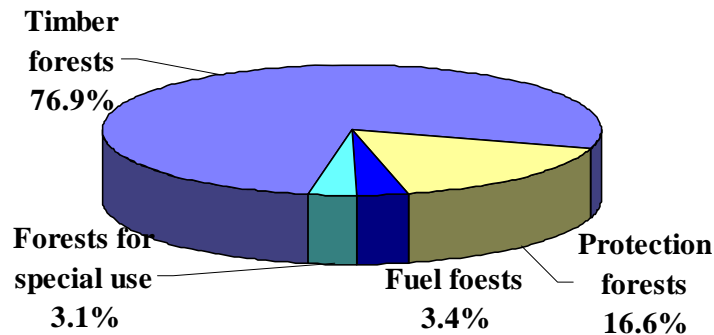
In the 740 endangered species listed in CITES, China possesses **189 species, i.e. 1/4 of total.**

Chen Yiyu 2008



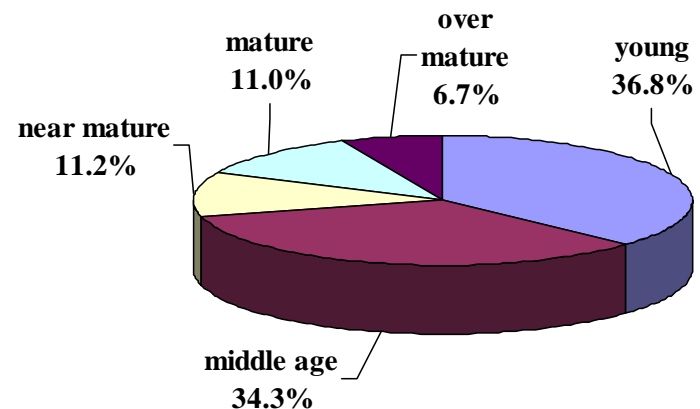
Forest ecosystems

- Increasing forest area vs simplified ecosystem structure and degraded service
- Plantation mostly composed of immature forest with simple structure, sparse understory and limited soil and water conservation service
- Mature forest area was decreasing by 610,000 ha/year since late 1970s



Stand area

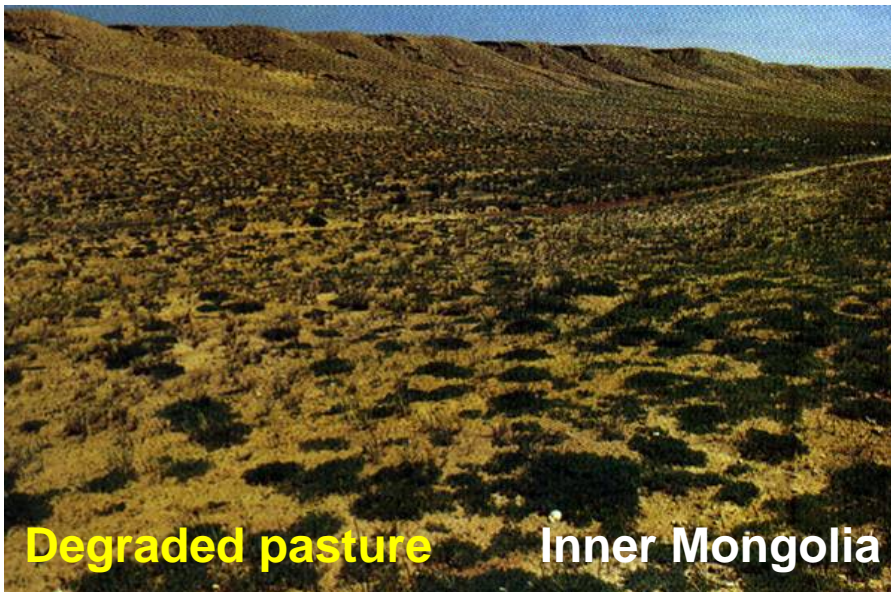
(5th forest investigation 1994~1998)



Forest age pattern

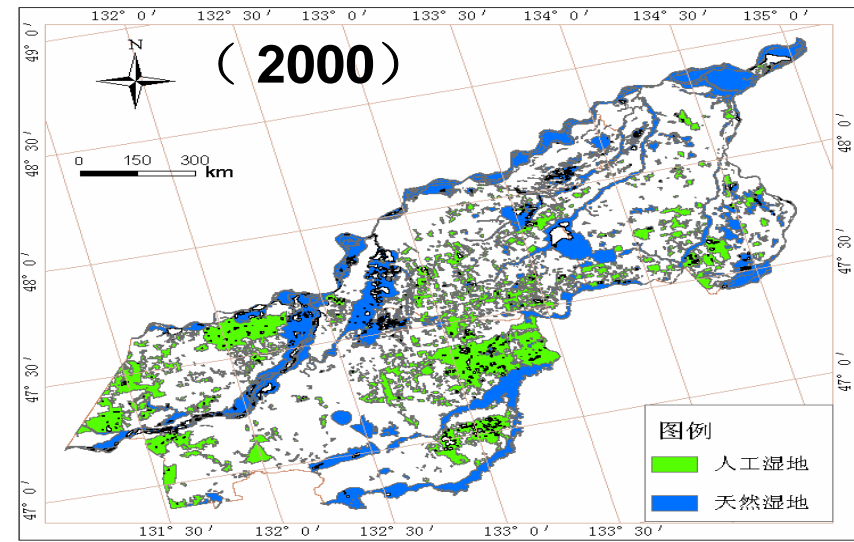
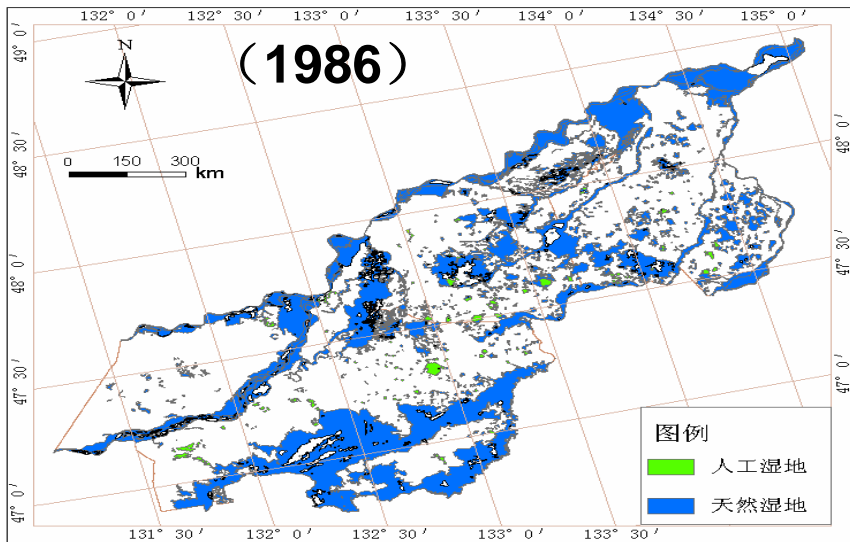
Grassland ecosystems

- **90%** of available nature grassland degraded
- Among them, **55%** became arable land and **30%** no longer available



Wetland ecosystem

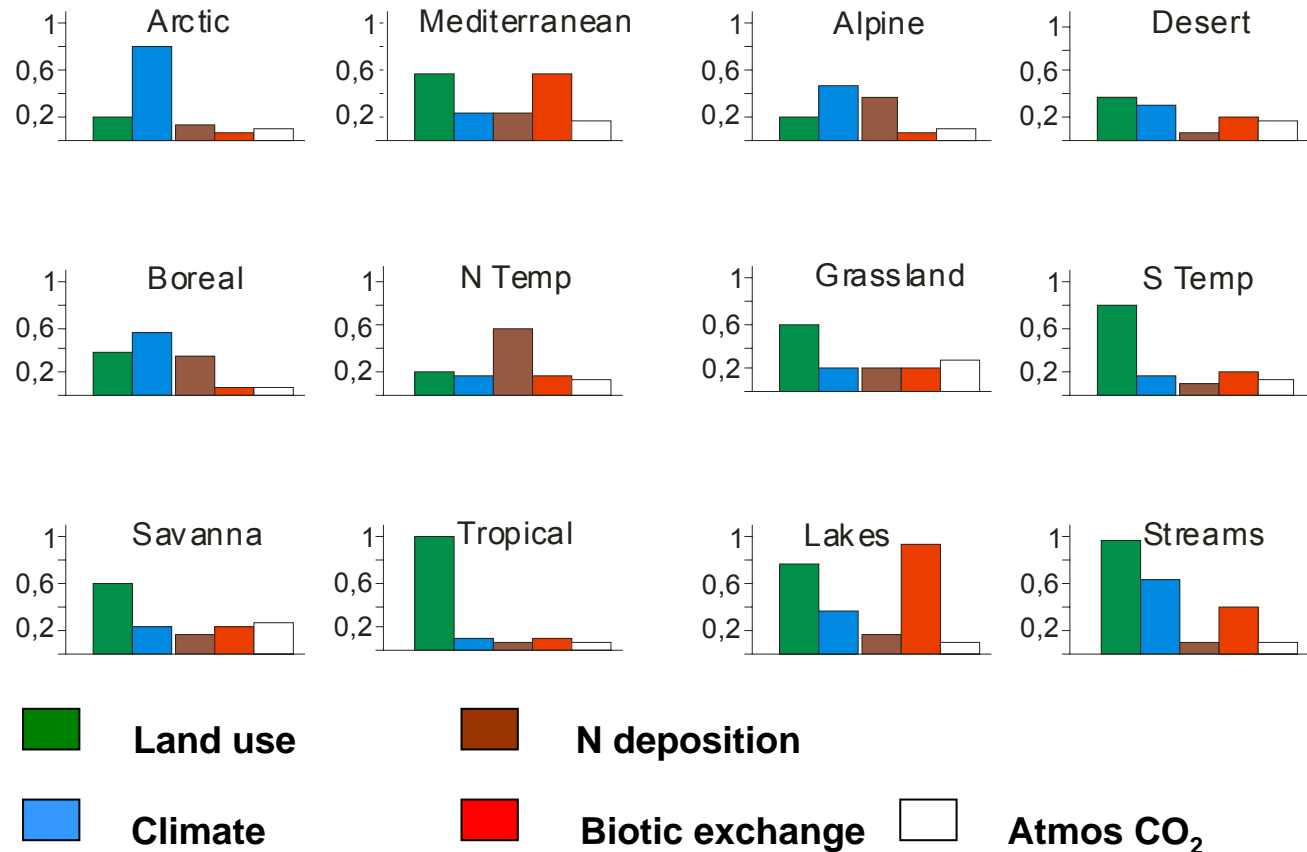
- Due to continuous exploitation, lots of natural wetlands disappeared
- Lakes suffering from eutrophication, biodiversity losses, ecosystem service degradation and decreased capacity for flood retentions



From 1986 to 2000, northern Sanjiang plain lost 105,000ha natural wetland

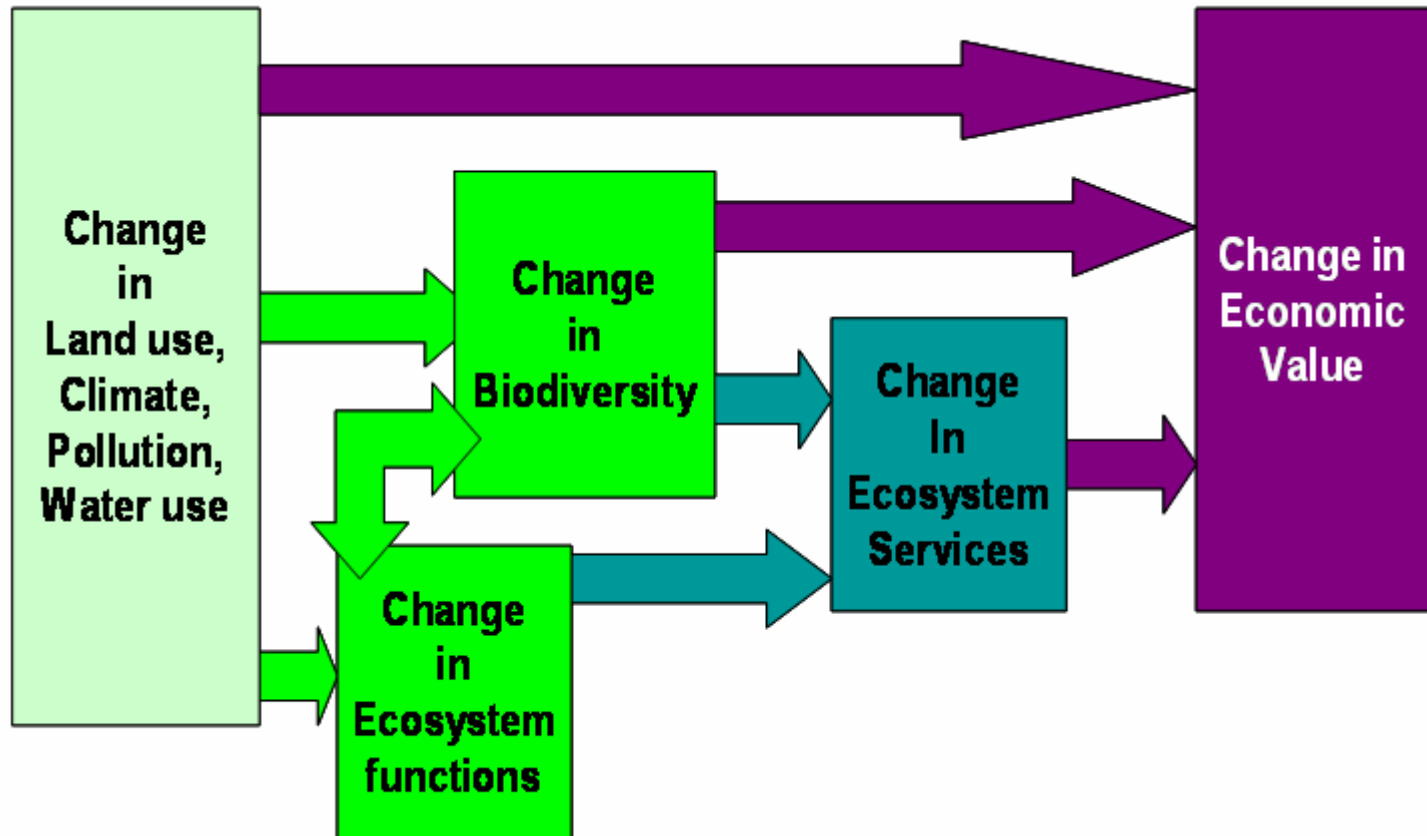
Drivers of Changes in Biodiversity

Effects of main drivers on biodiversity change in different terrestrial biomes (Sala et al. 2000)



- **Main Drivers: Land use and climate change**
- **Variation across biomes**
- **Complex interrelations**

Consequences of Change



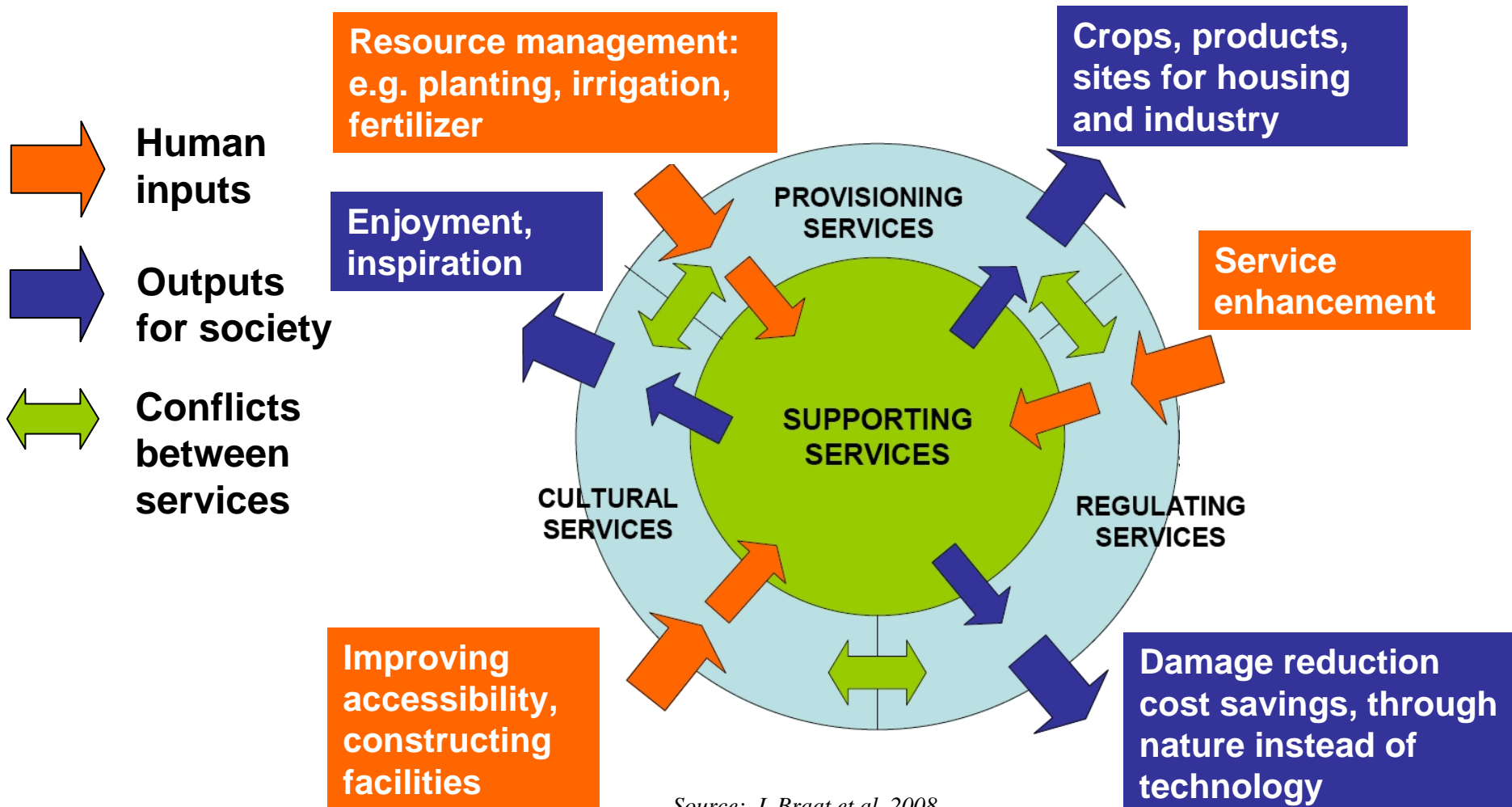
Source: L. Braat & P. ten Brink (eds.)



Ecosystem Management

Resource Use, Ecosystem Services and Management Measures

Tackling the problem of interdependencies



Best Practice Elements of Ecosystem Service Management Planning

Consideration of all relevant aims and needs (public and private)



Definition of indicators (monetary and non monetary)



Application of suitable assessment frames / prediction models accounting for all relevant ES



Application of decision support tools (MCDA: multi criteria decision analysis; CBA: cost benefit analysis) having regard to reversibility and save minimum standards



Decision on project design / management schemes



Monitoring and Evaluation

Stakeholder involvement / participation (public authorities, business, „land user“, civil society)

Adequate Public Framework

Ecosystem services management and planning is to be embedded in an appropriate legal environment

Adequacy of government structures

Supporting legal and fiscal instruments (taxes, levies on resource use, payments for ecosystem services)

Consideration of all relevant aims and needs (public and private)

Definition of indicators (monetary and non monetary)

Application of suitable assessment frames / prediction models accounting for all relevant ES

Application of decision support tools (MCDA: multi criteria decision analysis; CBA: cost benefit analysis) having regard to reversibility and save minimum standards

Project design / management schemes

Monitoring and Evaluation

Stakeholder involvement / participation (public authorities, business, „land user“, civil society)



International Best Practice

Certification schemes

Sustainable Management of Forests by FSC



The **international certification** scheme of Forest Stewardship Council (FSC) guarantees a responsible management of the world's forests taking into account the economic, social and ecological values of forests:

- Prohibit conversion of forests or any other natural habitat
- Respect of international workers rights
- Prohibition of use of hazardous chemicals
- Respect of Human Rights with particular attention to indigenous peoples
- No corruption – follow all applicable laws
- Identification and appropriate management of areas that need special protection (e.g. cultural or sacred sites, habitat of endangered animals or plants)

Example for Successful Environmental Policy Measures – Costa Rica

- By 1992 loss of 2/3 of forests, only 21% of total terrestrial area covered with forests
So far, forests did have no real “value”
- Policy Goal: to increase forest area substantially
- Policy Measures:
 - Tax exemption for afforested lands
 - Payments for Ecosystem Services
 - provision of water
 - avoided green house gas emissions
 - biodiversity conservation
 - restoration of landscape beauty
- Result: today forest area > 50%



Examples for Best Practice Renaturation of Peatlands in East- Tibet/China



Tibetan Plateau 3500 a.s.l.: Drained Subalpine Peatland



Impacts:
Drainage
Overgrazing
Erosion
Additionally increased through Climate Change



30 years ago: Ditches built by young communist brigades. 2005: Deeply drained and eroded mire landscape



Artist impression for the future: stimulation for peatland restoration workers



Little dams for mire restoration in China – a huge project

Result



**One of the last living Percolation Mires with
Black Nacked Crane**

Functions of rewetted peatlands

Function	Description
Sink	Deposition and recycling of nutrients
Disposal	Carbon sequestration
Regulation	Keeping cultural landscapes open; site- and culture-specific biodiversity; ground-water retention
Conservation	Regional responsibility for plant communities; key species
Production	Fodder, food, biomass, raw materials
Information	Landscape beauty, recreation, aesthetics and cognition, research

Source: A. Schäfer 2007

Searching for new types of land use: Alder forestry on rewetted fens

Co₂-Release:
24 t Co₂ per ha,
per annum

**Costs per t
Co₂:**
1 – 4 €

Co₂-Fixation:
1 t Co₂ per ha,
per annum



Cultivated fen

Rewetting

+

Alder forestry



**Rewetted fen with
alder forest**

Monetary value of a sustainable wood production on rewetted peatlands

	EUR per t CO ₂
Insulation of buildings	350 – 750
Renewable Energy Sources Act Incentive Programme	200
Windmill energy	70
Petrol taxes	60
Hydropower	22
Alder forestry on rewetted fens	1 – 4

- **Investing in peatland conservation is more effective than other CO₂-mitigation**

Source: A. Schäfer 2007

But there are also some “soft” arguments

Additional benefits of rewetting

- **revitalisation of traditional land use combined with new ways of processing**
- **new land-use concepts with minimal damage**
- **raw materials for energetic and industrial uses**
- **increase in energy political autarchy**
- **improved perspectives for (eco)tourism**
- **restored habitats for rare species/communities**
- **improved landscape hydrology**
- **reduced nutrient run-off into the Sea**



Economic Values of Ecosystem Services

Using Economic Valuation of Ecosystem Services for Decision Support Tools

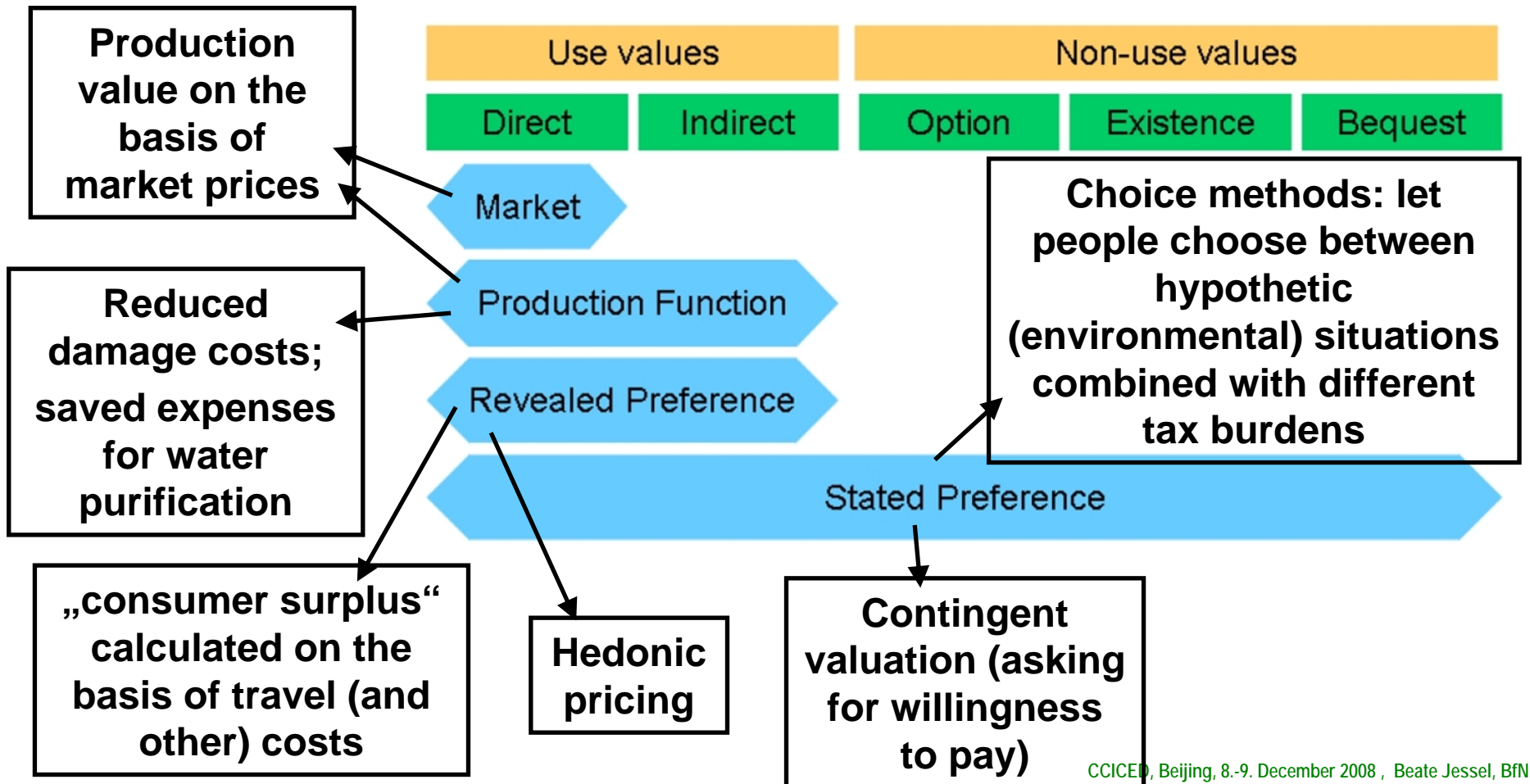
The Basic Concept: Total Economic Value (TEV)

Components of TEV

- **Direct use values** e.g. for agricultural production, forestry, recreation, angling, hunting, aesthetic value / scenic beauty;
+
- **Indirect use values** e.g. benefits from improvement of water quality, carbon sequestration, flood prevention, pollination;
+
- **Option value** benefit from ensuring the option for a future use;
+
- **Existence value** benefits from conserving / willingness to forgo a part of ones income in order to conserve a resource – especially natural amenities or species – without having any direct or indirect use of it, i.e. due to ethical or religious motives;
+
- **Bequest value** benefits from ensuring that certain goods will be preserved for future generations.

Methods to Determine the Components of Total Economic Value (TEV)

Economic Evaluation Methods for ESS



Problems of Applicability of Economic Valuation Methods for Measuring TEV

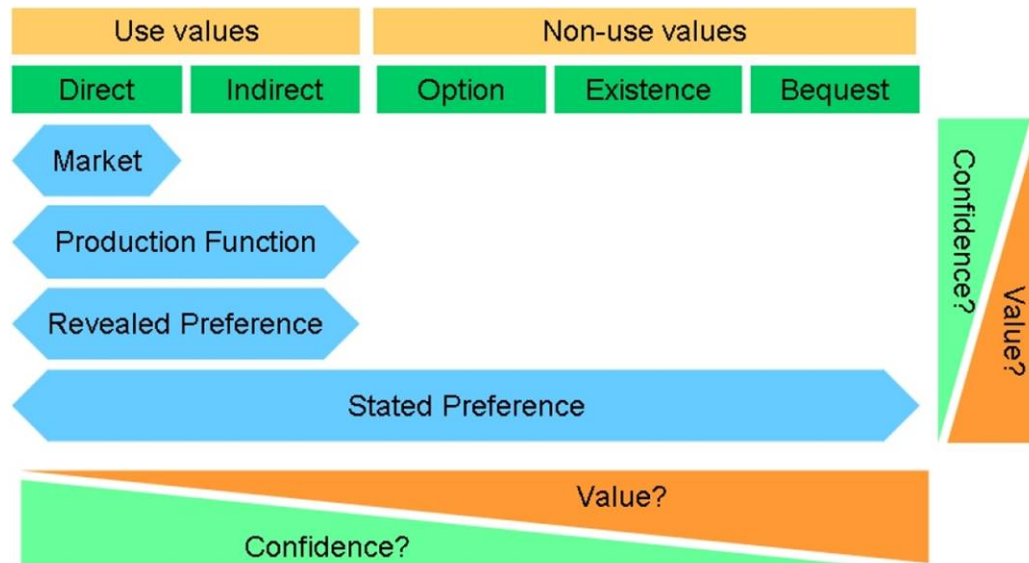
Problem



Considerable application costs if evaluation studies are done in any single case



Problems of confidence esp. when valuing on the basis of stated preferences



Source: TEEB COPI study / Alistair Mc Vittie and Dominic Moran 2008

Solution ?



Benefit transfer ?



Restoration costs as an alternative economic valuation approach for natural capital ?

Benefit Transfer

Value or benefit transfer is a technique in which results of studies performed earlier are applied to obtain values in a new policy context.

Methods:

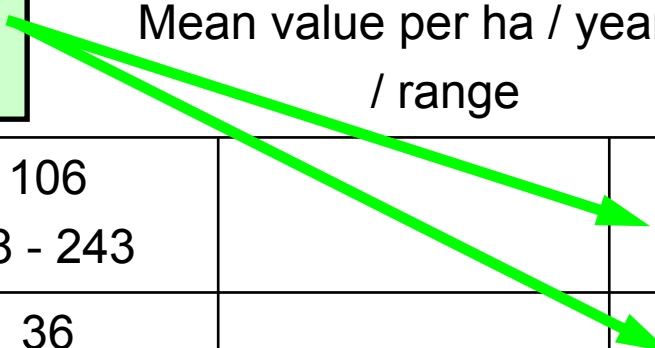
- simple transfer of a mean or median values**
- transfer on the base of a demand function (e.g. for recreational values)**
- transfer on the basis of statistical meta analysis**

Applicability of Benefit Transfer

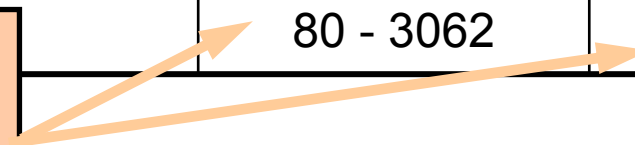
Examples for economic values of ecosystem services (source: TEEB-Study)

Ecosystem service	Grassland	Tropical Forest	Temperate Forest
	Mean value per ha / year (€) / range		
Food, fibre, fuel	106 28 - 243		14 - 246
Climate regulation (a.o. carbon sequestration)	36 0 - 102		240 - 542
Water regulation		80 - 3062	344 0,2 - 980

Medium range, better transferability because of global markets and well known ecological conditions



High range of values, difficult to transfer for very specific local conditions



Capital Values of Ecosystems Calculated on Restoration Costs and Periods

High Nature Habitats / Ecosystems (about 10% of German landcover)	Area	% of German landcover	Euro / ha	Value (Mio. €)
Natural and semi-natural dry grasslands	99,720	0.27	8.06	8,037.43
Molinea meadows	14,000	0.04	18.51	2,591.40
Riparian grasslands and tall herbaceous perennial vegetation of moist to wet sites	37,700	0.10	6.14	2,314.78
Low intensively used meadows	179,000	0.48	6.14	10,990.60
Fens and swamps free of woodland	11,100	0.03	9.80	1,087.80
Other types of agricultural grasslands with species diversity	447,264	1.19	2.66	11,897.22
Low intensively used ponds for fish farming	3,150	0.01	48.93	1,541.30
Natural woods and low intensively used forests	734,438	1.96	18.44	135,430.28
Coppice and coppice with standard	182,813	0.49	4.47	8,171.72
Nature-like woodland edge communities	3,450	0.01	22.79	786.26
Raised bogs including less degraded restoreable forms	67,489	0.18	195.46	131,914.41
Nature-like running and standing surface waters	246,675	0.66	48.93	120,698.08
Total	3,555,033	9.48		736,416.07

80% of the value of Germany's productive technical equipment (933.88 Bio.€)

A new Initiative for valuing ecosystem services: The TEEB-study (The economics of Ecosystems and Biodiversity)

Goals

To mainstream the economics of ecosystems and biodiversity

To address the needs of the “end-users” of these economics :
policy-makers, local administrators, corporations and citizens

To review extensively the current state of the science and
economics of ecosystems and biodiversity, and recommend a
valuation framework and methodology

Source: Pavan Sukhdev, Bonn 2008

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valuation framework and use the science

**Phase 1: preliminary scoping work, ground work, some first
analysis, clarification as how to address the wider goals,
preliminary identification of experts and organisations that could
contribute to the wider work.**



Objectives, expected outputs and workplan of the CCICED-Task Force

CCICED Task Force on Ecosystem Services and Management

Duration: 18 (-20) months

No pure scientific approach, but elaboration of science-based policy recommendations

Draft of policy recommendations is needed until July 2010 (to be presented at CCICED annual meeting 2010.

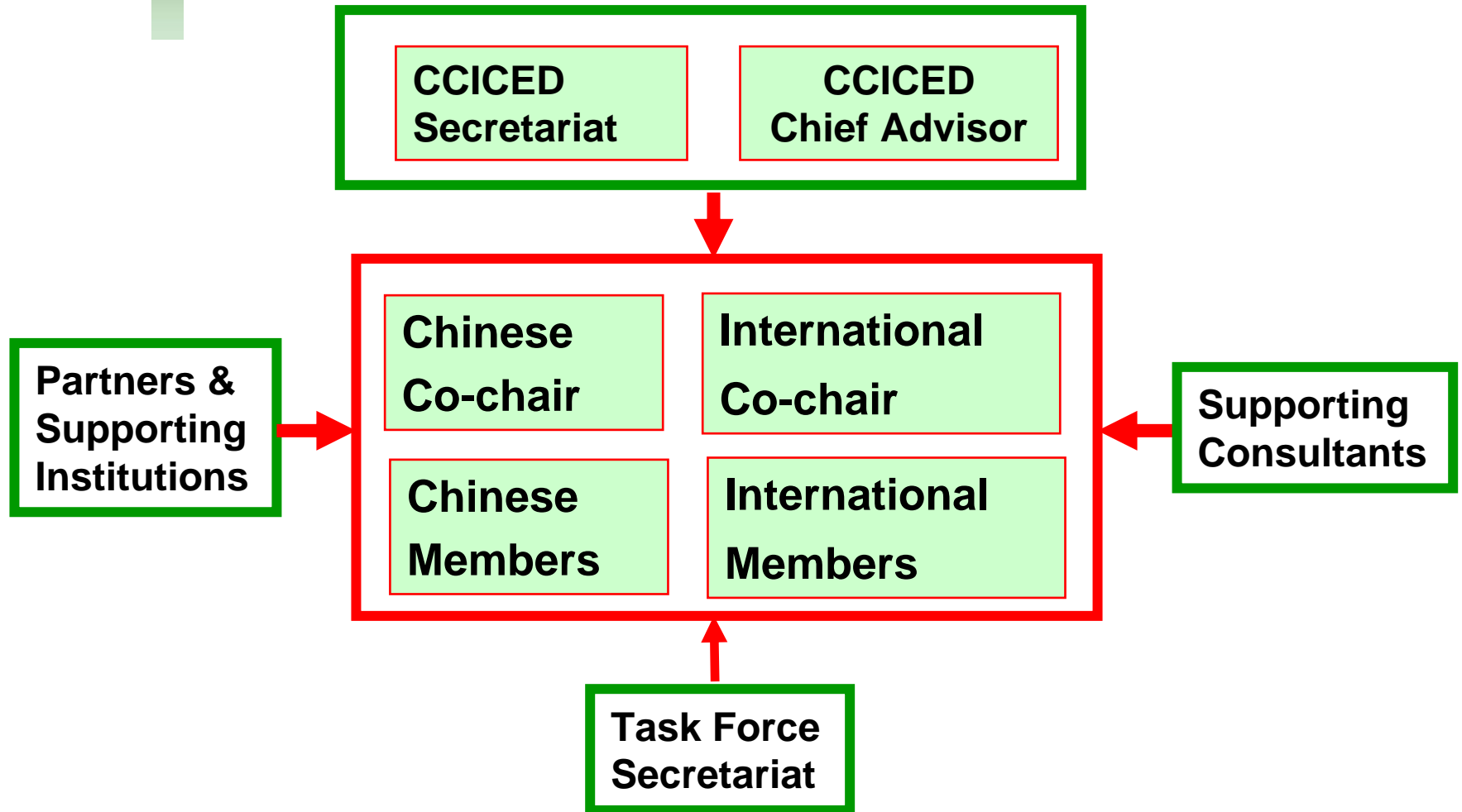
Concentration on forests, grasslands, wetlands

Results of previous task forces that have to be considered, e.g. on

- **bio-diversity,**
- **western China forest and grassland,**
- **bio-safety,**
- **integrated river basin management,**
- **protected areas**
- **payment of ecosystem services, environmental economics**

➤ ***Status report (which kinds of work have already be done) with gap analysis and analysis of previous recommendations (which failed – which were successful) will have to be prepared as a first step***

Task Force structure



CCICED Task Force on Ecosystem Services and Management

Objectives

- **Show decision makers the economic and social benefits of sustainable ecosystems management based on an ecosystems services approach**
- **Provide evidence to illustrate the opportunities and provide Chinese and international lessons on promising approaches**
- **Present science-based recommendations and policy options to integrate ecosystem services into development decision-making in China**

Outputs & deliverables

Outputs

- Overview of status & trends in China
- Analysis of constraints & recommendations
- Demonstration of economic costs & benefits
- Supporting case studies & scenarios
- Recommended policy options

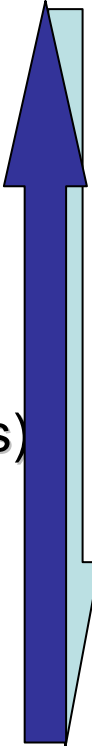
Deliverables

- 200 page book "Promoting ecosystem services and management in China"
- 30 page report on policy recommendations to CCICED (with summaries)
- 4 page executive summary
- 1 page State Council Brief (with < 6 recommendations)

Bi-monthly policy brief

Book series

Ecosystem approach case study input into CBD COP in 2010?



Tasks & draft workplan

Four high level tasks proposed (with detailed actions):

- **Integrated study of ecosystem service and management in China**
- **Economic valuation of ecosystem service and policy options in China**
- **Case studies of ecosystem service and best practice of management**
- **Communication, education and public awareness**

Considerations of inception workshop: I. Scenario analysis

Desirable scenarios for the Analysis of Ecosystems Services in China's Development,

to be developed in relation to the 2020 Economic Growth Targets and to be related to China in a global context

Scenario 1: Business as Usual

Scenario 2: Sustained Ecosystems Services: existing levels of ecosystems services availability continue through to the future, with management strategies designed to maintain existing levels of service provision introduced.

Scenario 3: Enhanced Ecosystems Services: actions to enhance ecosystems services availability through the restoration of lost ecological potentials: e.g. restored forests, reconstructed river flows.

Scenario 4: Integrating Climate Change

Scenario 5: External Impacts: Scenario 4 but with the impacts on ecosystems services beyond China included resulting from the importation of natural resources (e.g. timber) and the downstream impact on international river basins (e.g. the Mekong). Methodology

Considerations of inception workshop:

I. Scenario analysis

*Necessary
focus
because of
limited
resources*

Step 1: Current Status

- o Assess/mapping of existing ecosystems services in China: based on 4 MA categories & including trends.
- o Value existing ecosystems services: current contribution of ecosystems services to the national economy & in relation global environmental assets.
- o Identifying the main drivers affecting ecosystem service availability & trends: e.g. land-use patterns, changing consumption patterns, urbanization etc.

Step 2: Assess the Baseline / current status (Scenario 1)

- o Assess implications of existing development patterns – project current patterns of ecosystems services degradation forward to 2020.
- o Value loss of ecosystems services from present trends & cost of replacing these lost services necessary to maintain economic development targets.

Step 3: Assess Alternative Development Pathways and actions needed to maintain existing ecosystem service levels

Step 4: Comparative Analysis: Compare the relative costs and benefits of the different scenarios; identify a range of options for achieving different development outcomes.

Considerations of inception workshop:

II. Case studies

**Provide evidence to illustrate opportunities..... –
Chinese and international examples (Case studies)**

Task 1

Synthesize lessons from existing Chinese programs (grains to green, grazing ban, etc) with respect to:

What works - what does not work, what are obstacles (and next steps)
Pay attention to ecosystem services, economic development, human well-being.

Six months: a contractor

Task 2

Develop 2-3 Chinese case studies that best demonstrate how an integrated ecosystem services approach changes decisions in a fundamental way and in doing so promotes economic development, human well-being, and sustainable delivery of ecosystem services. Select to also intersect with scenario analyses.

12 months (after careful selection)

Who: depends on case study picked – could be a partner, or a Chinese institution

Task 3: Conduct two international study trips that examine ecosystem services integrated management that provide approaches not used in China (something to learn) and that represent developing economies

Engagement of government agencies should be developed as a parallel process

Who? Key ministries?

**National Development and Reform Commission
(NRDC)?**

How?

Presentation at CCICED annual meetings

**Discussions concerning draft recommendations
in 2010?**

Presentation at COP 10 conference in Oct. 2010

Involvement in case studies?

Involvement in field trips?

Time line

Proposal from A. Prof. Yu

December 2008 - inception workshop, draft work plan, status report commenced

By March 2009 – preparation of status report, 2nd meeting of task force, choice and delegation of case studies; probably field trip to case studies in China ?
(July 2009 – 3rd meeting, study tour abroad)

November 2009 – interim report, report to CCICED annual meeting

By March 2010 – submission of interim report with case studies

By July 2010 – Draft of policy recommendations

*Ideas and suggestions from participants
are highly appreciated!*

Thank you !



Some results of discussion within High Level Session

- **Contacts to / adjustment with other Task forces,**
e.g. T.F. on Sustainable Development Strategy for the Oceans
-> Definition of / integration of ecosystem services
-> Avoiding contradictions with other T.F. recommendations
- **Relation to climate change**
-> Integrate contribution to adaptation/mitigation as one es. service
- **Elaborate suggestions for integration ecosystem services into ecocompensation**
- **Establishing close relations to the political process** -
-> Integrate a broad discussion with government agencies from the first beginning
-> elaborate recommendations to be integrated in 5year-plan already next year
-> integration into sino-european dialogue next year
-> pay also attention from point of legislation
- **Focus on ecosystem services and economic valuation**
-> Develop / describe new methods of economic valuation that go beyond neoclassic approaches