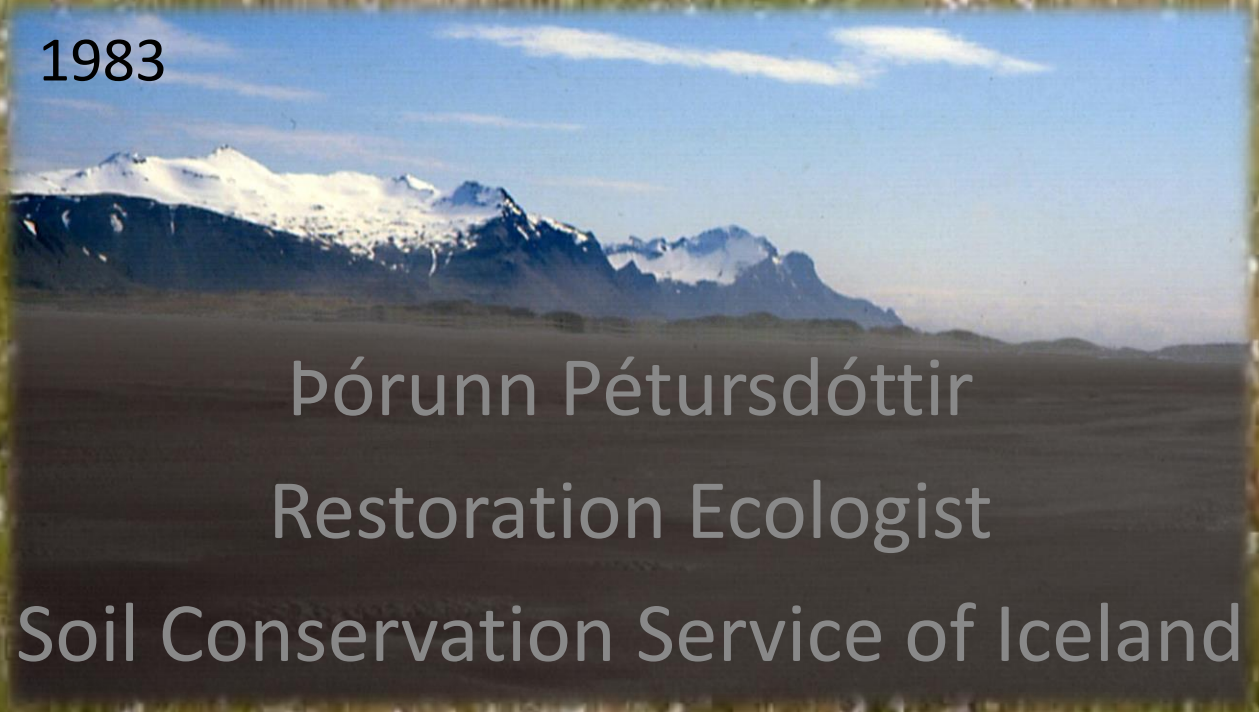
Capacity-Building Workshop for Europe on ecosystem conservation and restoration to support achievements of the Aichi Biodiversity Targets, 2 to 6 June, Isle of Vilm, Germany

2001

Identifying drivers of land use change and type of degradation

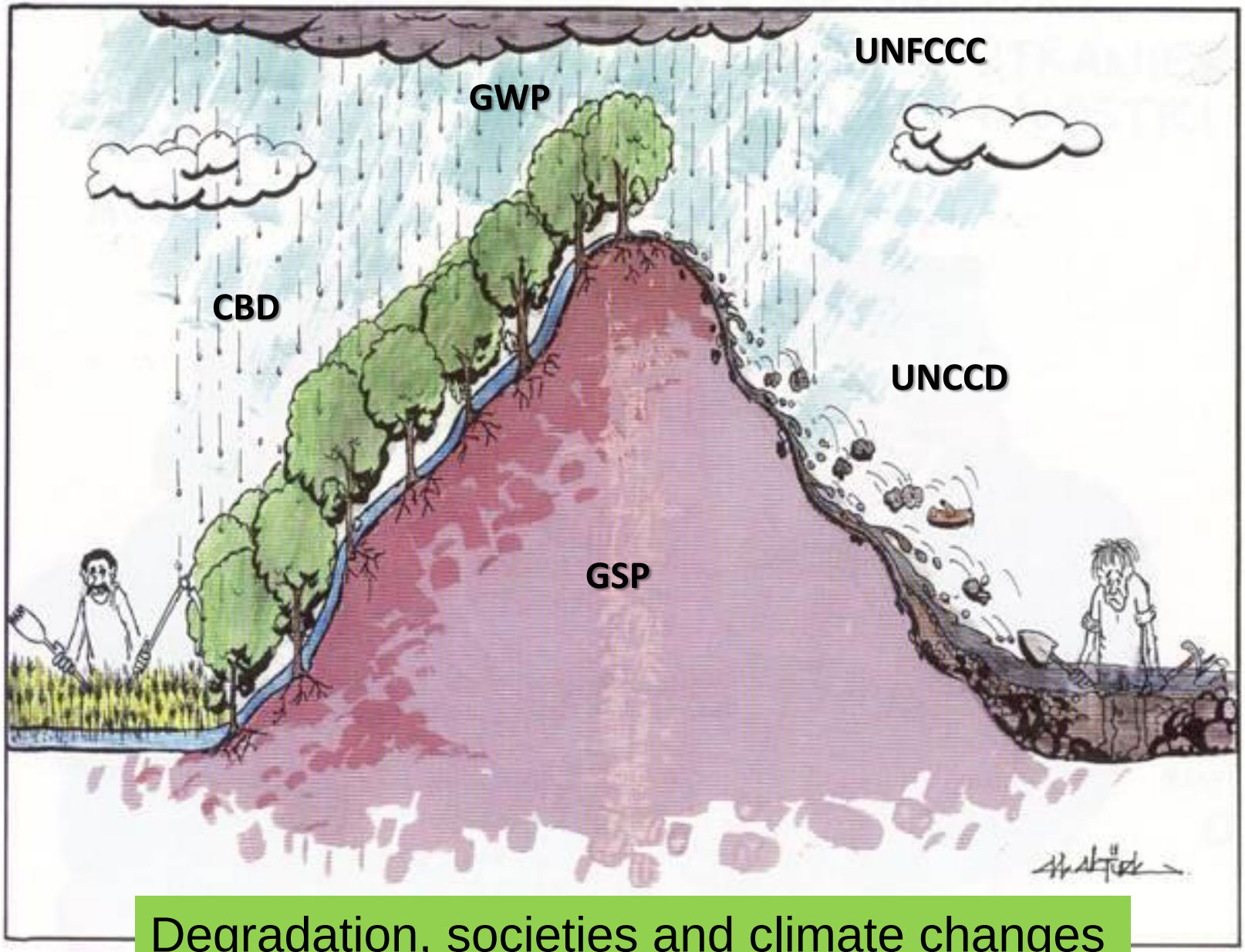


Þórunn Pétursdóttir

Restoration Ecologist

Soil Conservation Service of Iceland

Supported with materal from colleagues in COST ES 1104 – Arid land degradation and restoration



Degradation, societies and climate changes

Resilience-based management

Key Concepts:

–Resistance
–Resilience

"Resistance is the capacity of ecological processes to continue to function with minimal change following a disturbance.

Resilience is the capacity of these processes to recover following a disturbance (see Figure).

Resilience can be defined in terms of the rate of recovery, the extent of recovery during a particular period of time, or both."

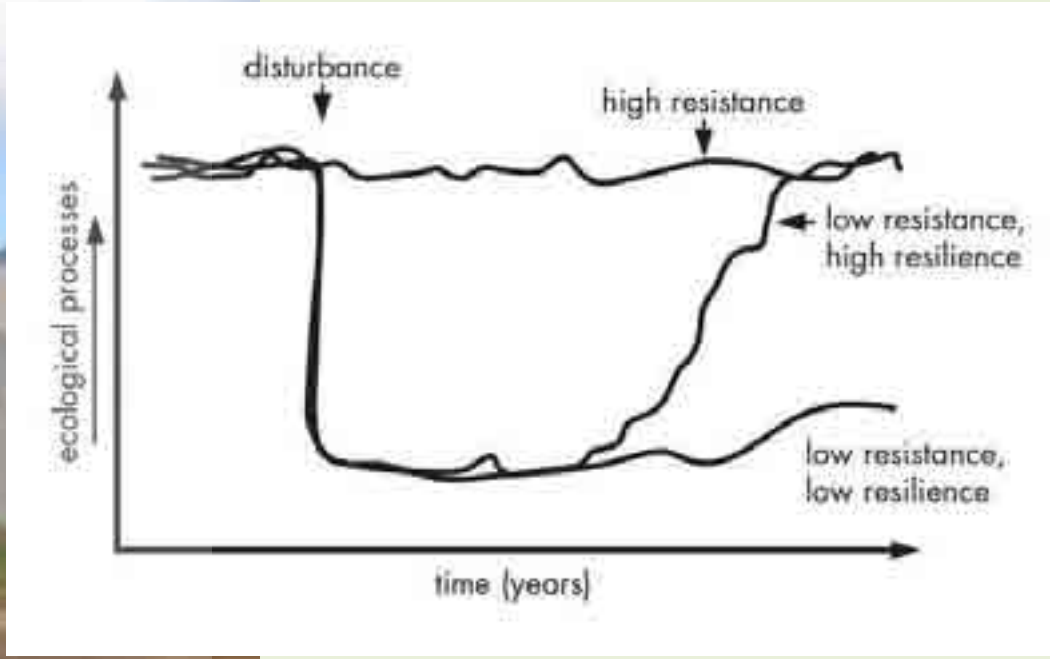
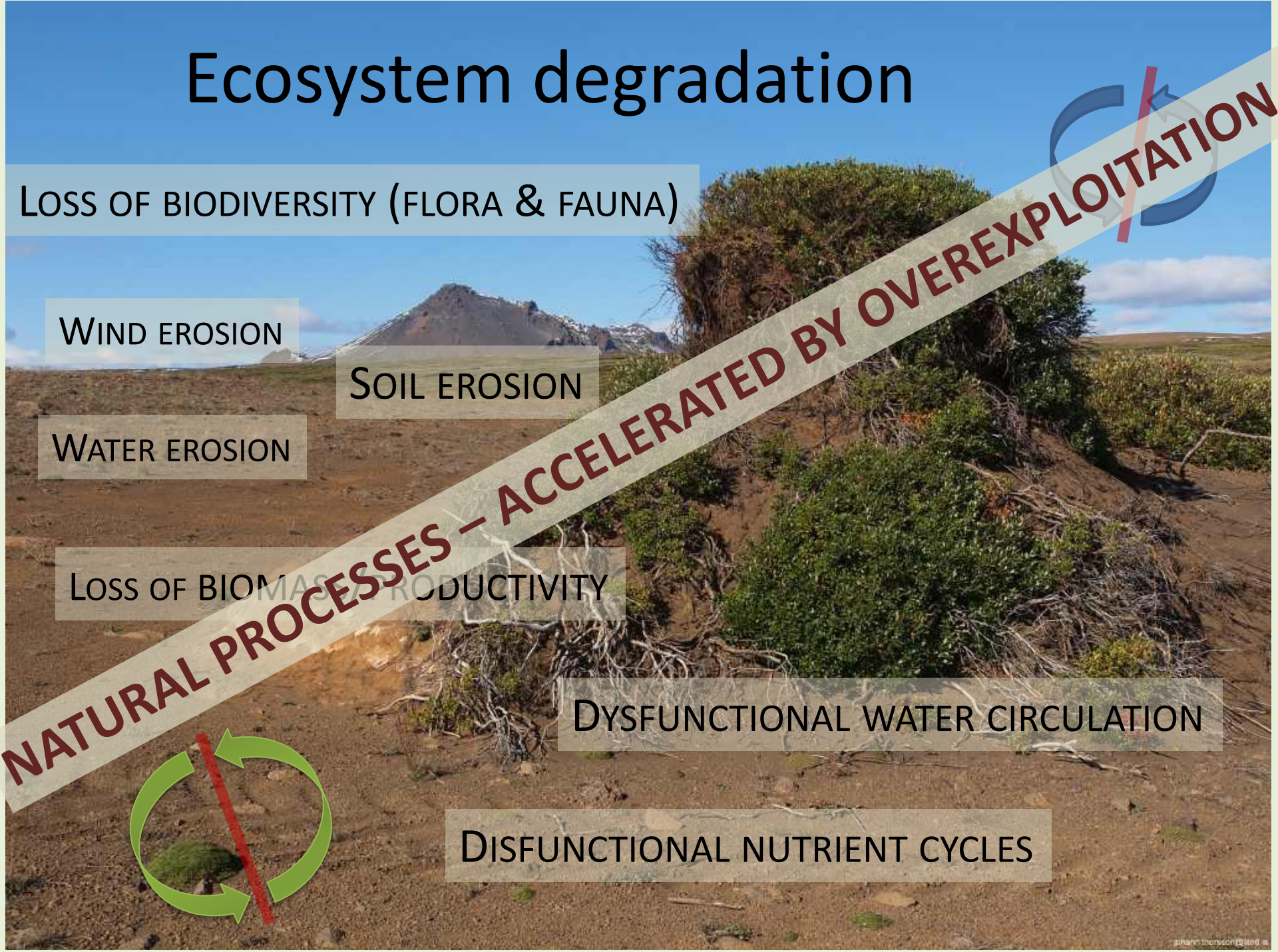


Figure 1. Changes in ecological processes over time following disturbance for systems that vary in resistance and resilience (adapted from Seybold et al. 1999)

Pellant et al. (2005)

Ecosystem degradation



Collapsed ecosystems: A universal challenge

Iceland

Niger

BROKEN ENVIRONMENTAL CYCLES

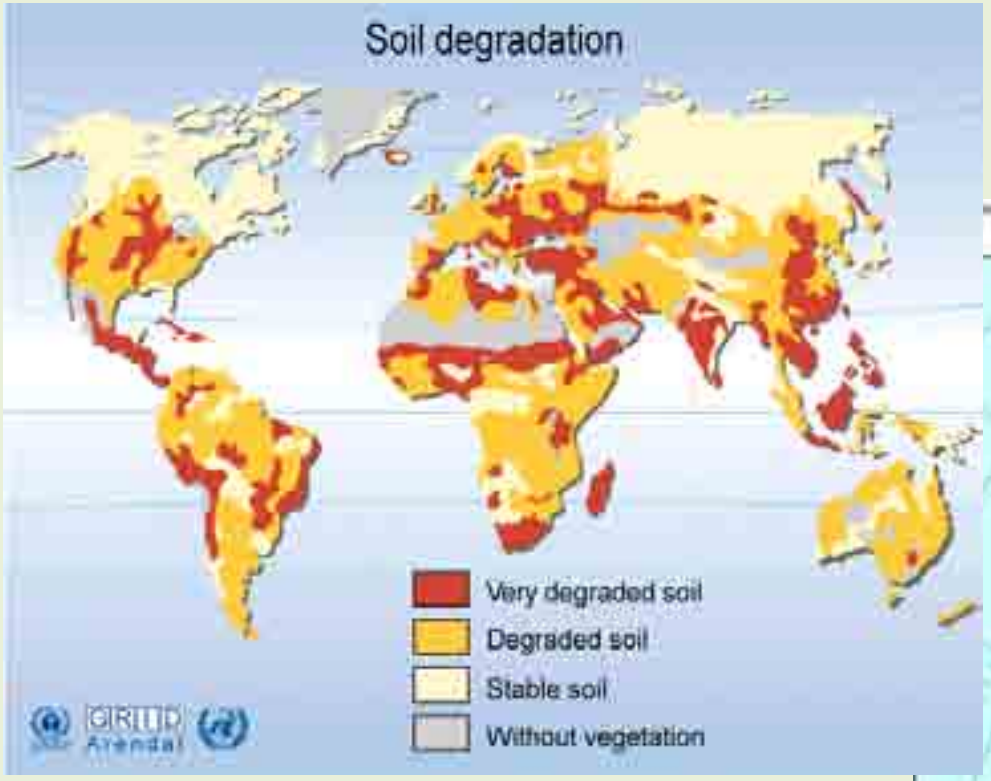
Limited photosynthesis

Limited carbon stock

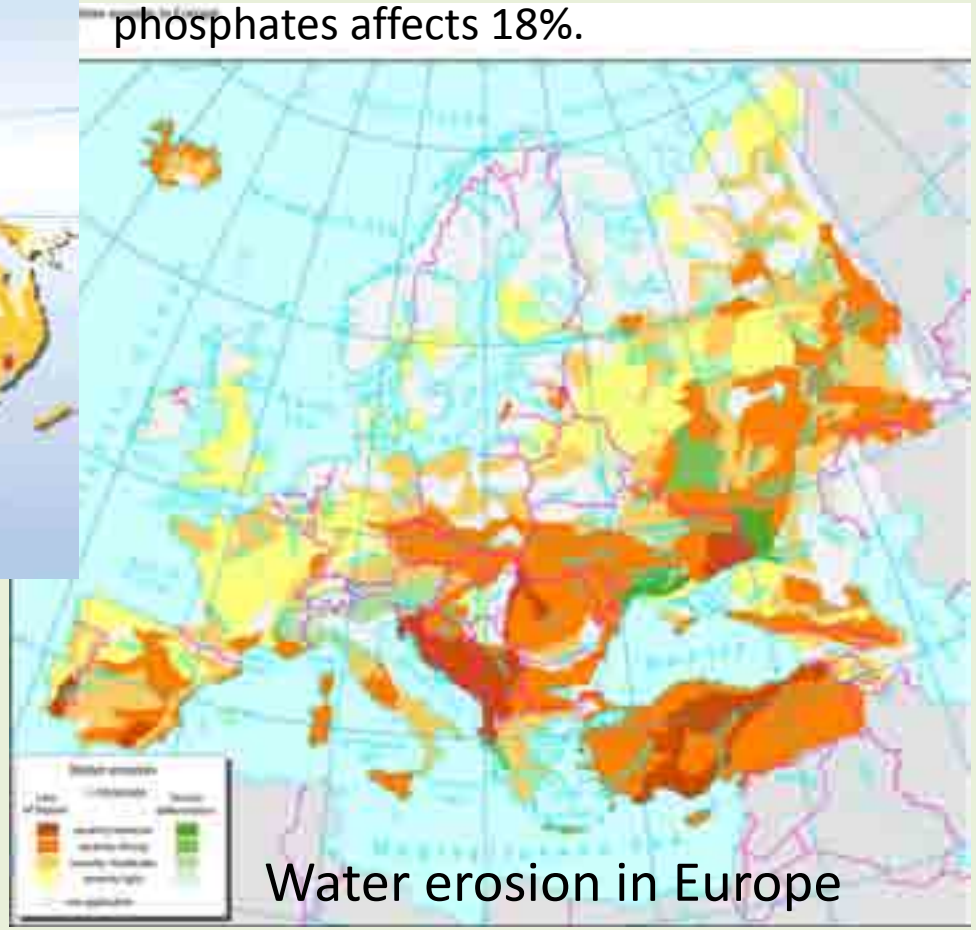
Lack of water supplies

Lack of available nutrients

Ecosystem degradation



Erosion by water and wind estimated to affect 16% of European land
Contamination by pesticides affects 19%
Excess application of nitrates and phosphates affects 18%.



Water erosion in Europe

"Global assessments of land degradation estimate 15% of the world's total land area shows evidence of damage, mainly a consequence of erosion, nutrient loss, salinization and physical compaction. "

EU REPOSRT: IP/A/ENVI/FWC/2006-172/LOT1/C1/SC20

Drivers of land use change in Rumenia

Categories of drivers:

Anthropogenic such as:

- Political drivers (communist period and post-communist period)
- Economic drivers
- Technological drivers
- Demographic drivers

Natural such as:

- Erosion processes
- Floods ...

Source: Dr Rares Halbec, Timisoara, Romania

Drivers of land use change

- Global trade liberalization
- poor forestland management
- fragmentation of arable lands
- Abandoned or destroyed irrigation and drainage systems
- Suburbanization
- the shrink of natural and chemical fertilizers
- the use of inadequate agricultural practice
- transnational migration

Climatic changes (increased air temperature, decreased precipitation, the extended aridity and drought phenomena)

Drivers of land use changes in Spain

Anthropogenic factors key triggers…

Socio-economic drivers both in rural and urban settings (the latter frequently overlooked in national initiatives and int. fora)

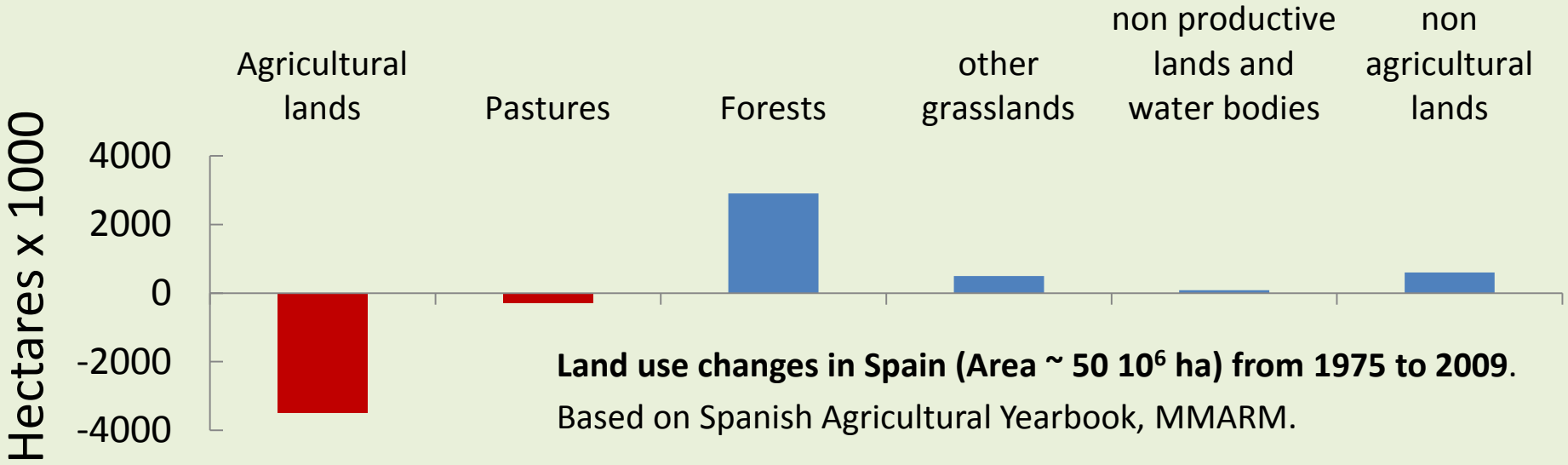
The release of agricultural land (marginal or not) has been matched by socioeconomic and policy contexts

= an unprecedented urbanization leading to the loss of ecological functions of land and soil

The low and decreasing profitability of Spanish farming is the single most important push factor. Nevertheless, this and other push factors are dwarfed by the magnitude of some pull drivers like industrialization and more recently, urban development and the increasing demands of a booming tourist sector

Source: Dr Maria José Marqués, Madrid Spain

Land use changes in Spain



Land use changes in Spain (Area ~ 50 10^6 ha) from 1975 to 2009.
Based on Spanish Agricultural Yearbook, MMARM.

DRIVERS

- Declining soil fertility
- Scarcity of water for agricultural uses
- Lack of profitability of farming
- Relative depreciation of agricultural lands
- Promotion of farmland set aside by CAP
- Weak environmental considerations in land use policies
- Rural exodus/Rural-urban migrations

- Priority of water supply to urban and tourist areas
- Profitability of real state and scarcity of alternative investments
- Fast increase of urban land prices
- High salaries of the building and real state sectors
- Growth of urban and touristic areas

Source: Dr Maria José Marqués, Madrid Spain

Main types of ecosystem degradation

- Agricultural mismanagement
- Rangeland degradation
- Deforestation
- Forest degradation
- Soil sealing/urbanization
- Wetland drainage
- River channelization
- Waterlogging
- Soil salinization
- Soil pollution
- Destruction (mining...)
- Tourist trampling

Main processes:

- Water erosion
- Wind erosion
- Frost/thaw cycles...

Over half of Europe's territory maintained by farmers

Ecosystem degradation - Agriculture

Landslide (East Romania)

Active ravine (East Romania)

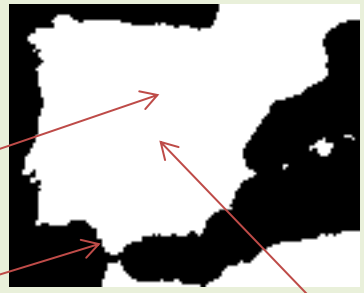
"As one of the most expansive land uses in Europe, agriculture represents a potentially significant source of land degradation"

Land use change (from vineyard to grassland) (East Romania)

Watermelon from Romania's Sahara (South Romania)

Source: Dr Rares Halback

Poor and denuded soils after centuries of agricultural use
Aranda, Burgos, Spain.



Bare soil in a young olive grove
Aranjuez, Madrid, Spain.

Sudden gully erosion due to overgrazing
(*Quercus suber* with exposed roots)
Medina Sidonia, Cadiz, Spain.

Source: Dr Maria José Marqués, Madrid Spain

Cultivation (mis)management

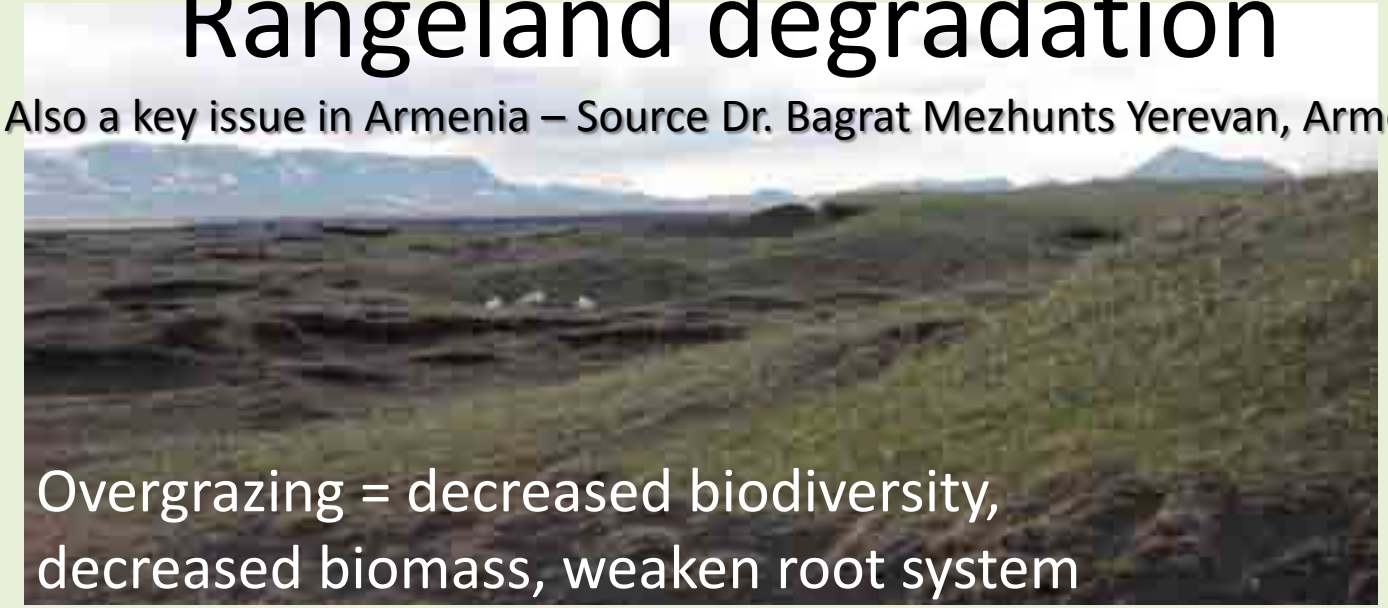
From South Italy - source: Dr Eduardo Constantini Florence, Italy

Grazing (mis)management

*[The natural pasture on the **left** is in stable condition despite cattle grazing, the pasture in the **centre** of the photograph shows forms of rill and sheet erosion due to up and down ploughing, while the other one on the **right** is completely bare of vegetation due to sheep overgrazing and tillage. Picture taken in Sardinia, Italy]. Photo credit: Zdruli, 2011.*

Rangeland degradation

Also a key issue in Armenia – Source Dr. Bagrat Mezhunts Yerevan, Armenia



Overgrazing = decreased biodiversity, decreased biomass, weaken root system

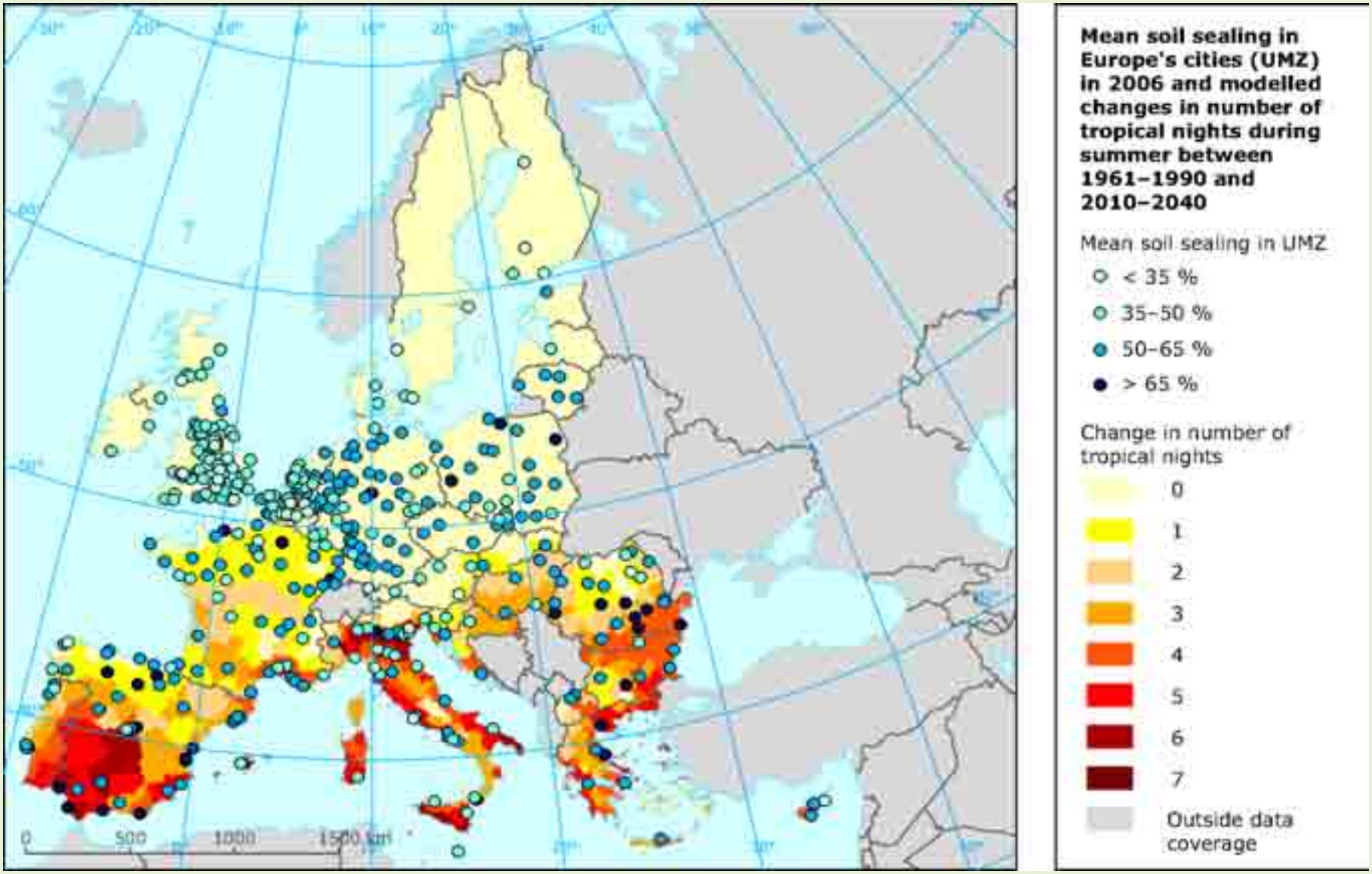
= accelerated natural degradation

= ruptured resilience .....

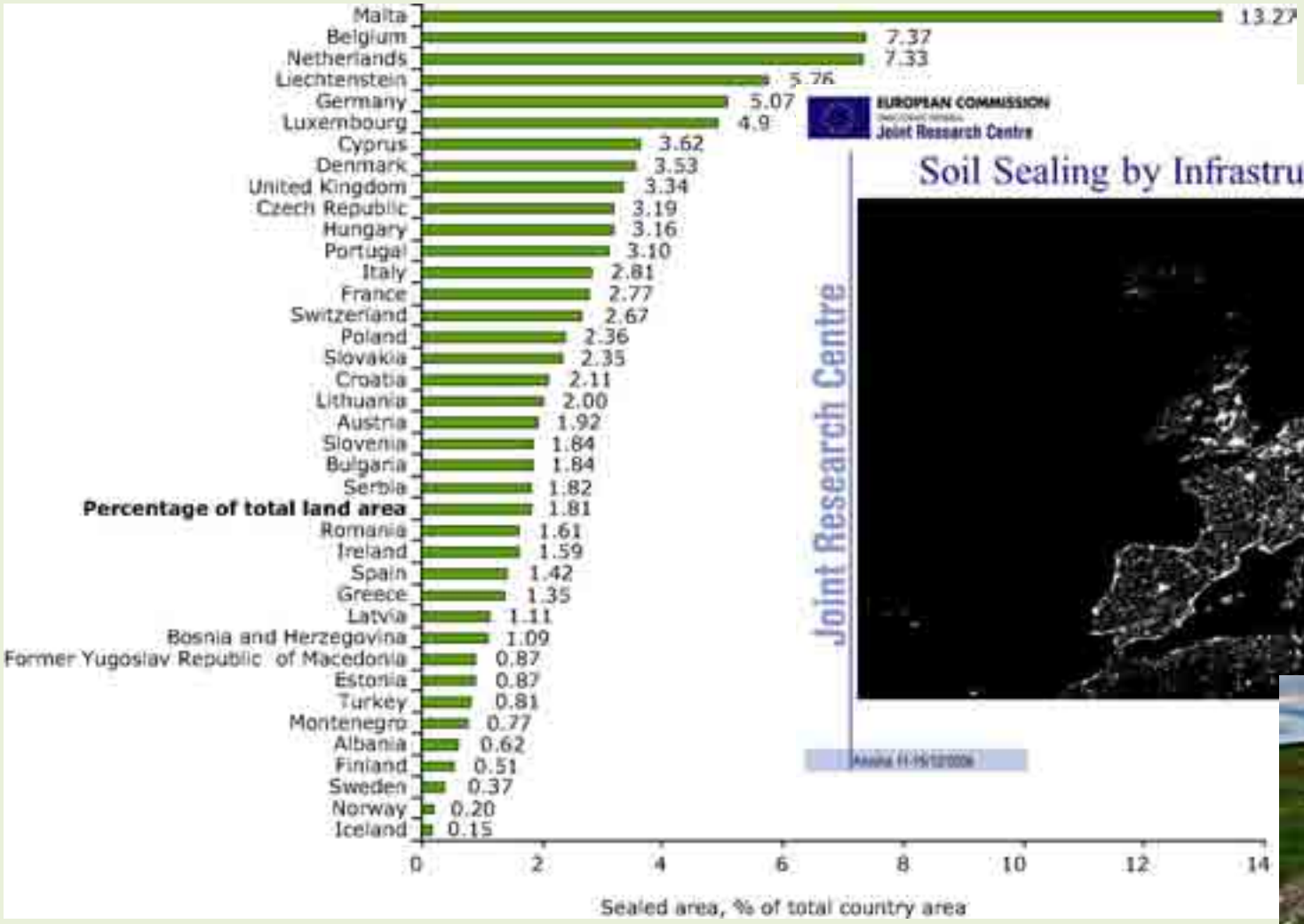
ICELAND

Erosion

Soil sealing



Soil sealing



Since the mid 1950s the total surface area of cities in the EU has increased by 78 %, whereas the population has grown by only 33 %.

Soil sealing

Solar panels replacing millenary olives in S Italy

Urbanization in Spain

Soil sealing

Recently build resovoir for hydropower production in East Iceland

Deforestation – forest degradation

Deforestation is responsible for around 20% of global CO^2 emissions

http://ec.europa.eu/environment/forests/deforestation.htm

Forests cover roughly 30% of the world's land area. Three percent of the earth's forest cover was lost between 1990 and 2005 and there has been no significant decrease in the rate of deforestation over the past 20 years

Ecological understanding essential

The three pillars of sustainable development, from left to right, the theory, the reality and the change needed to better balance the model

FULL STOP

LAND LITERACY

ECOLOGICAL RESTORATION

ECOSYSTEM APPROACH

RESILIENCE-BASED MANAGEMENT

TRANSPARENT/SUSTAINABLE SES