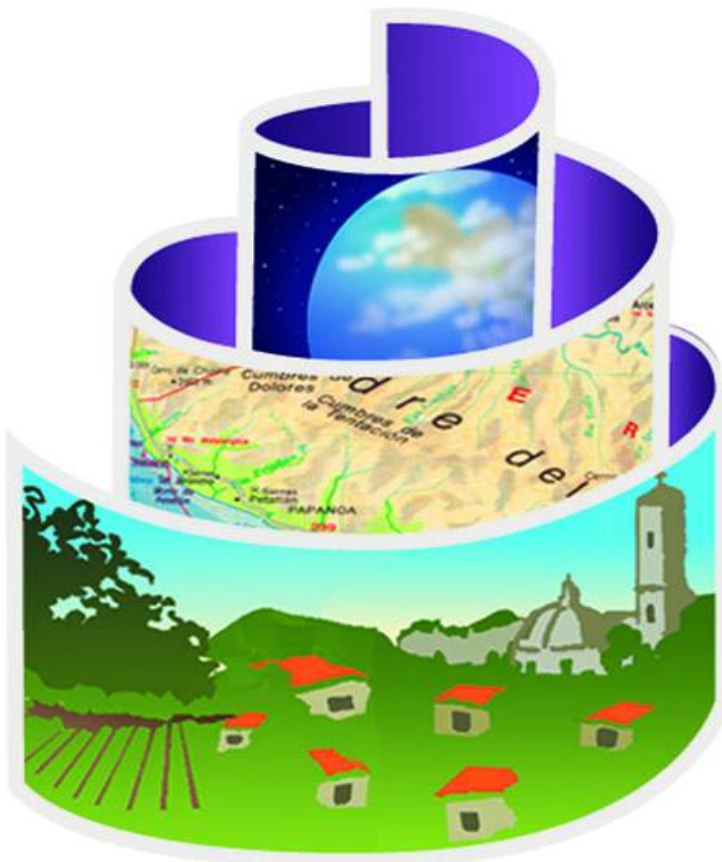
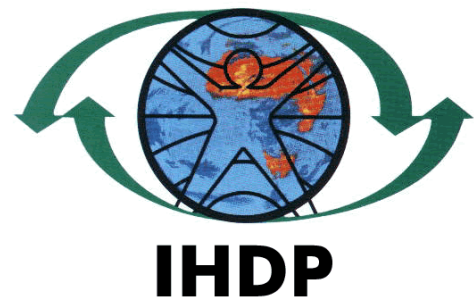
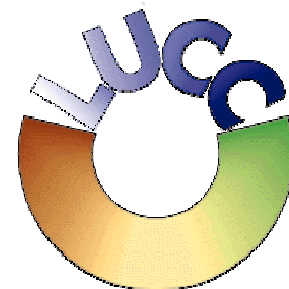


GLOBAL
I G B P
CHANGE

Global Land Project



GLP



GCTE

Global Change and Terrestrial Ecosystems



Contemporary and Future Terrestrial Carbon Sources and Sinks



Global Change Effects on Vegetation and Disturbance Regimes



Global Change, Agroecological Processes and Production Systems

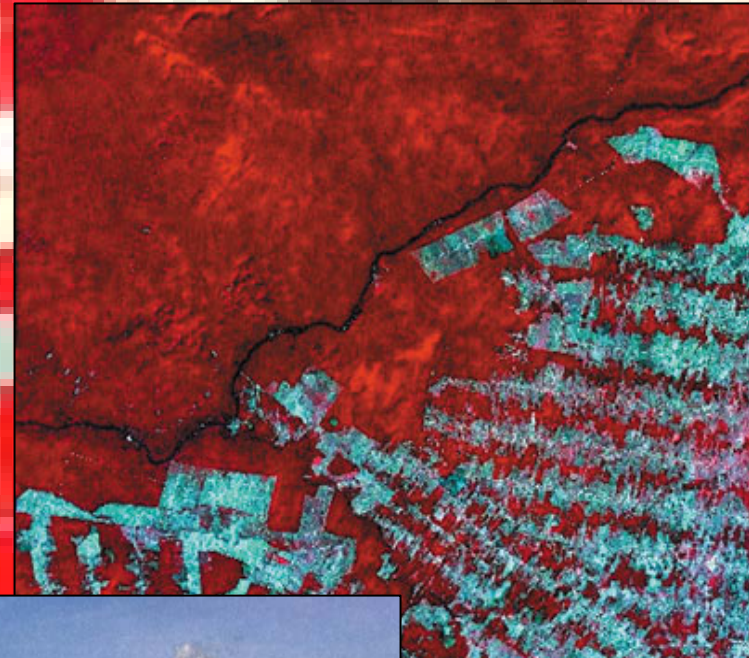


Changing Biodiversity and its Consequences on Ecosystem Functioning

Land Use and Cover Change (LUCC)

- Regional Case Studies
- Observations of Land Use/Cover Change
- Integrative Assessment

New IGBP-IHDP Land Project: GCTE + LUCC +++++





Social-ecological co-evolution

Anthropocene - a biosphere shaped by humanity (Paul Crutzen)

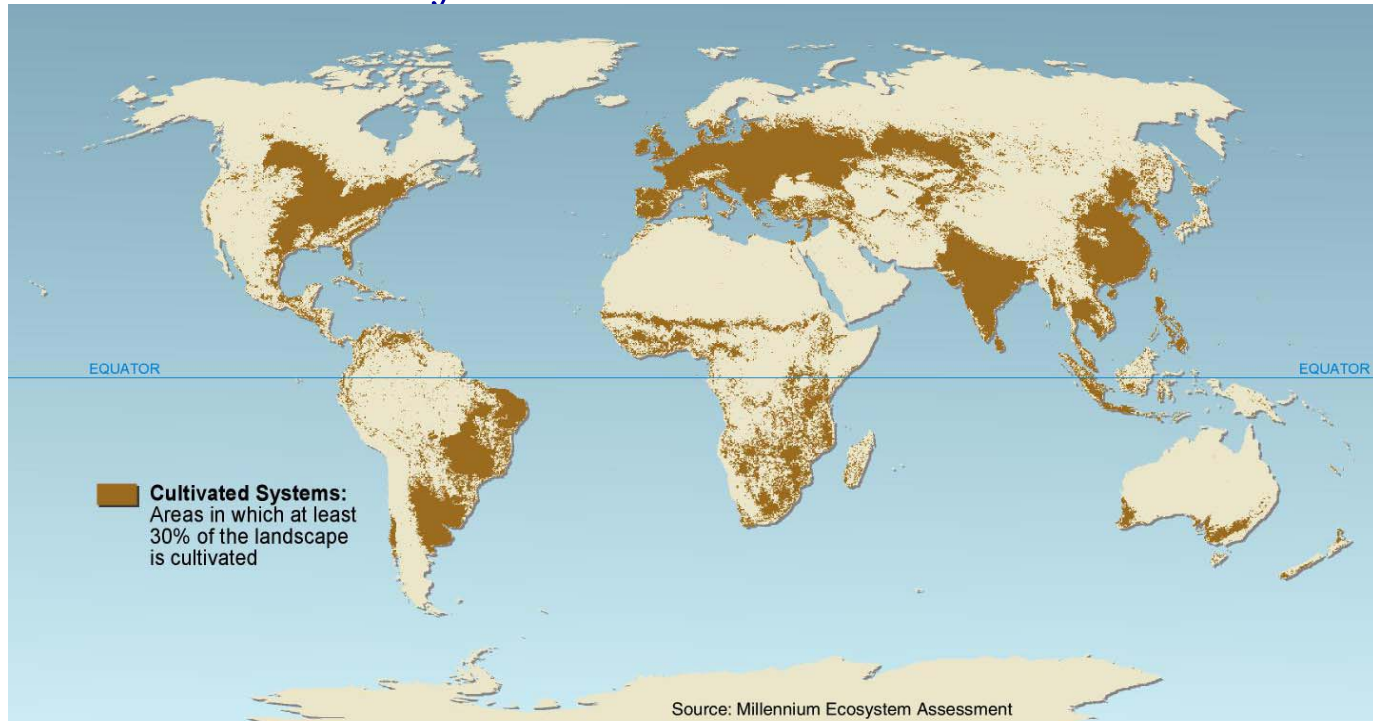


- Throughout history humanity has shaped nature and nature has shaped the development of human society.
- Social-ecological co-evolution now takes place also at the planetary level and at a much more rapid and unpredictable pace than previously in human history.



Unprecedented change in structure and function of ecosystems

More land was converted to cropland in the 30 years after 1950 than in the 150 years between 1700 & 1850



Cultivated Systems in 2000 cover 25% of Earth's terrestrial surface

(Defined as areas where at least 30% of the landscape is in croplands, shifting cultivation, confined livestock production, or freshwater aquaculture)

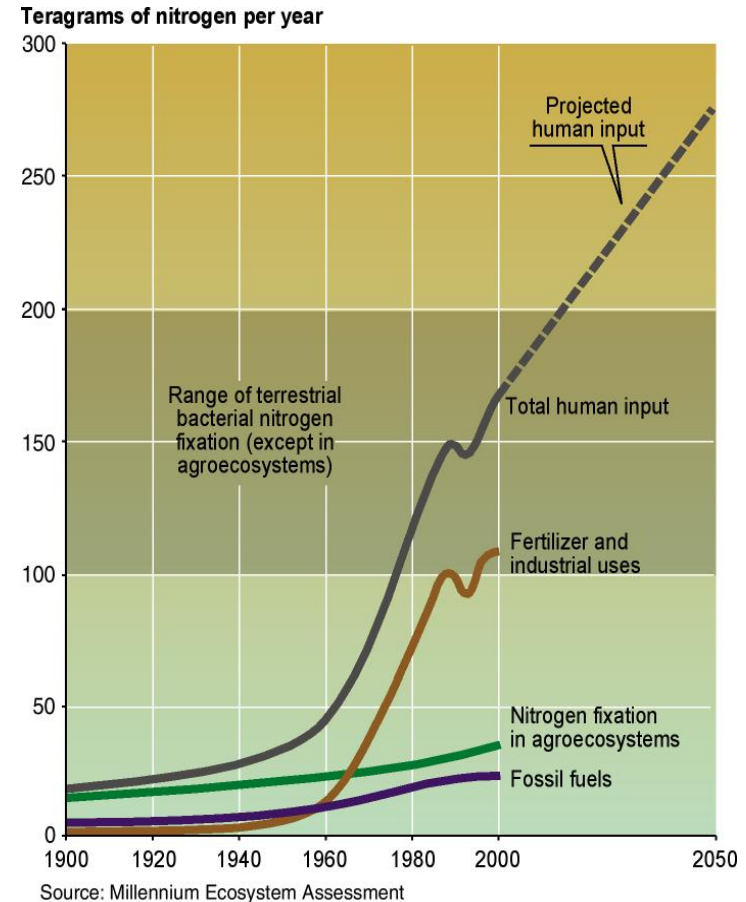
Millennium Ecosystem Assessment 2005



Unprecedented change: Biogeochemical Cycles

- **Since 1960:**
 - **Flows of biologically available nitrogen in terrestrial ecosystems doubled**
 - **Flows of phosphorus tripled**
- **> 50% of all the synthetic nitrogen fertilizer ever used has been used since 1985**
- **60% of the increase in the atmospheric concentration of CO₂ since 1750 has taken place since 1959**

Millennium Ecosystem Assessment 2005



Human-produced Reactive Nitrogen

Humans produce as much biologically available N as all natural pathways and this may grow a further 65% by 2050



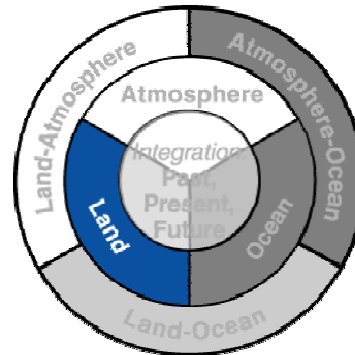
Keys to meeting Challenges

- Greater appreciation of the **coupled socio-environmental system**
- Analysis of **Land Decision Making**
- Valuation of **Ecosystem Services**
- **Scaling** across physical and scientific dimensions of observational systems and methods, case studies, experiments, and model analyses;
- **Vulnerability** analysis of multiple stressors from and on the coupled system
- Incorporation of **historical aspects** and timescales of social and environmental changes.

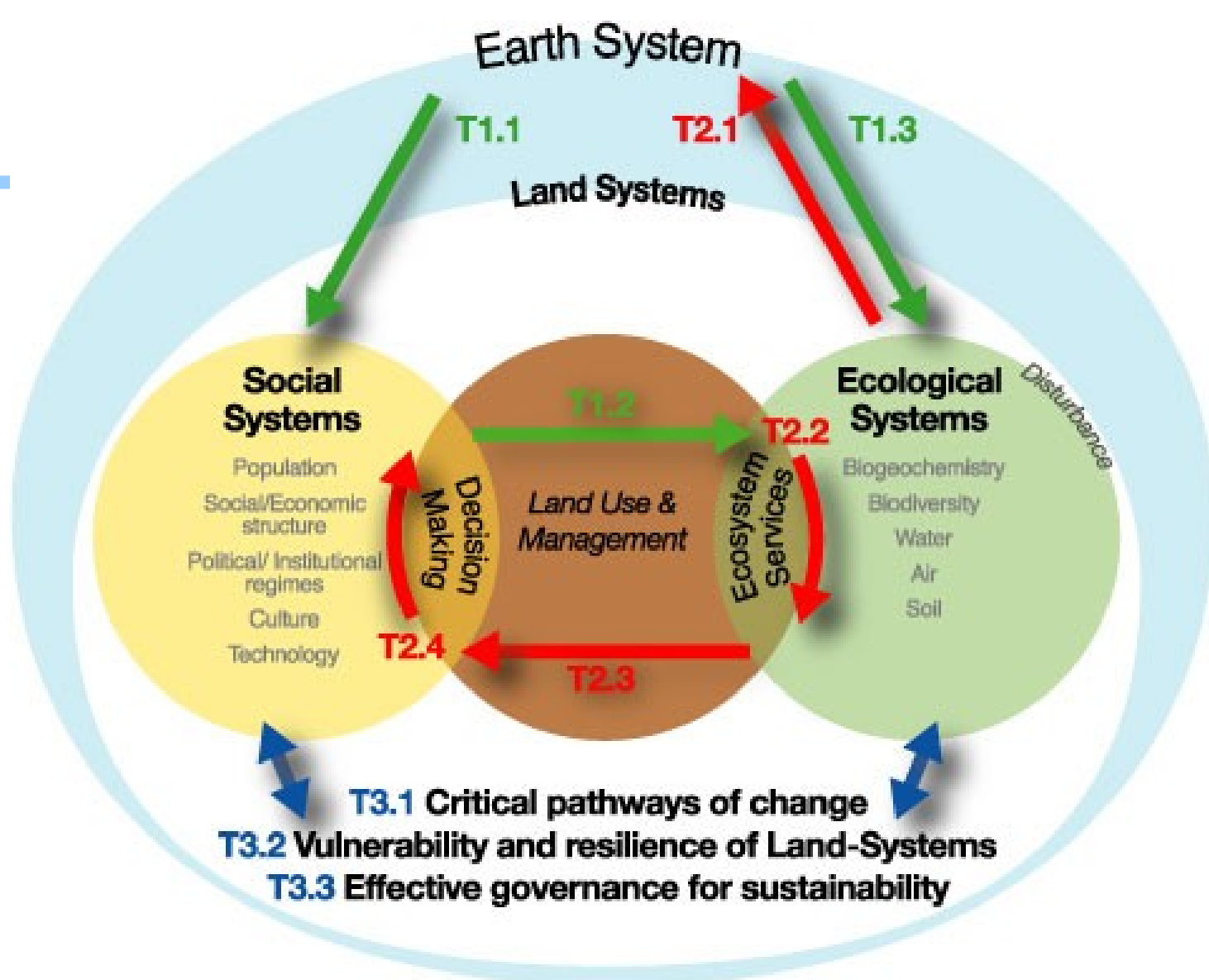





Land

- Dynamics of land systems.
- Consequences of land system changes.
- Integrating analysis and modelling for land sustainability.

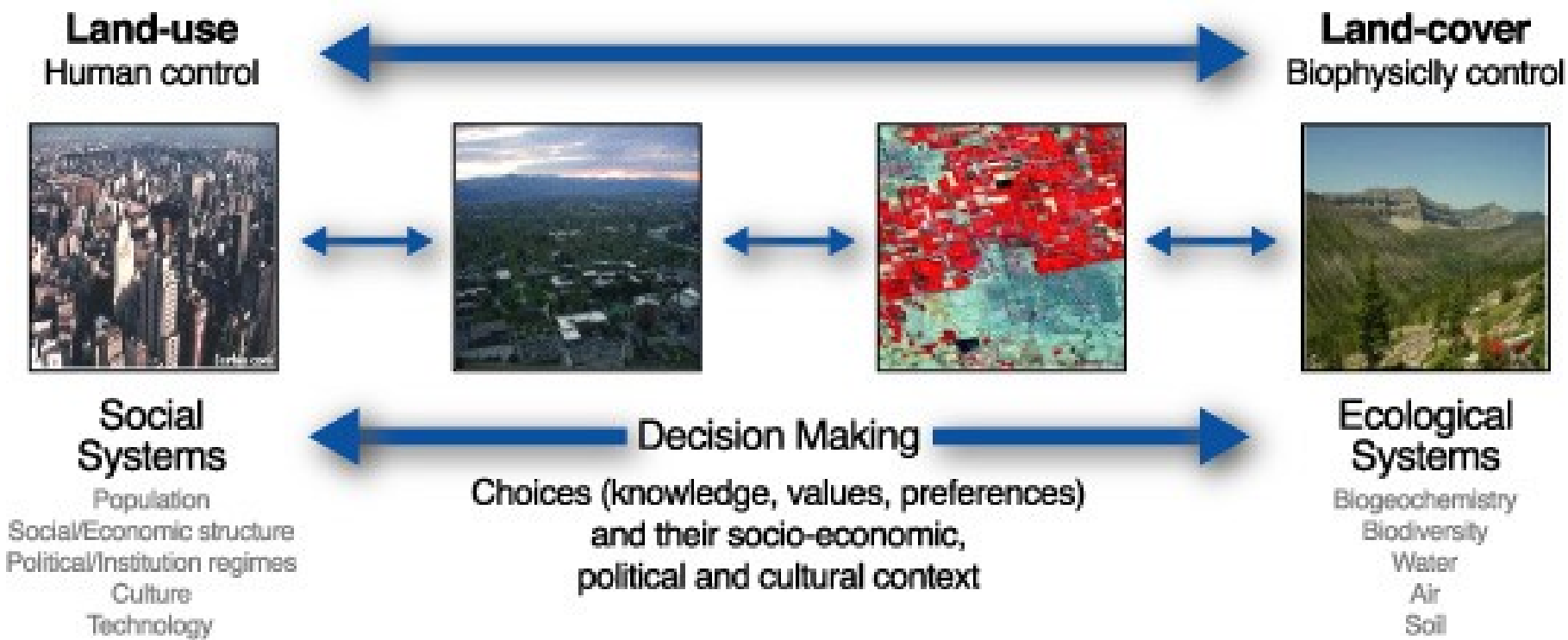


GLOBAL
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CHANGE



-  T1. Dynamics of land-systems
-  T2. Consequences of land-system change
-  T3. Integrating analysis and modelling for land sustainability

Dynamic Land Transitions



Social challenges

poverty
conflict
social justice
migration
consumption
health

Ecological challenges

pollution
diseases
food/fibre/fuel shortages
overcrowding
clean water supply

Ecosystem goods and services

clean air
clean water
waste recycling
food/fibre/fuel
recreation



Dynamics of Land-Systems

- How does globalisation and population change affect regional and local land use decisions and practices?
- How do changes in land management, decisions, and practices affect biogeochemistry, biodiversity, biophysical properties, and disturbance regimes of terrestrial and aquatic ecosystems?
- How do the atmospheric, biogeochemical and biophysical dimensions of global change affect ecosystem structure and function?





Consequences of Land-System Change

- What are the critical feedbacks from changes in ecosystems to the coupled Earth system?
- How do changes in ecosystem structure and functioning affect the delivery of ecosystem services?
- How are ecosystem services linked to human well-being?
- How do people respond at various scales and in different contexts to changes in ecosystem service provision?





Integrating Analysis and Modelling for Land Sustainability

- What are the critical pathways of change in land-systems?
- How do the vulnerability and resilience of land-systems to hazards and disturbances vary in response to changes in human and environment interactions?
- Which institutions enhance decision making and governance for the sustainability of land-systems?



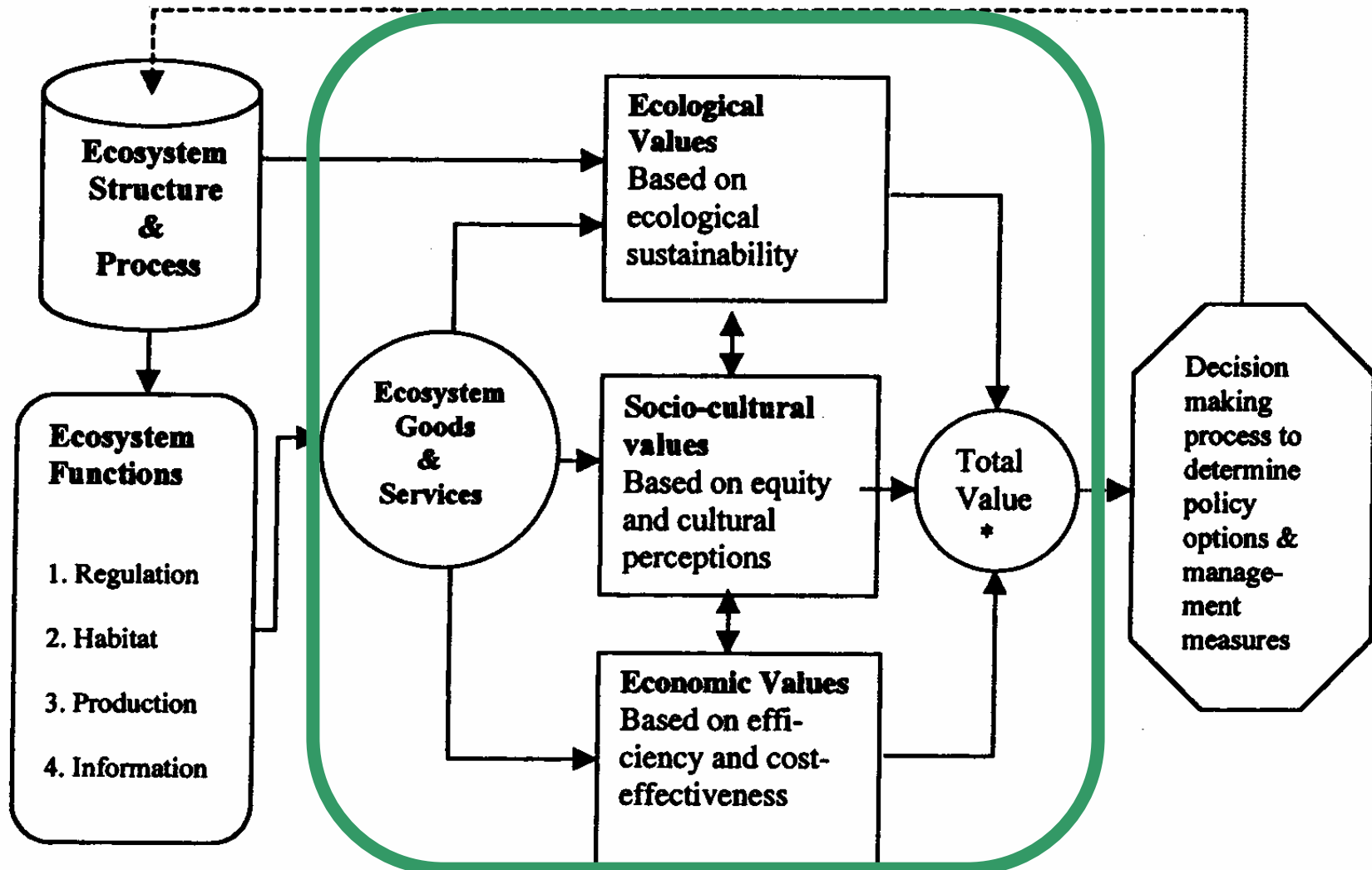


FAST TRACK ACTIVITIES

- a) Follow-on to Millenium Ecosystem Assessment
- b) Land Use Harmonization Scheme
- c) Development of Land Use Change Model
- d) Sustainability and Vulnerability
- e) Data and model integration and comparisons
- f) Decision Making Linkages to Decision Making
- g) Changing Disturbance Regime under Global Change
- h) Quantifying Regional Biogeochemical Budgets

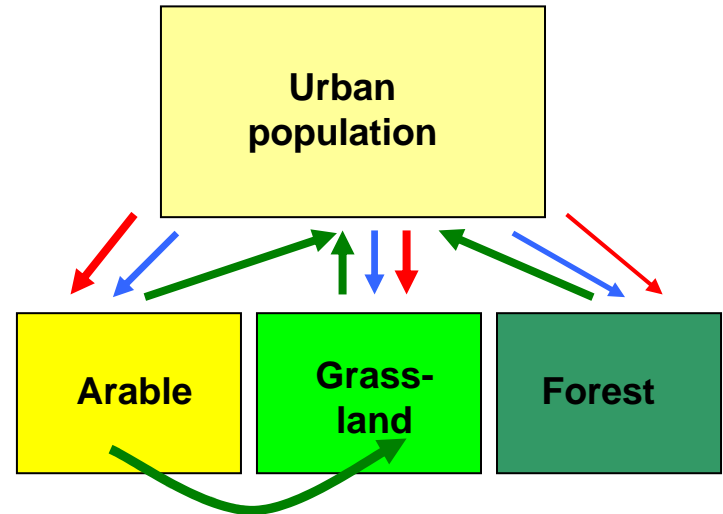
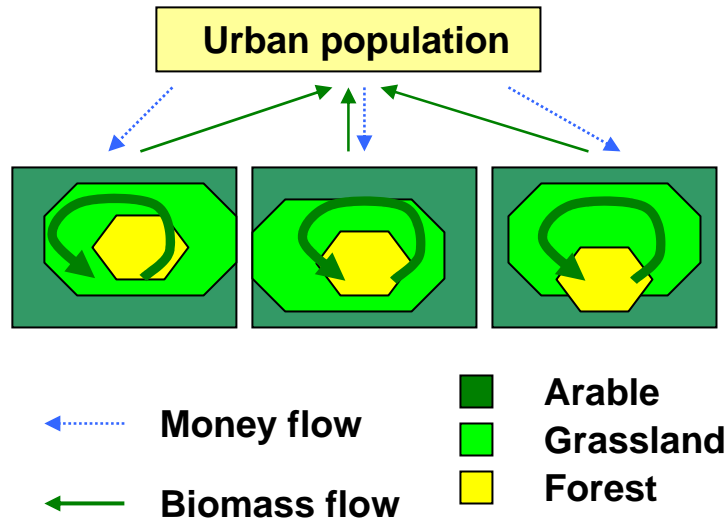


Decision making and ecosystem services



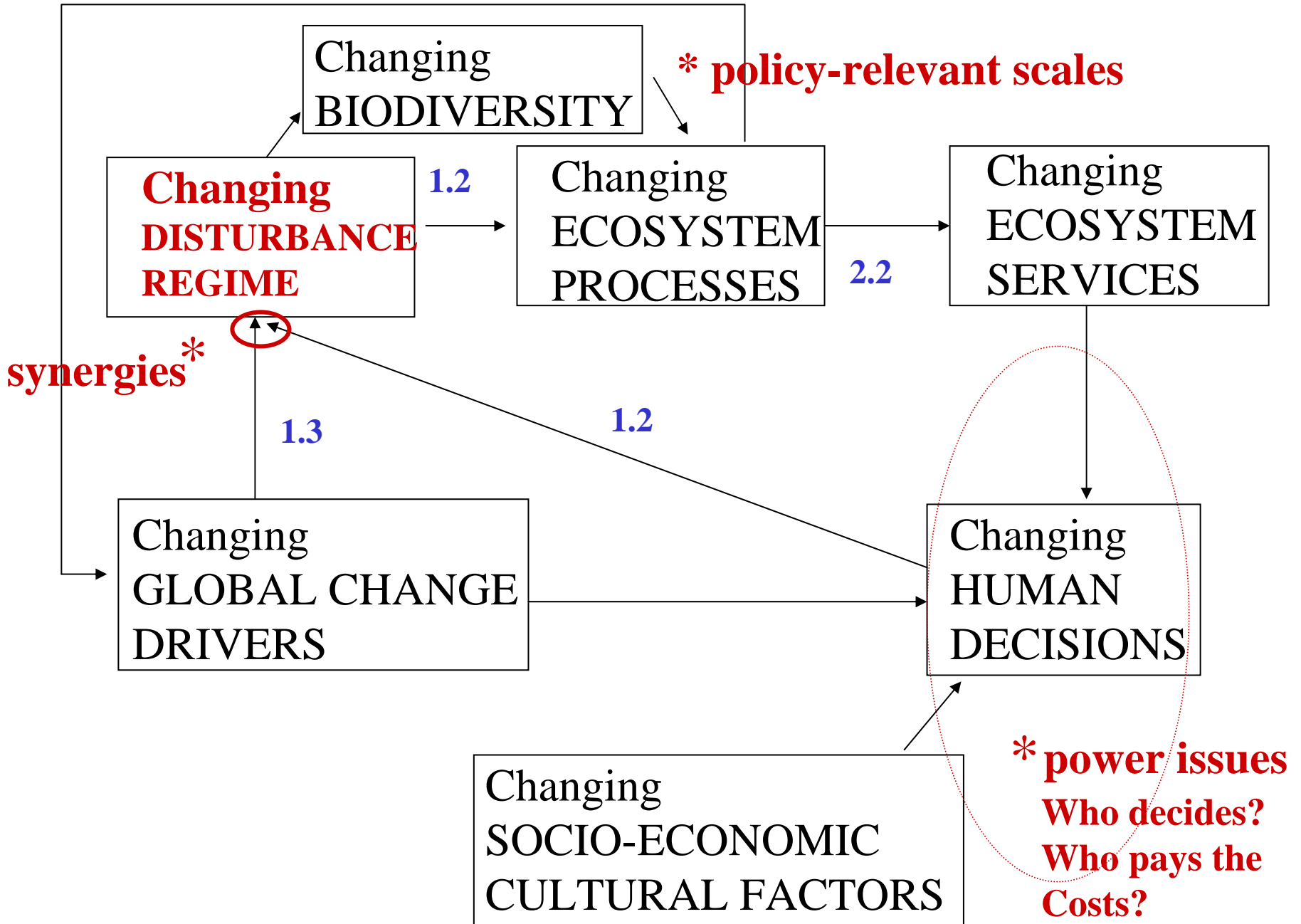


Pre-industrial versus modern agriculture



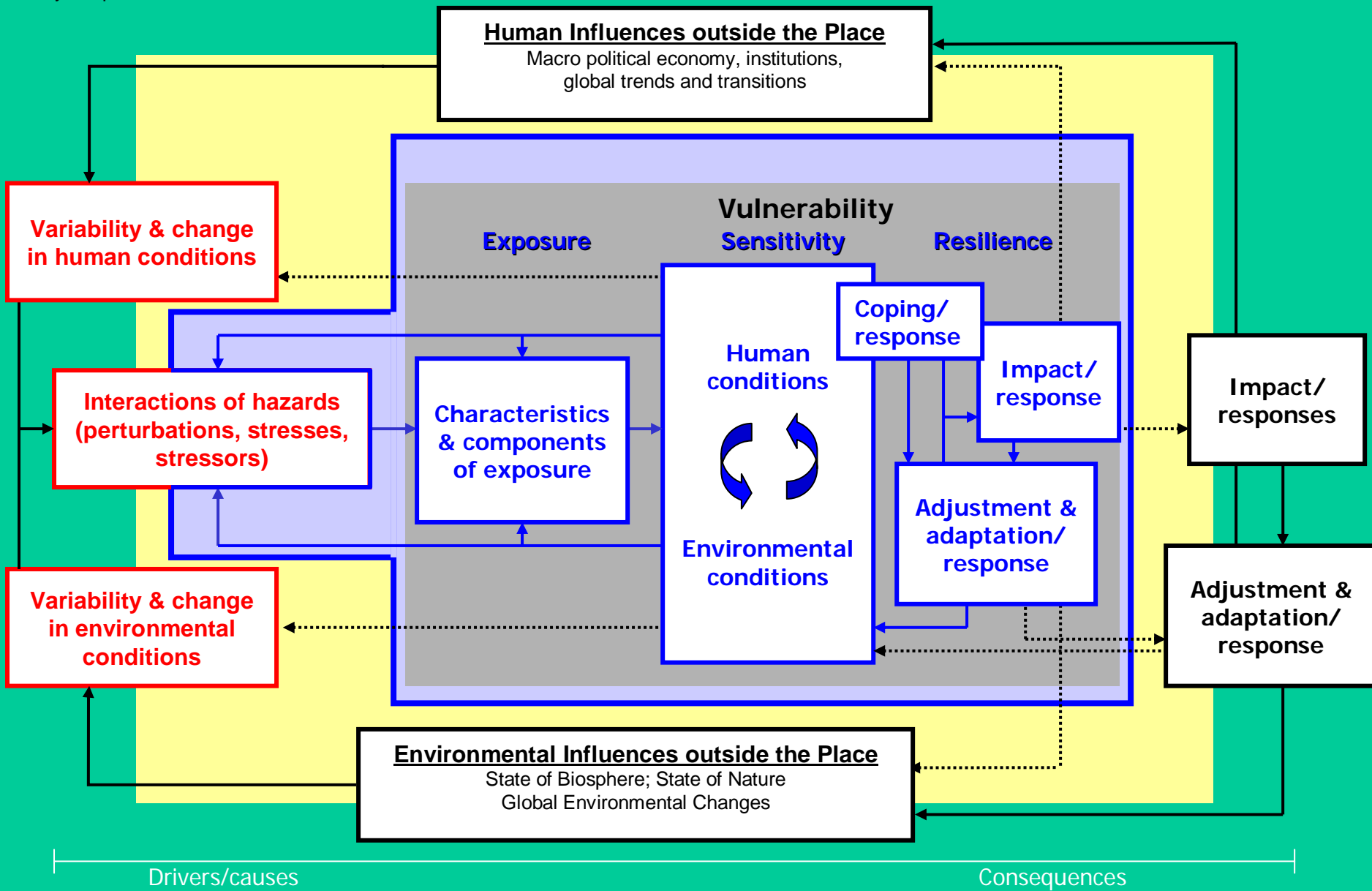
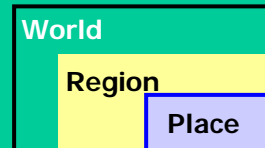
- Self-sufficient, integrated local systems ⇒ homogenous throughput systems
- Low input-low output ⇒ high input-high output
- Energy-efficient ⇒ area- and labor efficient
- Surging transport intensity.
- Globalization of environmental pressures.

*** feedbacks 1.3, 2.1**



Dynamics
 cross-scale ←
 in place ← ———
 beyond place ← ———

System operates at multiple spatial, functional, and temporal scales





Implementation Strategy

- **Approaches**
 - Place-based research studies
 - long-term observations/experiments
 - Process models (e.g., vegetation/ecosystem models, agroecosystem models, agent-based models)
 - Integrated studies
- **Networks / networks of networks**
 - existing GCTE, LUCC, Diversitas (and other EESP) networks
 - new networks
 - thematic, specific phenomena, tools
- **Case studies**
 - specific systems, e.g. arid, mountains
 - regional studies - incl. shared with other projects



CURRENT RESEARCH ACTIVITIES (Conditionally Endorsed by SSC)

- MRI: Mountain Research Initiative
- TERACC: Terrestrial Ecosystem Responses to Atmospheric and Climate Changes
- ARIDnet: Assessment, Research, and Integration of Desertification network
- MAIRS: Monsoon Asian IRS
- NEESPI: Northern Eurasian Earth System Partnership Initiative



NEXT STEPS

- Maintaining ongoing Networks
- Endorsement of Research Activities
- Implementing Open Data Policy
- Establish Training Programs
- Establishing Task Groups for Research Activities such as Synthesis Workshops
- Young Scientist Network



UPCOMING MEETINGS

- Urban Regional Carbon Management
Mexico City Sep 2006
- ESSP Sessions on GLP related topics: a)
Vulnerability; b) Ecosystem Services
(Nov 06)
- NEESPI/MRI Planning Workshop (Nov
06, Mongolia)
- NEESPI Land/Water Workshop on
Vulnerability of Semiarid Systems (Sep
07, Urumqi)