The science of making land adapted to climate change – an attempted assessment

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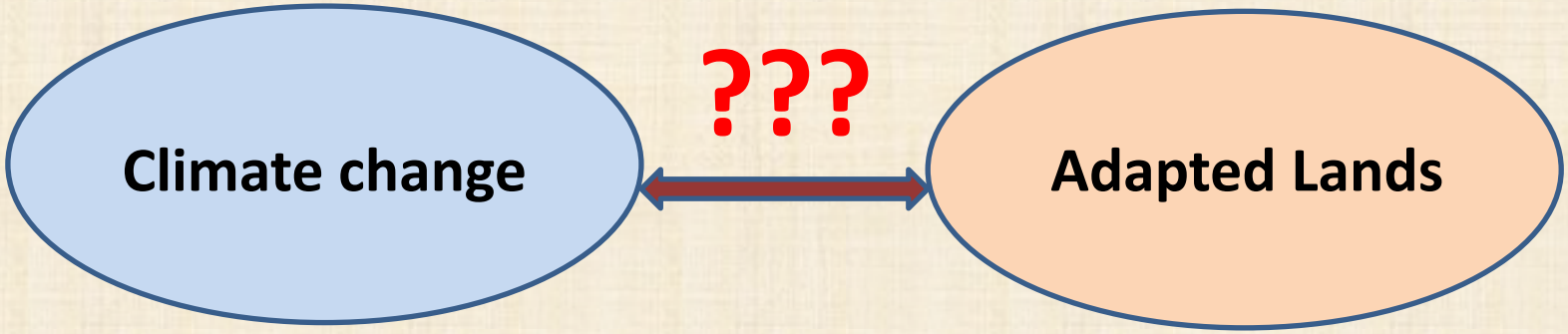


Logic of the assessment

- Researches, case studies and analytical reports
- New concepts and terminology
- Climate change adaptation in the light of UNCCD and UNFCCC
- Land degradation/Desertification: evolving concept
- Sustainable land management (SLM) and Ecosystem-based approach (EbA) issues: difference, interference and possible evaluation

Researches, Case Studies and Analytical Reports ("key words" collecting approach): various and numerous (up to n*10^3)

Main topics

- Regional and local examples
- Global assessments and analyses: data bases and full descriptions
- Scientific and practical efforts
- Socio-economic, political and institutional issues
- Sustainable land management (SLM) and Ecosystem-based adaptation (EbA) in: water management, BD conservation, agriculture, pasture management, forestry, transport, and other good practices
- Carbon sequestration
- Energy efficiency
- Early warning systems and prediction
- Direct and indirect evidence of climate reverse due to SLM
- Adaptation and resilience
- Charney effect
- Calculating carbon balance

A few general conclusions from the pre-SPI assessments:

- ***Climate change and land degradation*** reduce the provisioning of ecosystem services but ***occur at different temporal and spatial scales and therefore often require different solutions***.
- Top-down, infrastructure-related adaptations to the impacts of climate change are well promoted in policy arenas, but ***ecosystem maintenance and restoration can also play an important part in the adaptation process***
- ***Much of the literature on climate adaptation deals with yield-related strategies*** such as conservation tillage, the use of new varieties, and irrigation. There is general consensus that these strategies can help adapt to climate variability in the present.
- Nevertheless, ***much of the focus is on adapting to climate variability, and the effects being felt in the short-term by farmers,*** who invariably focus their time and limited financial resources on adaptation measures in the present and short-term.

A few general conclusions from the pre-SPI assessment:

- ***Carbon sequestration in soil is appearing to be the primary mechanism of net reduction in agriculture***. With this increased attention to land and soil vis-a-vis climate change ***a new platform is emerging for developing countries to engage in the adaptation and mitigation agendas***
- Mitigation and adaptation have historically been considered separately in global negotiations as well as literature. As such, there is ***less information on the synergies between climate adaptation and mitigation strategies***
- ***Many of the research and assessment activities*** to date have focused on the climatological, physical and biological aspects of climate change impacts ***without taking fully into account the socioeconomic aspects of vulnerability that inherently change with time*** and as a result of policies implemented

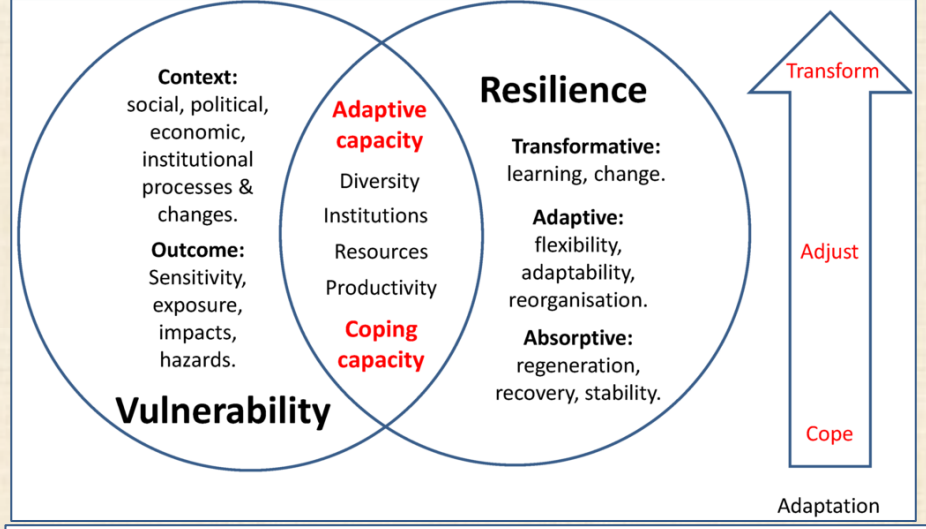
Appearance of new concepts in response to modern challenges

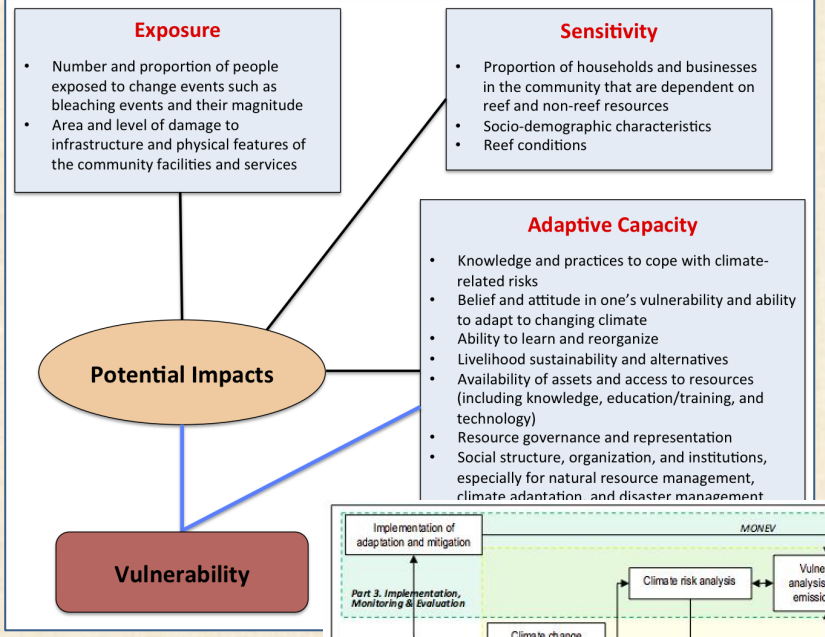
- Climate change adaptation
- Sustainable land/ecosystem/natural resources management
- Environmental/ecosystems health and services
- Food security and crop yield forecasting

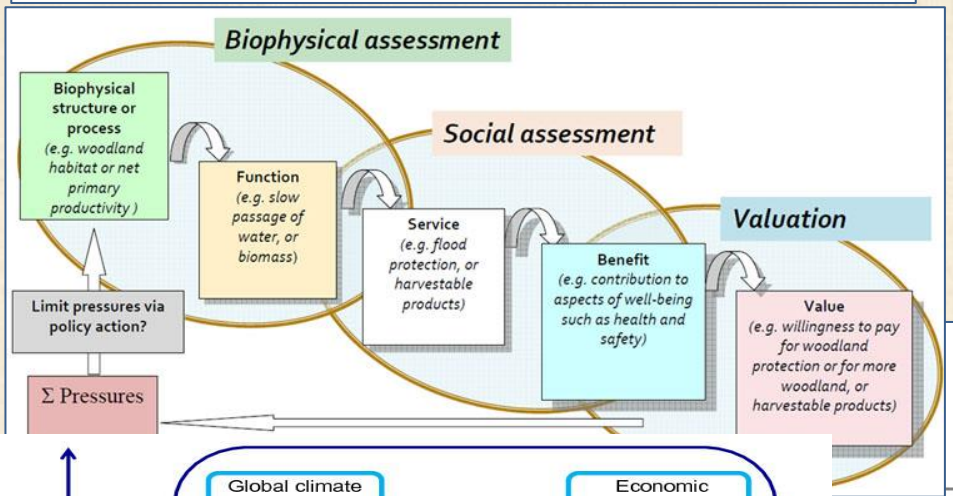
All of these initiatives still not having the common platform although some agreements in terms were reached (Schipper, 2006)

Terminology and concepts/paradigms/imperatives/visions.

Adaptation to climate change, Adaptation assessment, Adaptation baseline, Adaptation benefits, Adaptation costs, Adaptive capacity, Adaptation deficit, Adaptation measure, Adaptation method, Adaptation policy, Adaptation programme of action, Adaptation technology, Adverse effects, Catastrophic event, Climate change, Climate Change Scenario, Climate feedback, Climate impacts, Climate variability, Coping capacity , Coping range, Critical threshold, Disaster, Extreme weather event, Hazard, Health (environmental, soil), Impact assessment, Integrated Assessment, Mainstreaming adaptation, Maladaptation, Resilience, Reinsurance, Risk, Risk management, Robustness , Sensitivity , Stimuli (climate-related) , Strategy, Tolerance, Types of Adaptation (anticipatory and reactive adaptation, private and public adaptation, and autonomous and planned adaptation; maladaptation, community-based adaptation, ecosystem-based adaptation, coping, resilience building, development in a changing climate, conservation in a changing climate), Vulnerability , Vulnerability assessment, Uncertainty,… and so on and so forth…







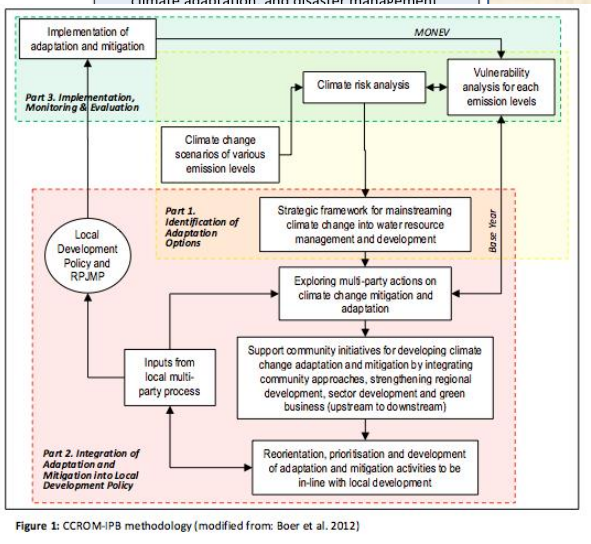
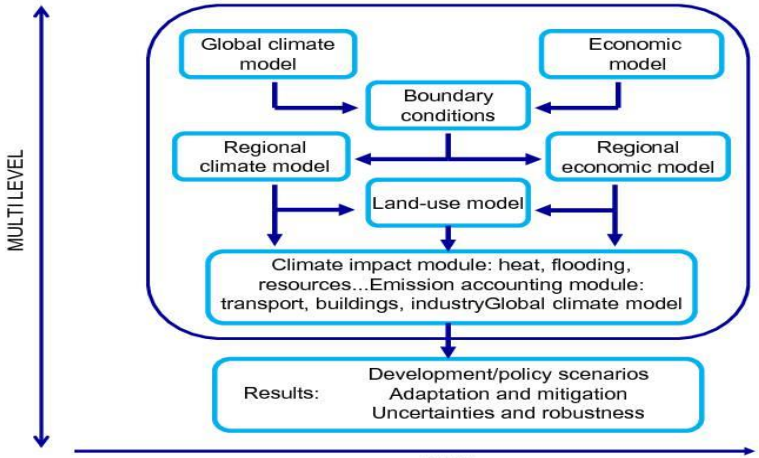
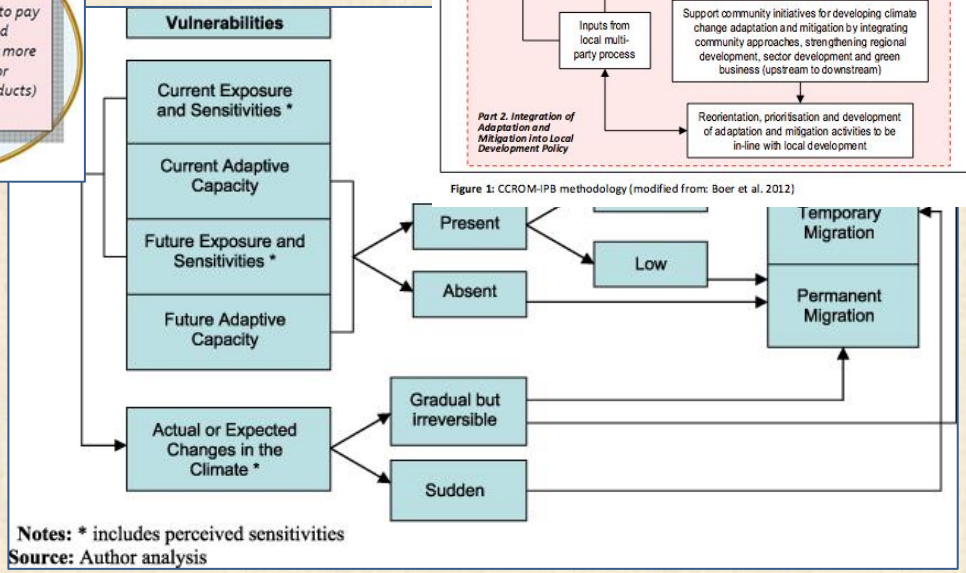


Figure 1: CCROM-IPB methodology (modified from: Boer et al. 2012)





Notes: * includes perceived sensitivities
Source: Author analysis

The possible solution in aggregating and classification of the terminology can be provided in schemes with all necessary synonyms and particularities.

Nevertheless, the process of seeking the consensus in the overall terminology is protracted. We have a lot of terms, but do not know exactly how to use them properly, how to measure and evaluate them.

Climate change adaptation in the light of UNCCD background

- **Climate dimension in not new for the UNCCD:**

"Desertification" is land degradation in arid, semi-arid, and dry sub-humid areas resulting from various factors, ***including climatic variations*** *and human activities.*

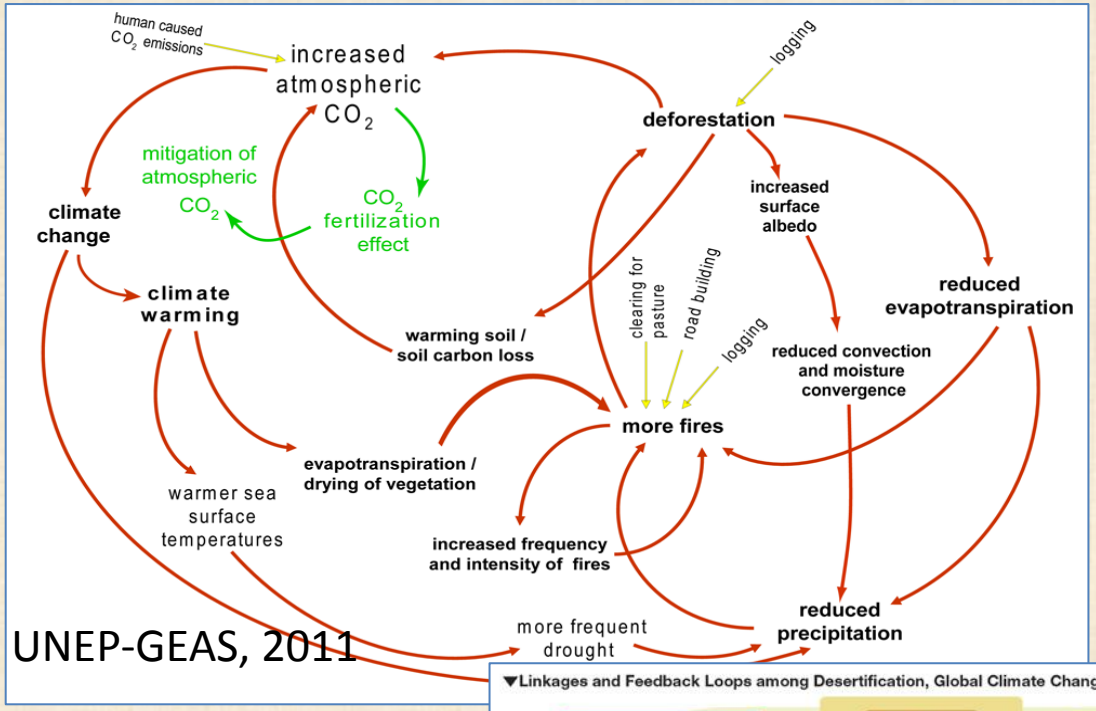
- **The desertification issue has a "climatic background":**

Climatic variations in drylands are well-known, but scientific efforts to study impacts of climatic factors on LD are locally based and limited to specific classes of LD.

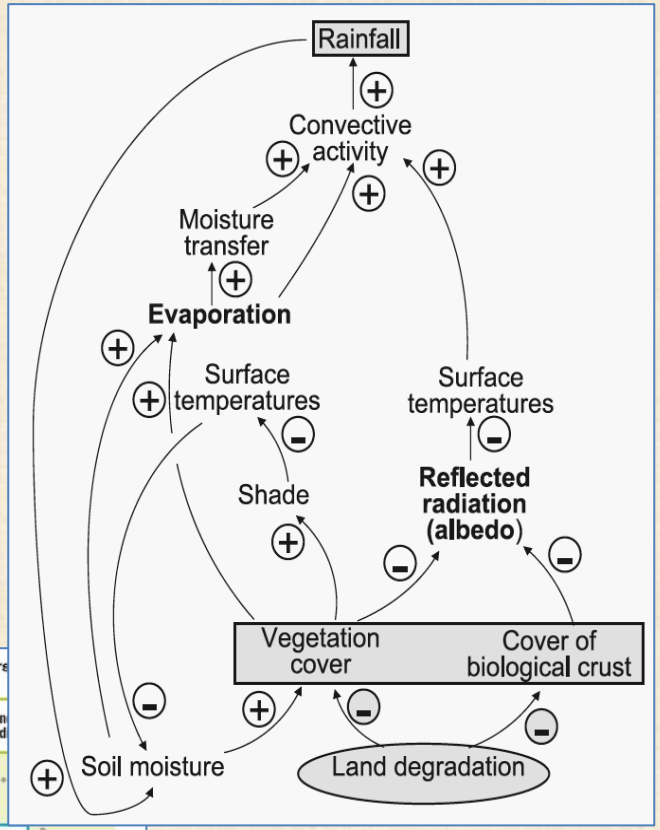
"Arid and semi-arid ecosystems cannot buffer the effects of climate variability successfully: even small changes in climate, especially in rainfall, intensify the already high natural variability and lead to permanent degradation of the productive potential of such lands" (OIES, 1991).

"Arid and semi-arid lands may thus be among the first regions in which ecosystem dynamics become altered by global environmental change (West et al., 1994)".

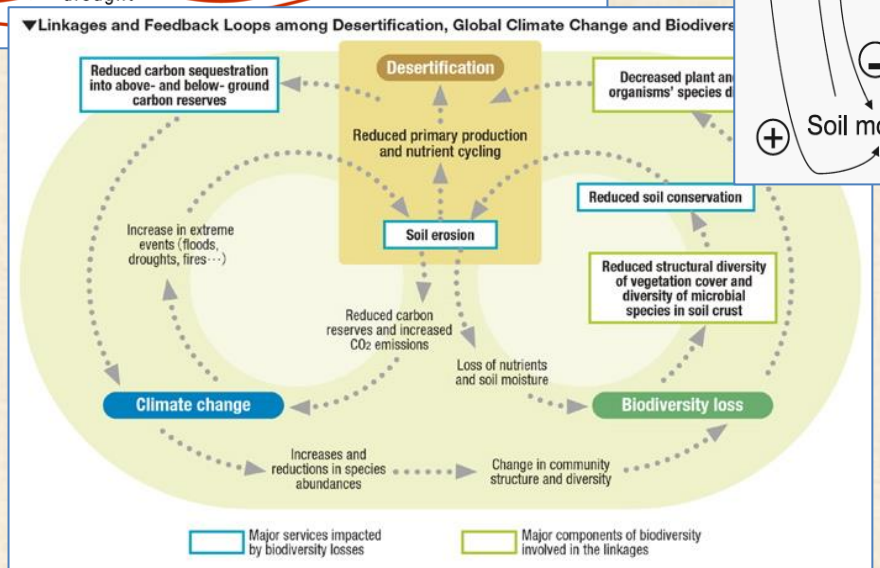
The linkages and feedback loops between desertification/land degradation and climate change are well known but complicated for policy-makers and do not include climate change adaptation

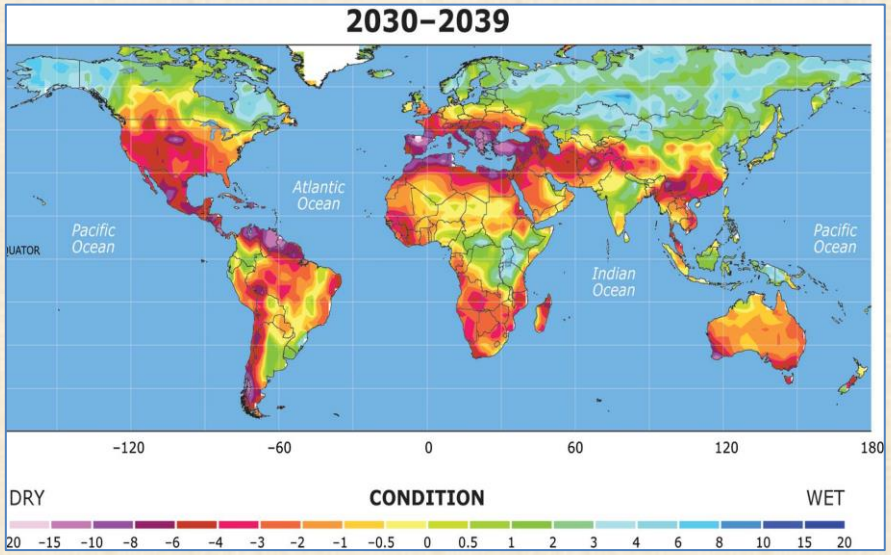


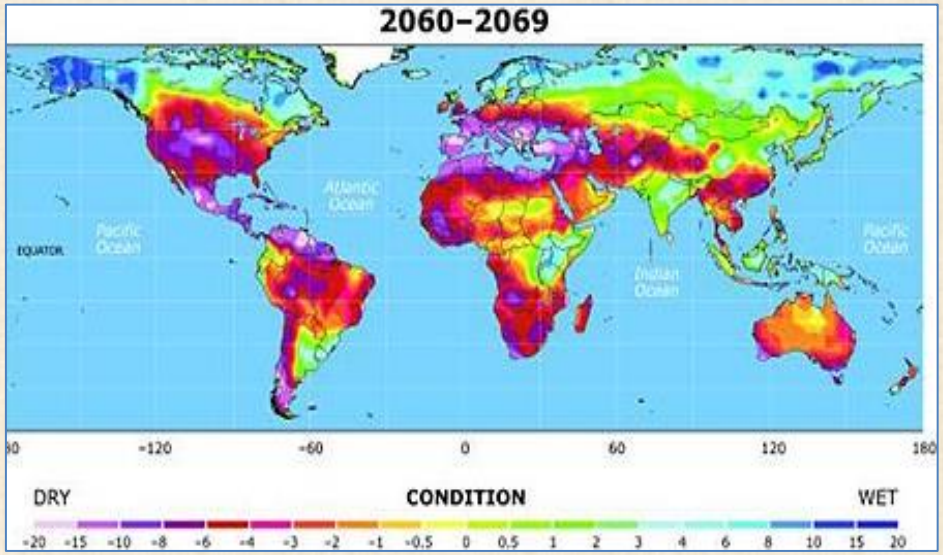
UNEP-GEAS, 2011



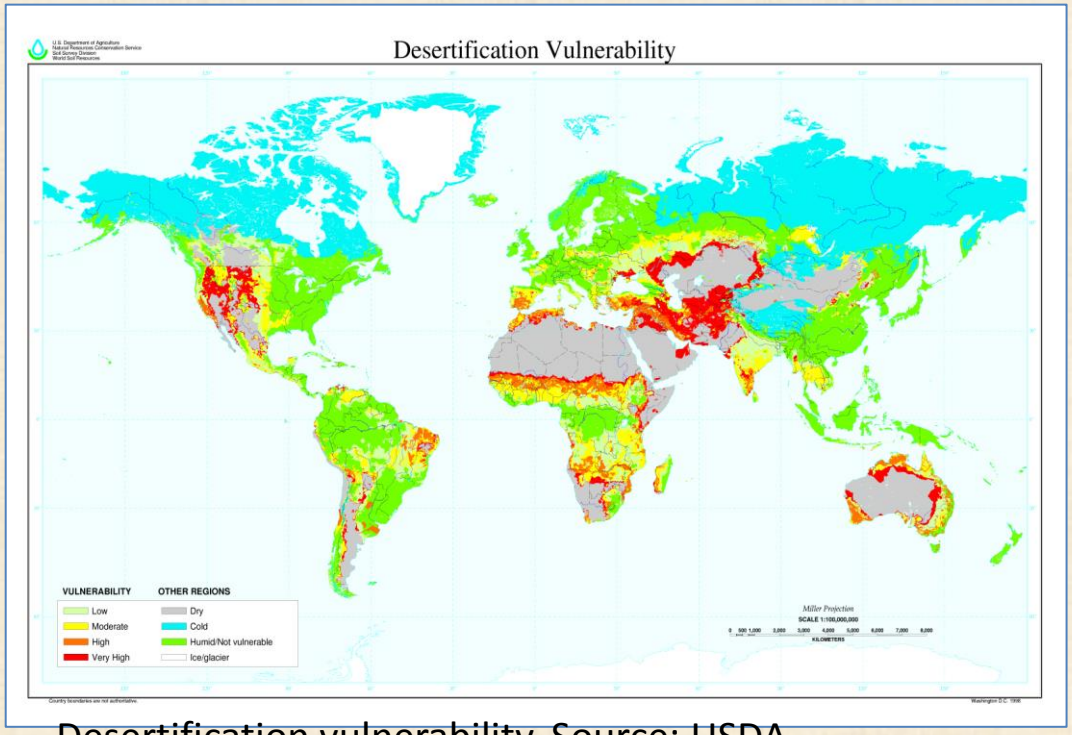
MEA, 2005







Palmer drought severity index. Source: NCAR images, 2006.



Desertification vulnerability. Source: USDA

Sometimes it is easier to predict global response than to make local prognosis, because so-called “models” are not enough accurate, and different levels of assessment need different approaches

Climate change and Adaptation in the light of UNFCCC background

UNFCCC text. Article 4.

All Parties, taking into account their common but differentiated responsibilities and their specific national and regional development priorities, objectives and circumstances, shall:

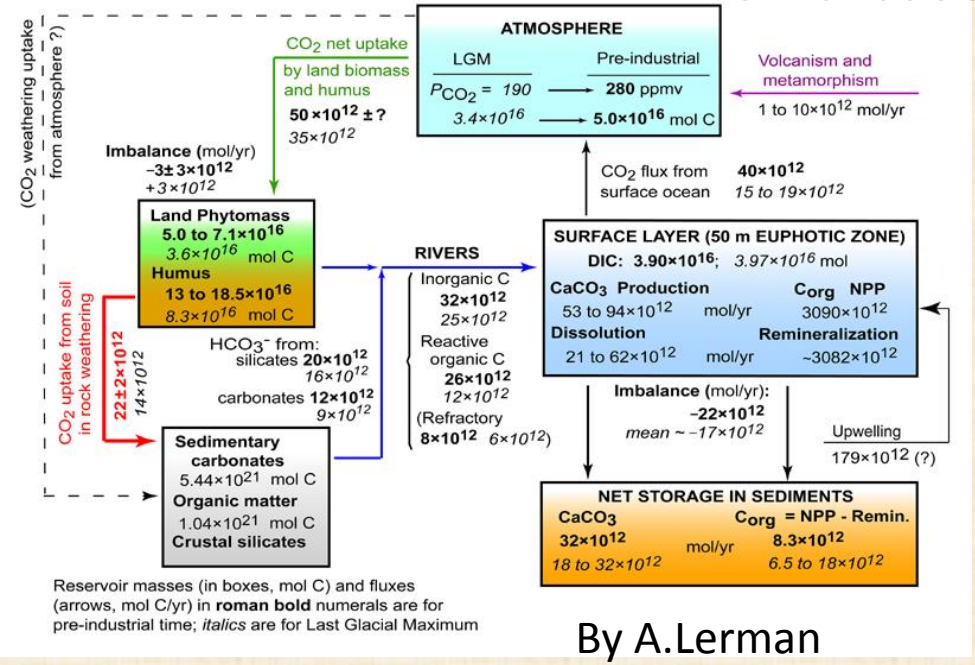
(e) Cooperate in preparing for ***adaptation to the impacts of climate change***; develop and elaborate appropriate and integrated plans for coastal zone management, water resources and agriculture, and for the protection and rehabilitation of areas, particularly in Africa, affected by ***drought and desertification***, as well as floods.

IPCC (2007): ***Adaptation to climate change*** is "An adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities"

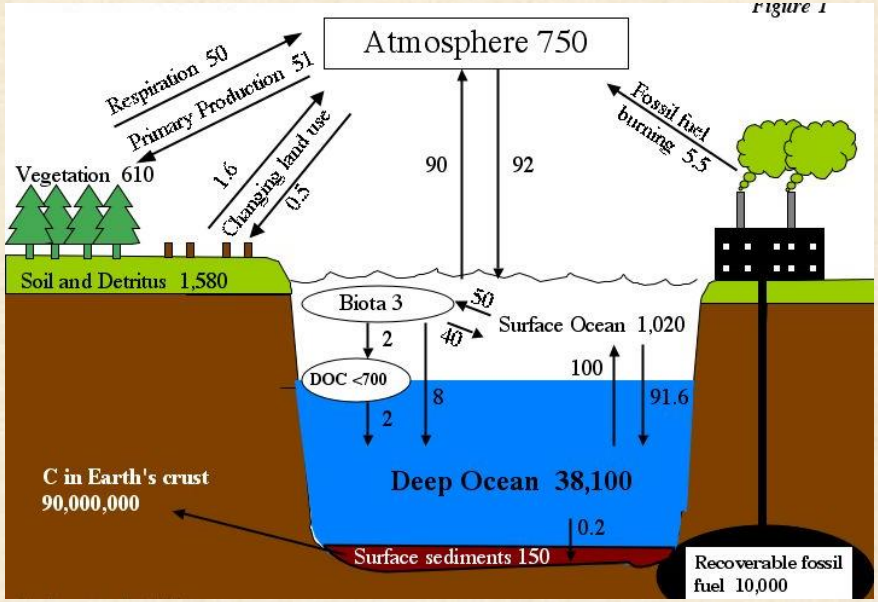
5 general components of adaptation activities :

- Observation of climatic and non-climatic variables; *****
- Assessment of climate impacts and vulnerability; *****
- Planning; **
- Implementation; ***
- Monitoring and evaluation of adaptation actions *

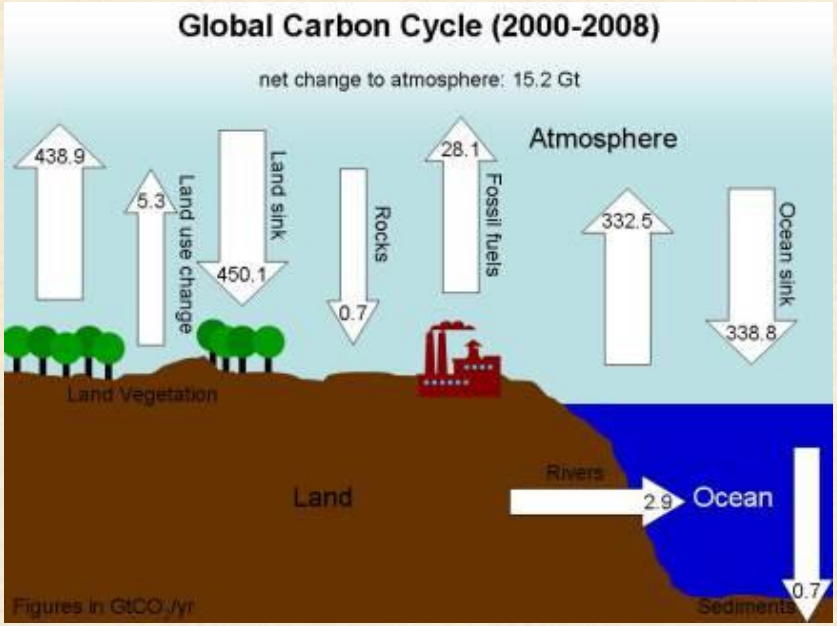
GHG-based approaches



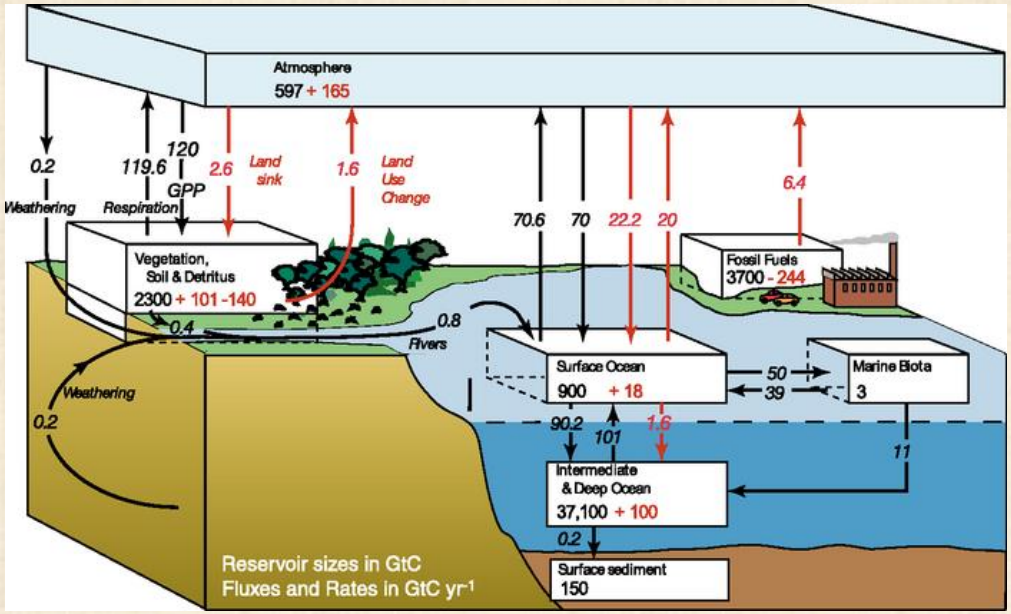
By A.Lerman



Carlson et al., 2001



Wight, 2010



IPCC, 2007

Challenges

1. Human adaptation to climate change is not a well-defined and delimited set of activities (Fussel, 2007, 2012)

2. The climate change adaptation approach mostly concerns with the content of greenhouse gases in the atmosphere.

3. Some more information appeared about carbon in soil and terrestrial biomass. Figures vary!

4. Land related issues are still not in the focus of UNFCCC (upcoming discussion is awaiting in Paris in 2015)

Desertification: the forgotten side of climate change (Miret, 2013)

Conclusion: Although the scientific information about role of terrestrial ecosystems in greenhouse gases is significantly growing during last 10-15 years, the “land-based” climate change adaptation issue did not grow beyond the “GHG” concept.

The Climate Change concept is # 1 among the concepts of the "changing world": does it make sense?

Other approaches/paradigms related to CC and LD

- Sustainable livelihoods/wellbeing
- Food security
- Disaster risk reduction (DDR)
- Ecosystem services
- Environmental/ecosystems health

Land/ Ecosystem level:
manifesting locally with global spread

The question is:
"Should climate change adaptation be considered as global or local issue"?

The answer could be:
"GHG" approach provides global solution, and "land" approach provides local solution covering other "locally manifesting" issues of global importance to serve as a central concept among those.

Questions again:

What can science provide?

What do we have already from the DLDD knowledge base?

We have: 1) Land degradation/Desertification: evolving concept

The desertification concept actually pull out the issue of global land degradation although the last is wider than just a loss of productivity and complexity in drylands:

«Narrow» UNCCD vision (early 90-s): desertification = land degradation in drylands.

“Land degradation" means reduction or loss, *in arid, semi-arid and dry sub-humid areas*, of the biological or economic productivity and complexity …;

«Medium» GEF definition (early 2000-s): land degradation is “*any form of deterioration of the natural potential of land* that affects ecosystem integrity either in terms of reducing its sustainable ecological productivity or in terms of its native biological richness and maintenance of resilience”

«Wide» concept of DLDD (early 2010-s): Desertification, land degradation and drought as a global issue (General Assembly resolution 65/160, UNCCD COP 10)

We have: 2) Drivers of the LD:

Although there is a big scientific progress in the LD assessment, the issue of the drivers of LD in the context of the climate change is still important. There is no theory but very few sketchy and fragmentary scientific studies to show the role of the factors of climate dynamics acting in a synergy with other common LD drivers, such as:

- unsustainable agricultural practices,
- soil erosion,
- overgrazing,
- deforestation,
- policy changes
- etc.

We have: 3) Knowledge about interrelations between LD, BD, CC, DRR (disaster risk reduction) issues

Examples of Land management and Climate change nexus

- Aridization of terrains
- Edaphic (soil) droughts
- Surface Albedo (Charney effect)
- Erosion, including gullies, mudflows and landslides
- Floods and bogging
- Environmental services
- Soil fertility and ecosystem bioproductivity
- Chemical toxicity and contamination
- GHG emissions
- Soil and peat organic matter
- etc

We have: 4) SLM as an evolving key approach

Land management is the process by which the resources of land are put to good effect. It covers all activities concerned with the management of land as a resource both from an environmental and from an economic perspective (UNECE, 1996).

The GEF mandate to combat land degradation focuses on sustainable land management (SLM) as it relates primarily to desertification and deforestation (as a result of unsustainable practices (GEF, 2003).

SLM is a knowledge-based procedure that helps integrate land, water, biodiversity and environmental management (including input and output externalities) to meet rising food and fiber demands while sustaining ecosystem services and livelihoods (World Bank, 2005).

SLM has been recognized as a key investment area for strengthening resilience to the impacts of climate change under the Pilot Programme for Climate Resilience (PPCR), paving the way for the integration of SLM into core development planning and implementation (PPCR, 2009).

In parallel: Ecosystem based approach/adaptation (EbA).

UNCBD/IUCN origin. Endorsed by the World Summit on Sustainable Development in 2002

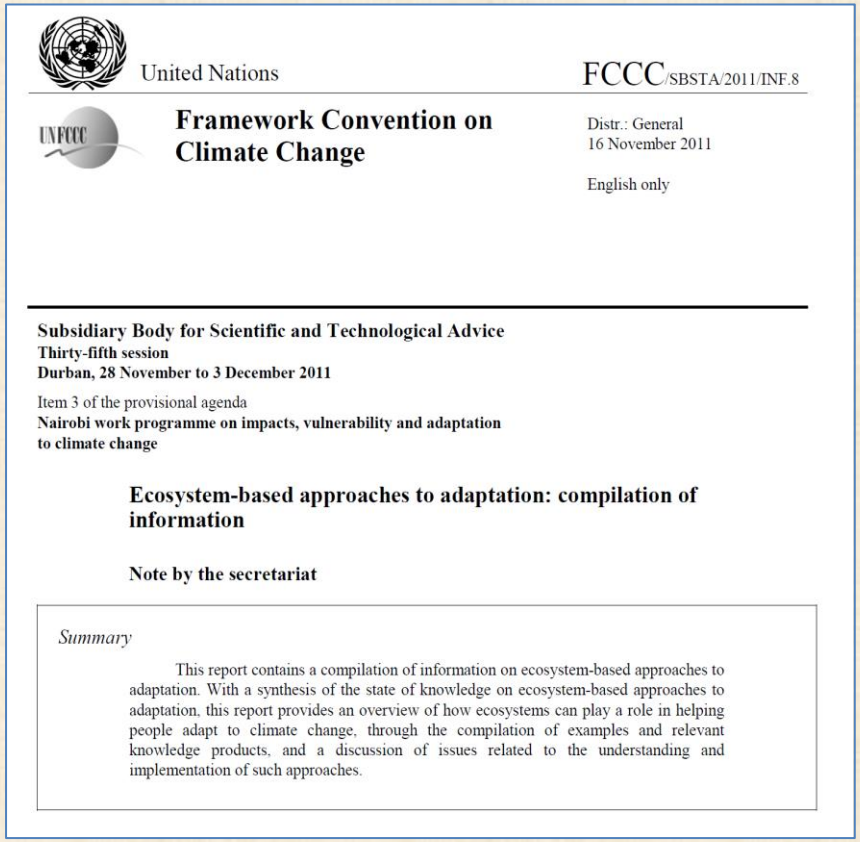
The ecosystem approach is a strategy for the integrated management of land, water, and living resources that promote conservation and sustainable use in an equitable way (UNCBD).

Ecosystem principles particularly relevant to EA fall into four main categories:

1. Maintaining ecosystem services by conserving ecosystem structure and functioning, recognising that ecosystems have limits, undergo change and are interconnected
2. Using appropriate time and spatial scales
3. Ensuring participatory decision-making and decentralised, flexible management; and
4. Using information from all sources including traditional, local and scientific information.

Recognition by FCCC (2011):

Ecosystem-based approaches to adaptation: compilation of information



United Nations

FCCC/SBSTA/2011/INF.8

UNFCCC

Framework Convention on Climate Change

Distr.: General
16 November 2011

English only

Subsidiary Body for Scientific and Technological Advice
Thirty-fifth session
Durban, 28 November to 3 December 2011

Item 3 of the provisional agenda
Nairobi work programme on impacts, vulnerability and adaptation to climate change

Ecosystem-based approaches to adaptation: compilation of information

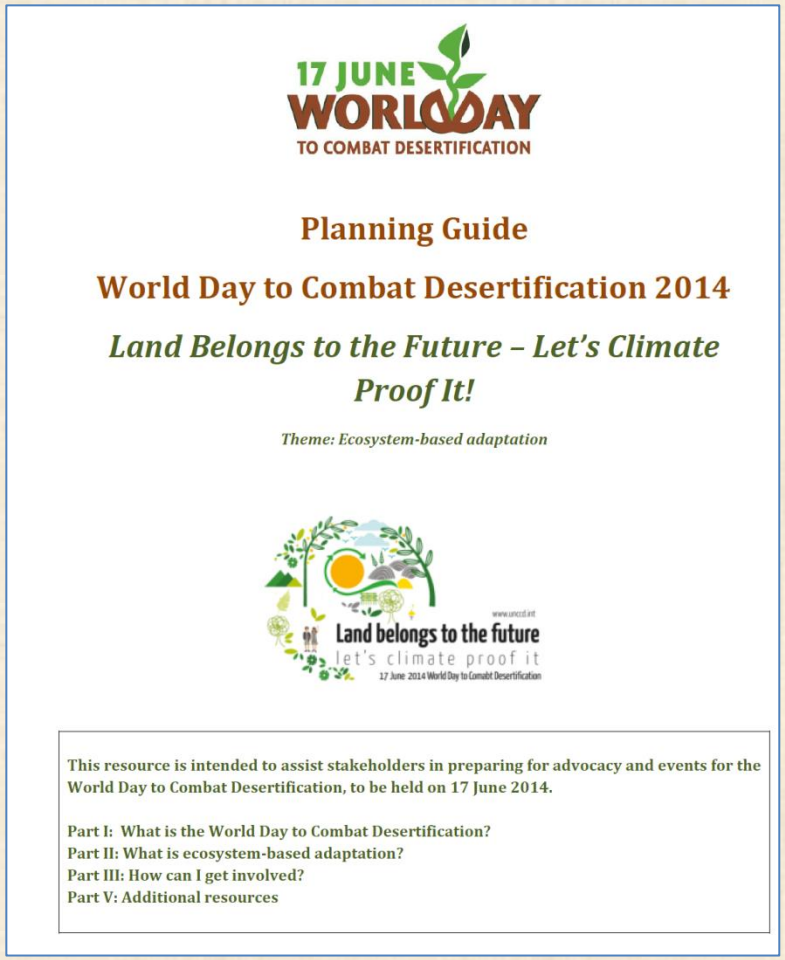
Note by the secretariat

Summary

This report contains a compilation of information on ecosystem-based approaches to adaptation. With a synthesis of the state of knowledge on ecosystem-based approaches to adaptation, this report provides an overview of how ecosystems can play a role in helping people adapt to climate change, through the compilation of examples and relevant knowledge products, and a discussion of issues related to the understanding and implementation of such approaches.

Recognition by CCD (2014):

Theme: Ecosystem-based adaptation



17 JUNE WORLD DAY TO COMBAT DESERTIFICATION

Planning Guide

World Day to Combat Desertification 2014

Land Belongs to the Future – Let's Climate Proof It!

Theme: Ecosystem-based adaptation

Land belongs to the future
let's climate proof it
17 June 2014 World Day to Combat Desertification

This resource is intended to assist stakeholders in preparing for advocacy and events for the World Day to Combat Desertification, to be held on 17 June 2014.

Part I: What is the World Day to Combat Desertification?
Part II: What is ecosystem-based adaptation?
Part III: How can I get involved?
Part V: Additional resources

SLM and EbA – what is the difference?
Specific concepts or repackage?

-Practices

-Approaches

-Benefits

EbA practices, activities, measures, strategies (UNCCD, 2014, adapted from IUCN).

- ***Sustainable water management***, where river basins, aquifers, flood plains and their vegetation are managed to provide water storage and flood regulation
- ***Disaster risk reduction***, where restoration of coastal habitats such as mangroves can be effective against storm surges, saline intrusion and coastal erosion
- ***Sustainable management of grasslands and rangelands***, to enhance pastoral livelihoods and increase resilience to drought and flooding
- Establishment of ***diverse agricultural systems***, incorporating indigenous knowledge, and maintaining genetic diversity of crops and livestock
- Strategic ***management of shrublands and forests*** to limit size and frequency of uncontrolled forest fires
- Establishing and effectively managing ***protected areas systems*** to ensure the continued delivery of ecosystem services that increase resilience to climate change.

EbA benefits

UNCCD: Examples

- Erosion prevention
- Soil health
- Drought prevention
- Regeneration of natural resources
- Food security
- Habitat
- Preservation of genetic materials
- Water security
- Barriers to disaster
- Conservation of biodiversity
- Empowerment of the rural poor
- Incorporation of indigenous knowledge
- Holistic approaches to development, non-siloed approach

IUCN/WWF/WB/UNFCCC: Examples

- Livelihood sustenance and food security
- Sustainable water management
- Disaster risk reduction
- Co-benefits for Climate change Mitigation
- Cost effective and Pro-poor
- Complementary to other initiatives
- Wide Applicability
- Multi-sectoral and Multi-scale in nature

Linkage between EbA and CbA.

EBA concept is fast growing, but there is probably no concept more confusing or misunderstood. The brief overview of the scientific literature and dufferent projects also show that the current EbA practices still have a careen towards biodiversity and conservation related interventions

Many conservationists believe that EbA exists to help species, biodiversity, and ecosystems just like CbA (community cased adaptation) helps people. Environmentalists often cite the potential of the EbA. Development practitioners similarly promote community-based approaches (CbA).

There are differences between EbA and CbA, but both have *the end goal of increasing the ability of vulnerable people to adapt to CC, and ecosystems and their services are already the foundation of many adaptation strategies:* an approach that joins together both is needed (IIED, 2014).

Need for the Integrated Climate Change Adaptation = SLM?

Objectives of integrated climate change adaptation:

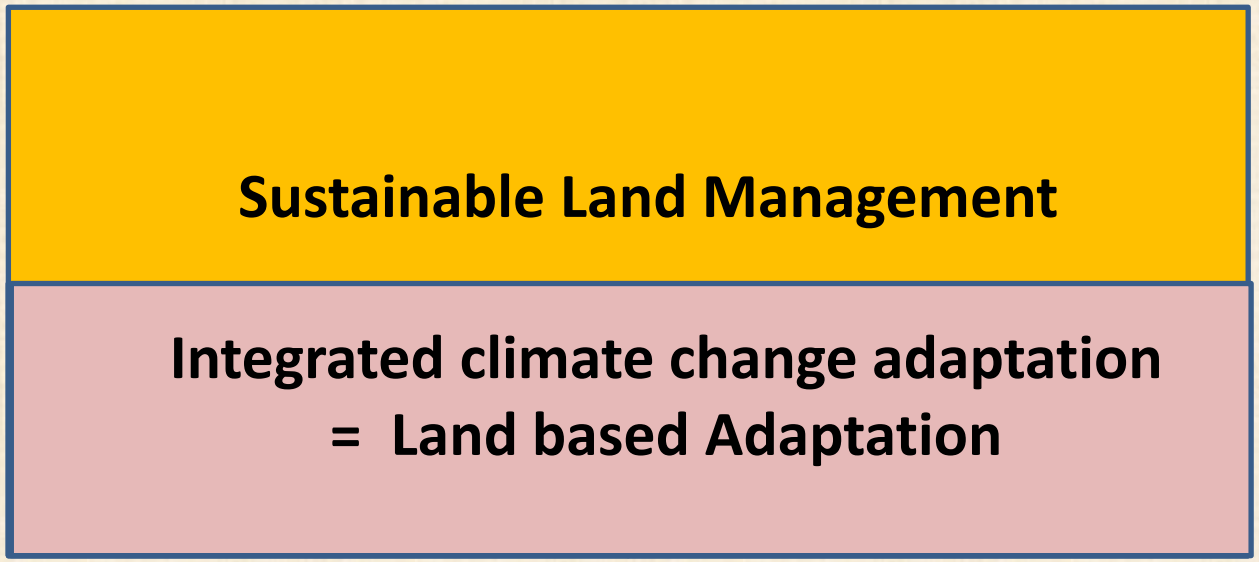
- To promote the resilience of livelihoods;
- To reduce the impacts of natural disasters such as storms and floods, on vulnerable people and ecosystems;
- To build the capacity of civil society and government institutions to support integrated approaches to adaptation;
- To increase awareness of the underlying causes of vulnerability (degraded ecosystems, poor governance, unequal access to resources and services, discrimination and other social injustices);
- To promote the sustainable management and biodiversity conservation to maintain the benefits provided by ecosystems .

Provisional conclusion: SLM as an adaptation strategy.

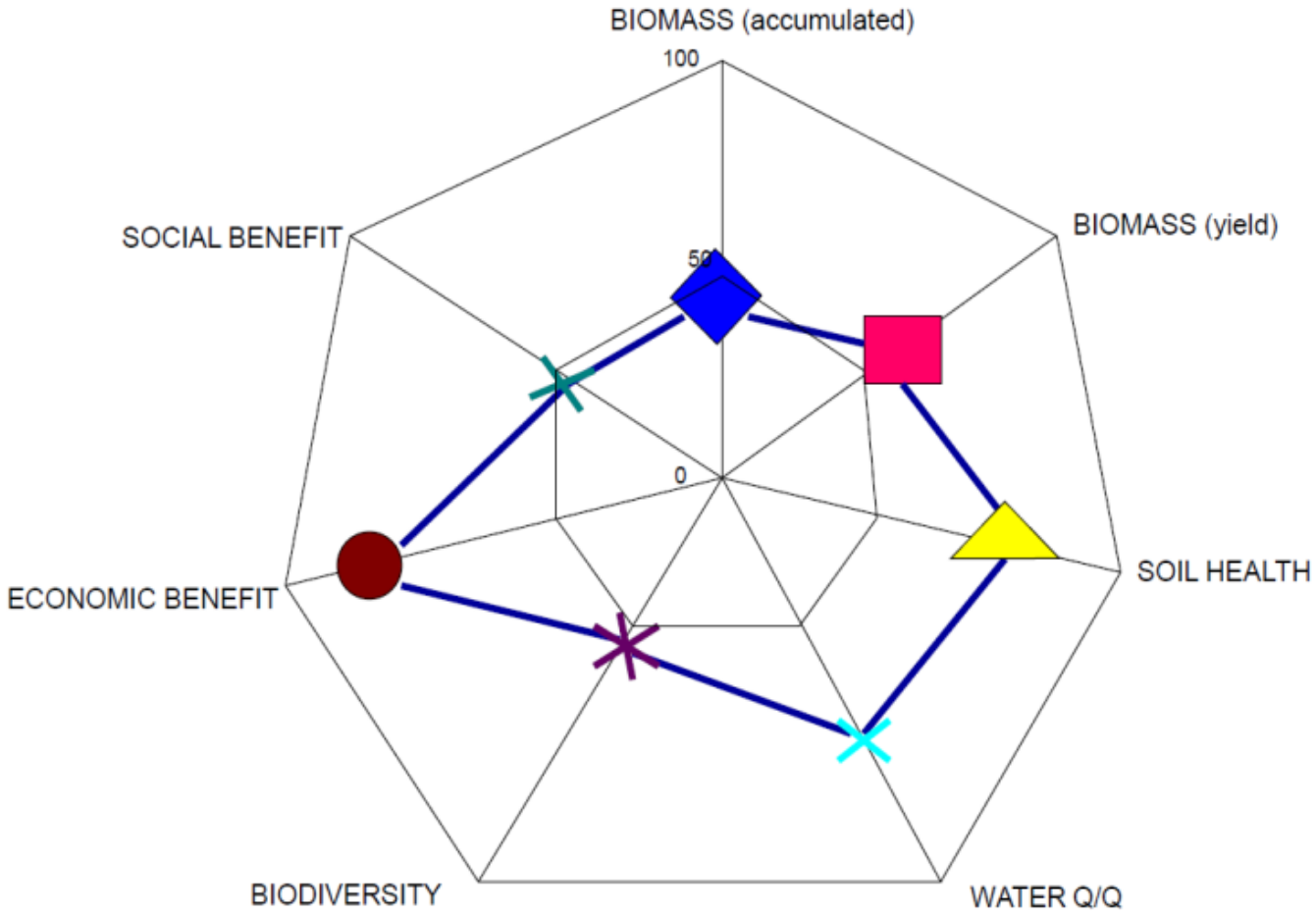
Land based adaptation (LbA) = EbA + CbA

UNCCD: Ecosystems are complex and interconnected. They are naturally adaptable and resilient - up to a point. When ecosystems are ***healthy***, they can better adjust to the effects of climate change and related disasters. Sustainably-managed ecosystems reduce the vulnerability / increase resilience of people to CC impacts and hazards

WOCAT: SLM as the better thinking than DLD: bad news -> good news



How to calculate Land-based adaptation -> calculate SLM?



Source: Akhtar-Schuster et al., 2009

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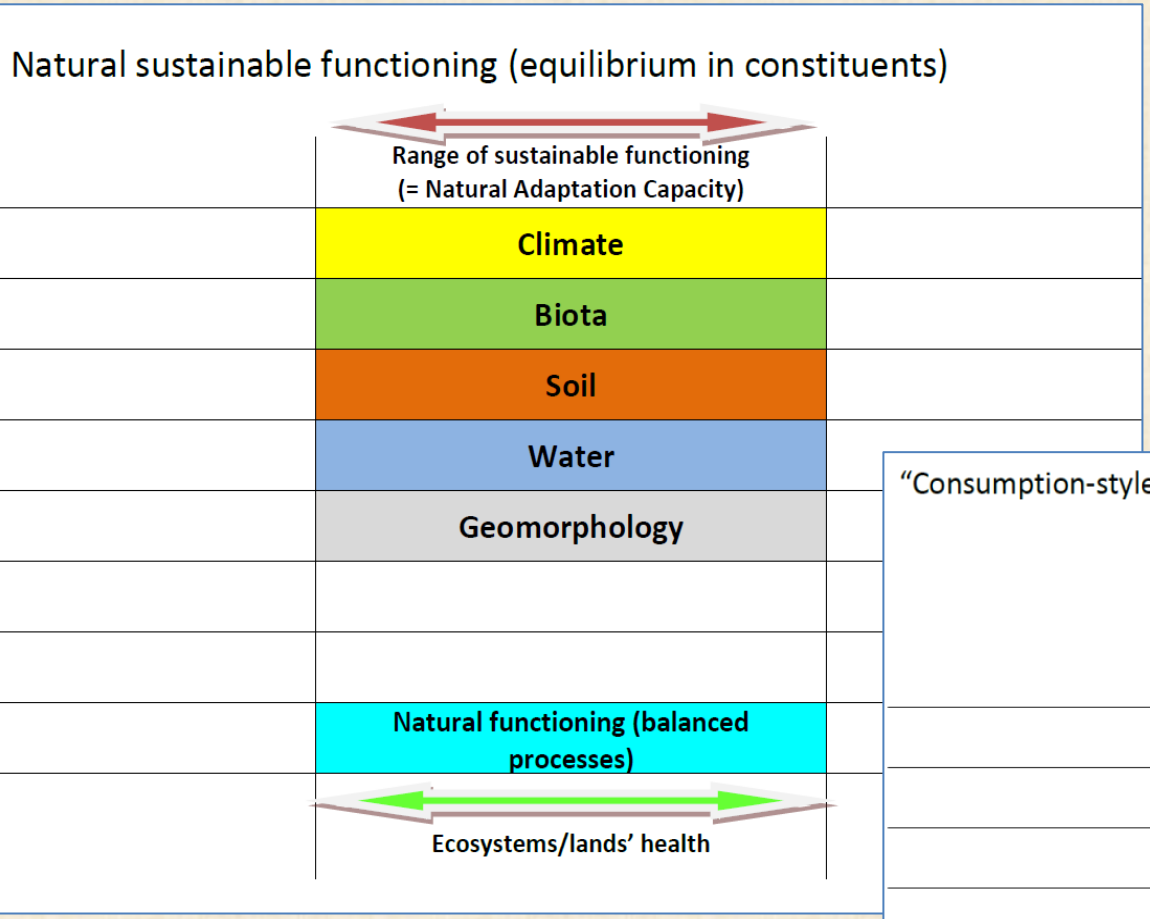

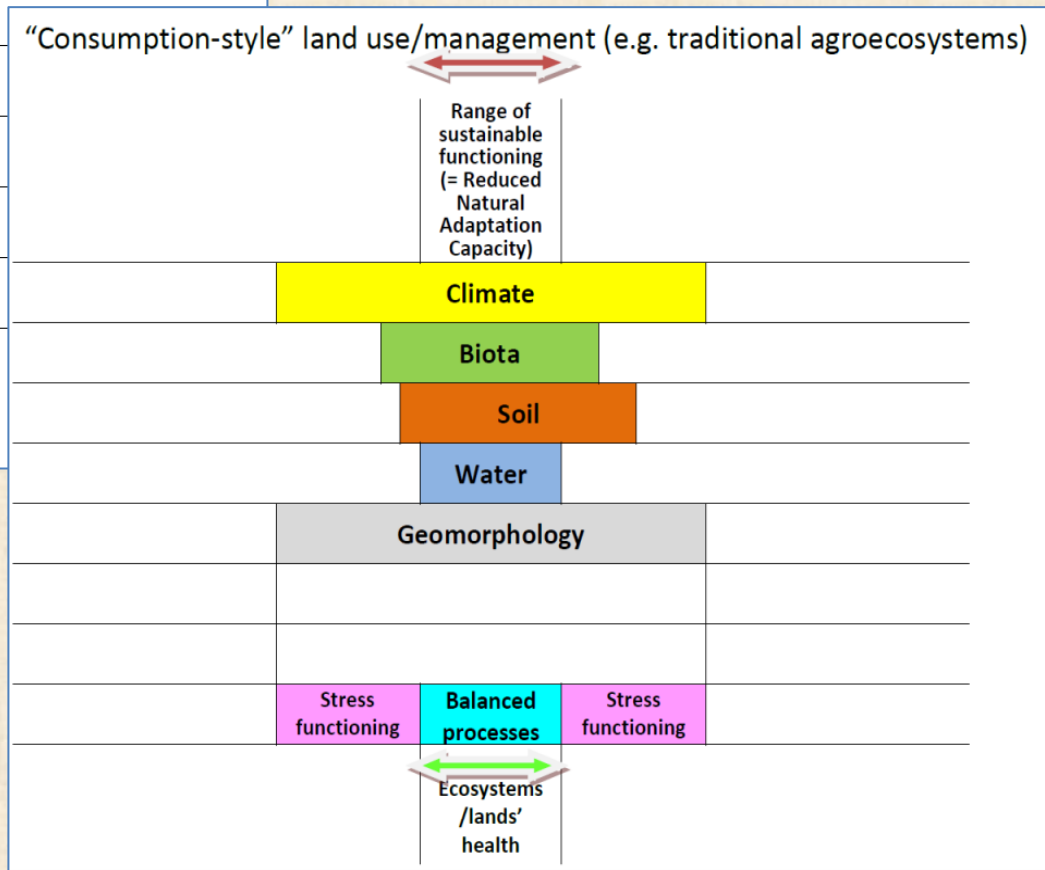

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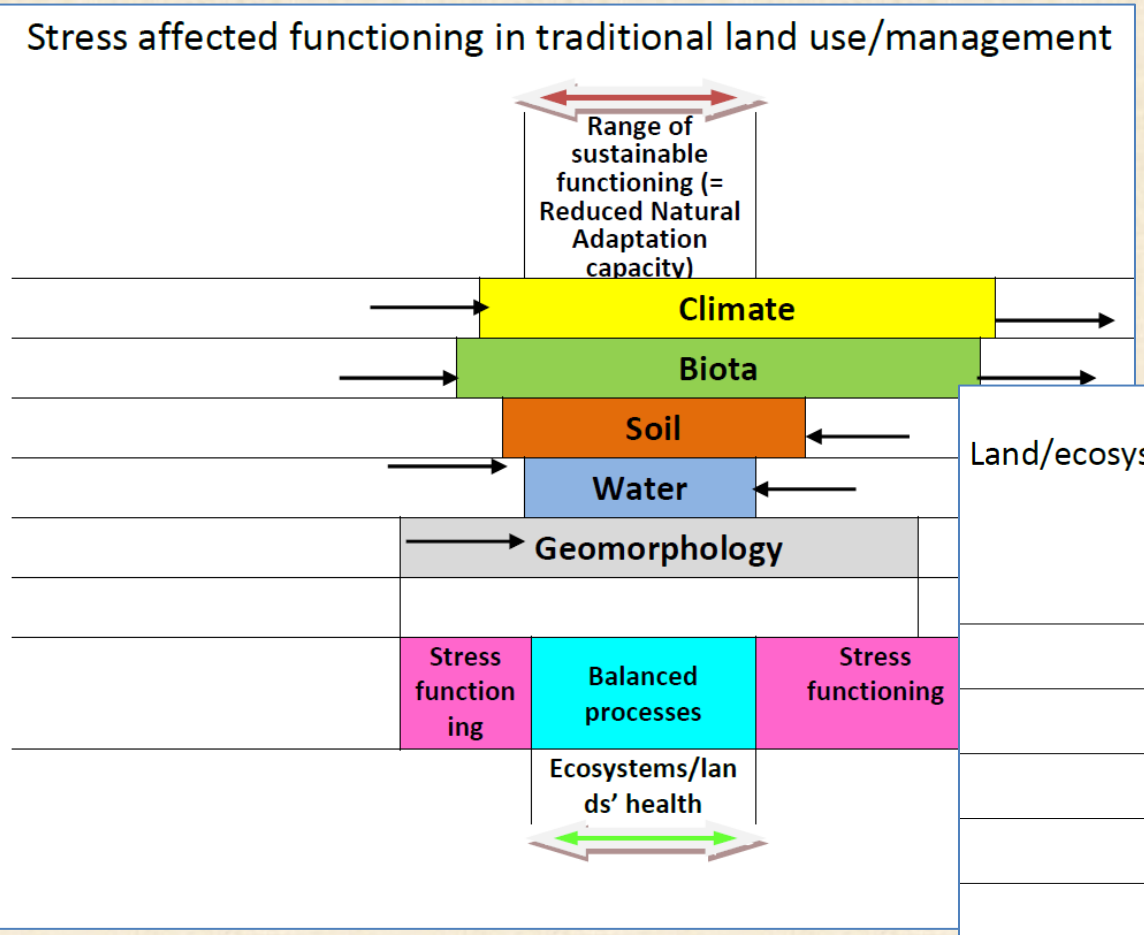

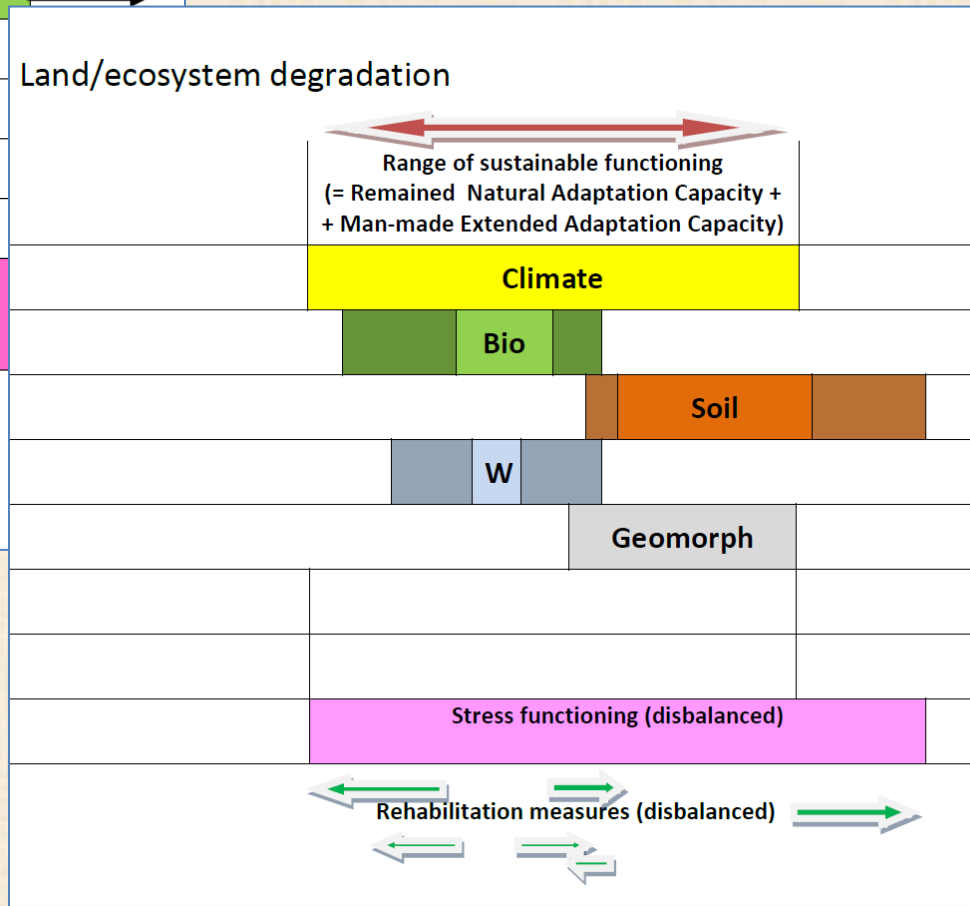

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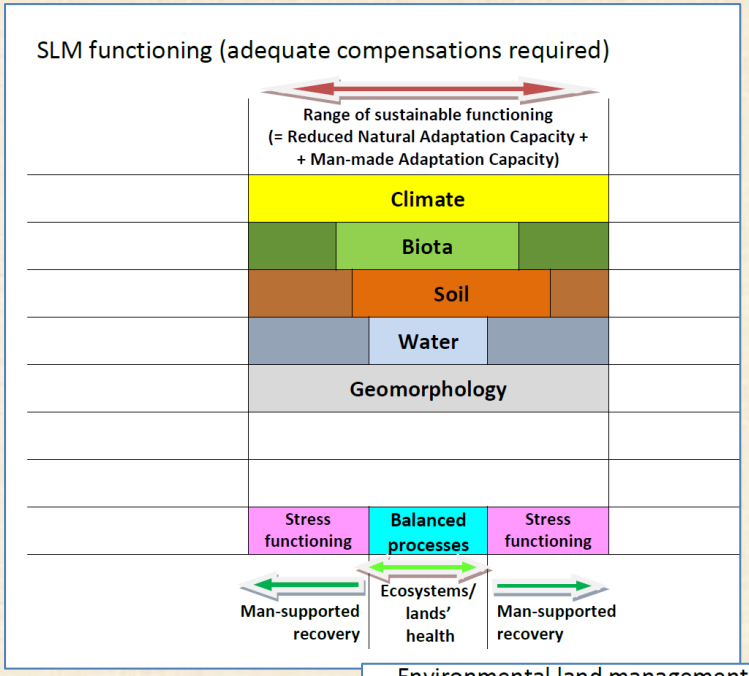

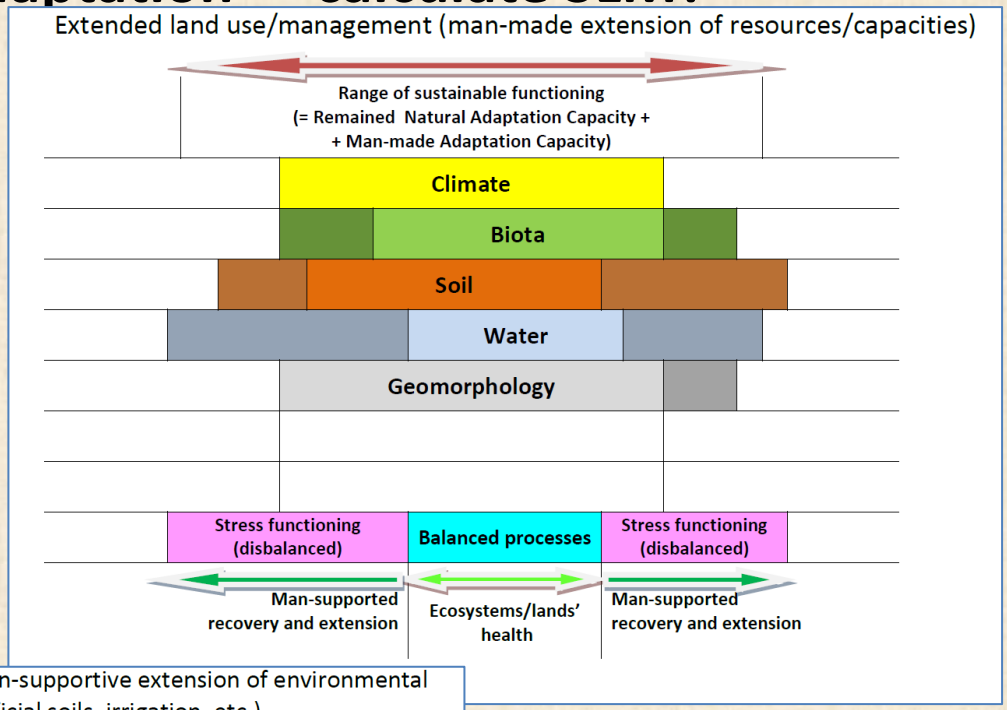

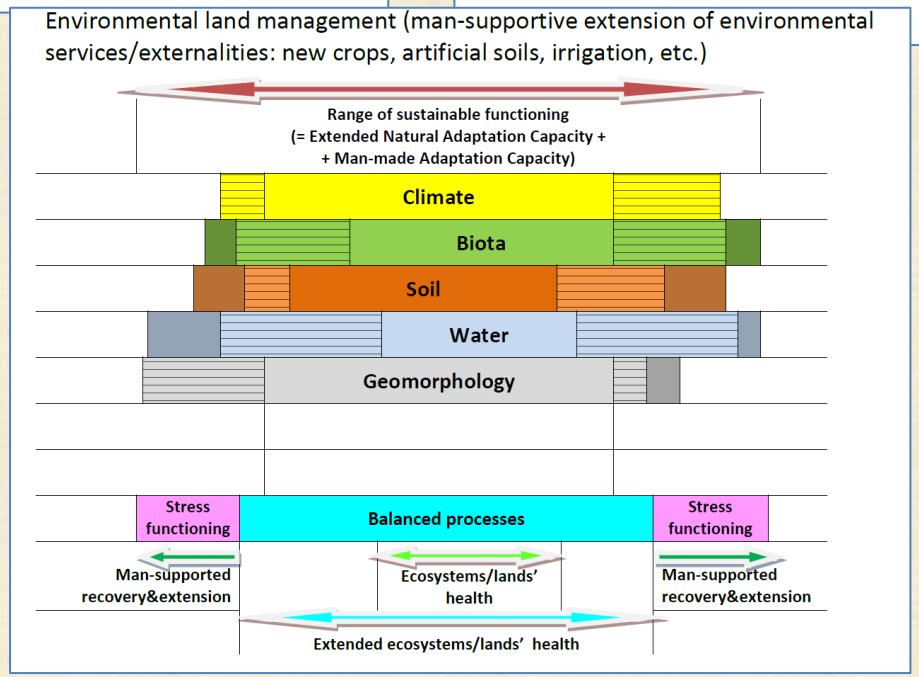

Possible Solutions and Suggestions: what science do we need?

Long list of 15 points (all discussed above)


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Спасибо