

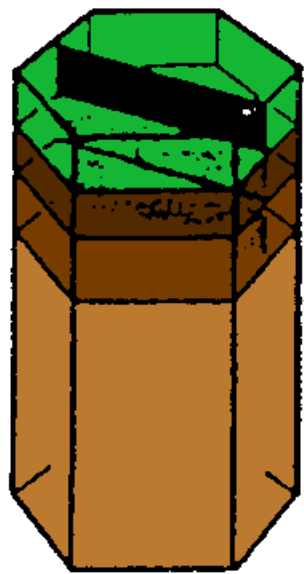
SOIL AND FOOD SECURITY UNDER GLOBAL CHANGE

by

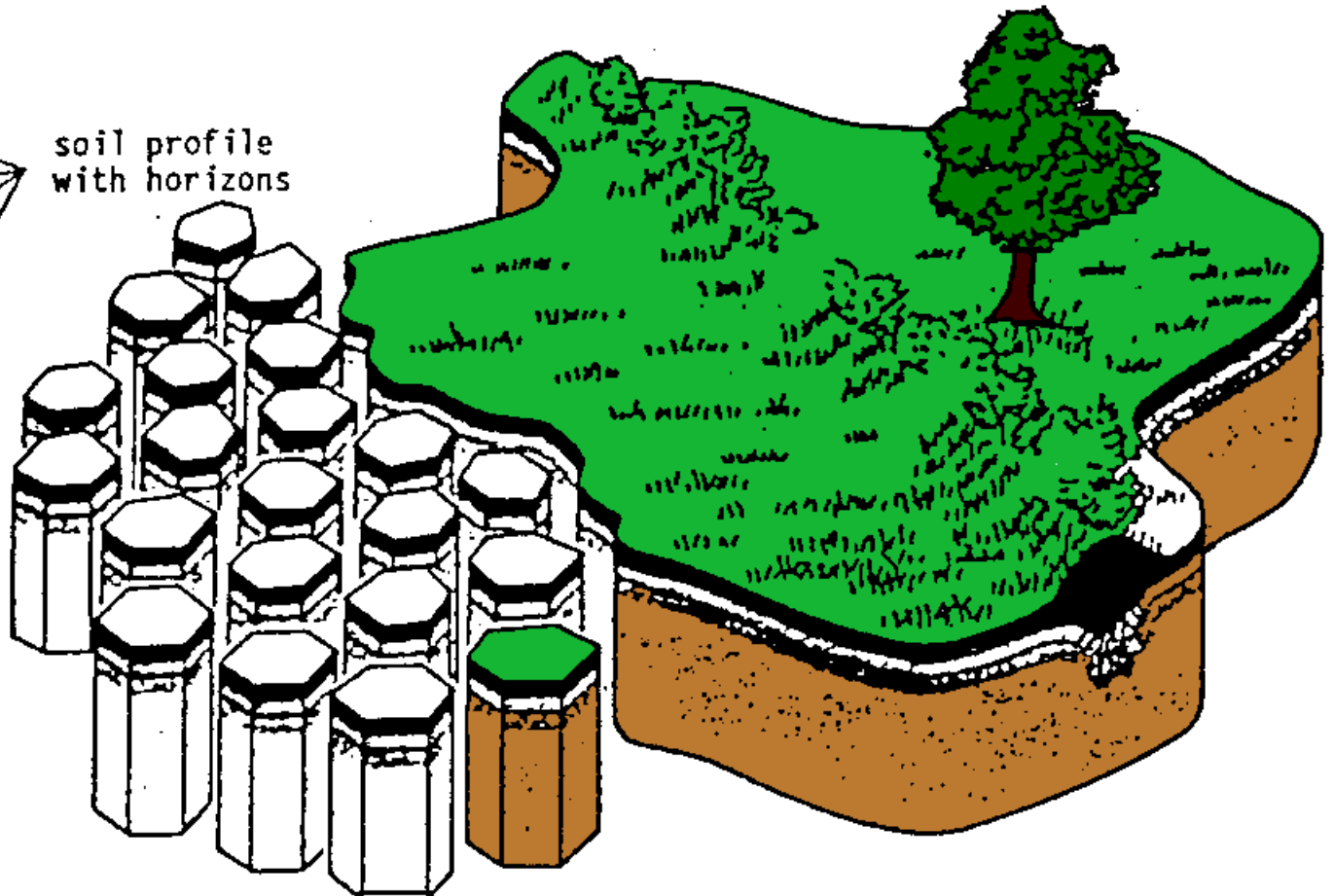
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soil profile
with horizons



WORLD SOIL SUITABILITY FOR SUSTAINING LIFE

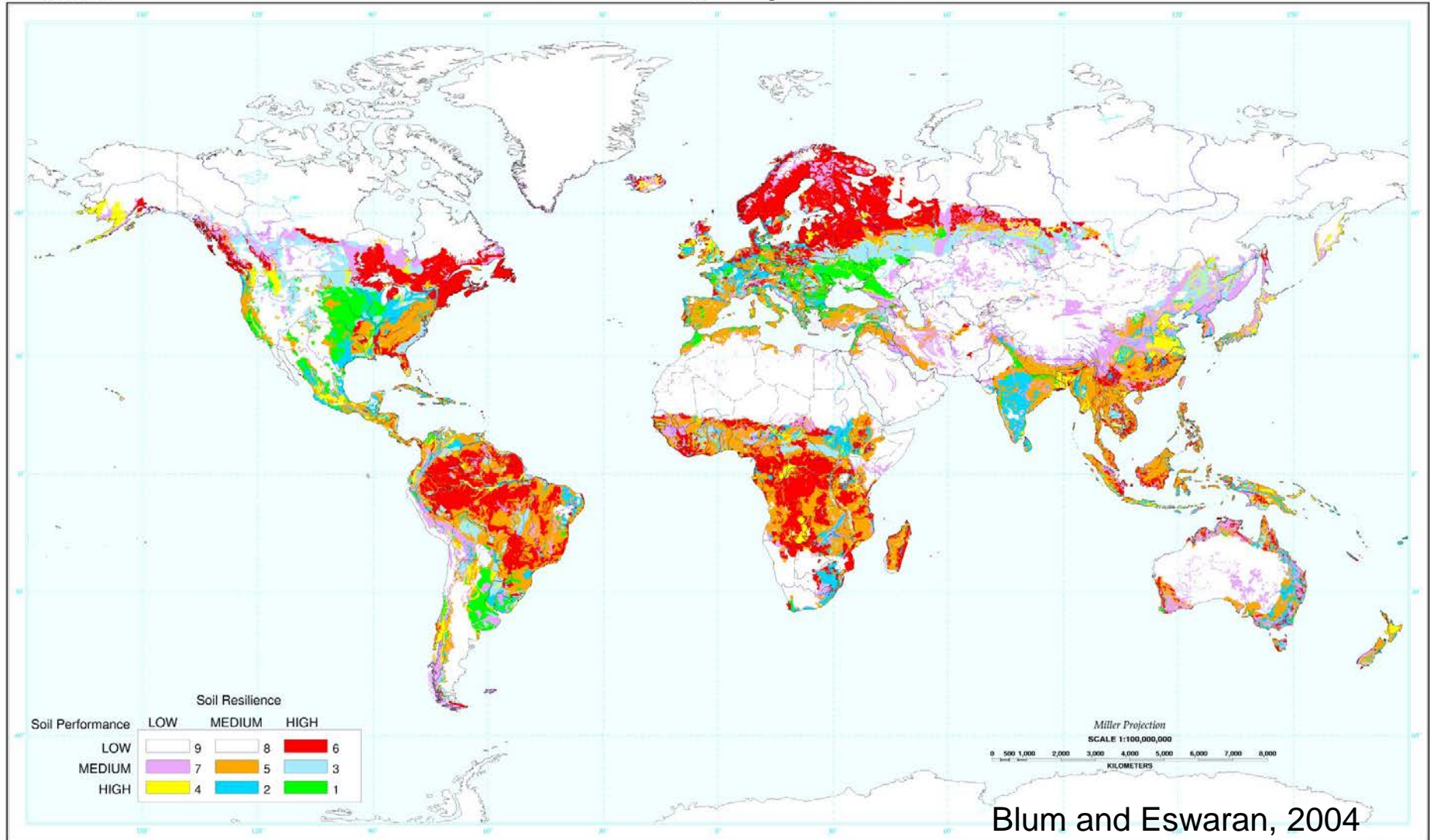
- ~ 12 % of the land surface suitable for crop production;
- ~ 24 % can be used for grazing
- ~ 31 % produce forests
- ~ 33 % unsuitable for any kind of sustainable use

(Buringh, 1998; FAO 1995)

Global map of land quality

Inherent Land Quality Assessment

U.S. Dept. of Agriculture
Natural Resources Conservation Service
Soil Survey Division
World Soil Resources



Blum and Eswaran, 2004

GLOBAL LAND QUALITY WITH REGARD TO LAND SURFACE AND POPULATION DISTRIBUTION

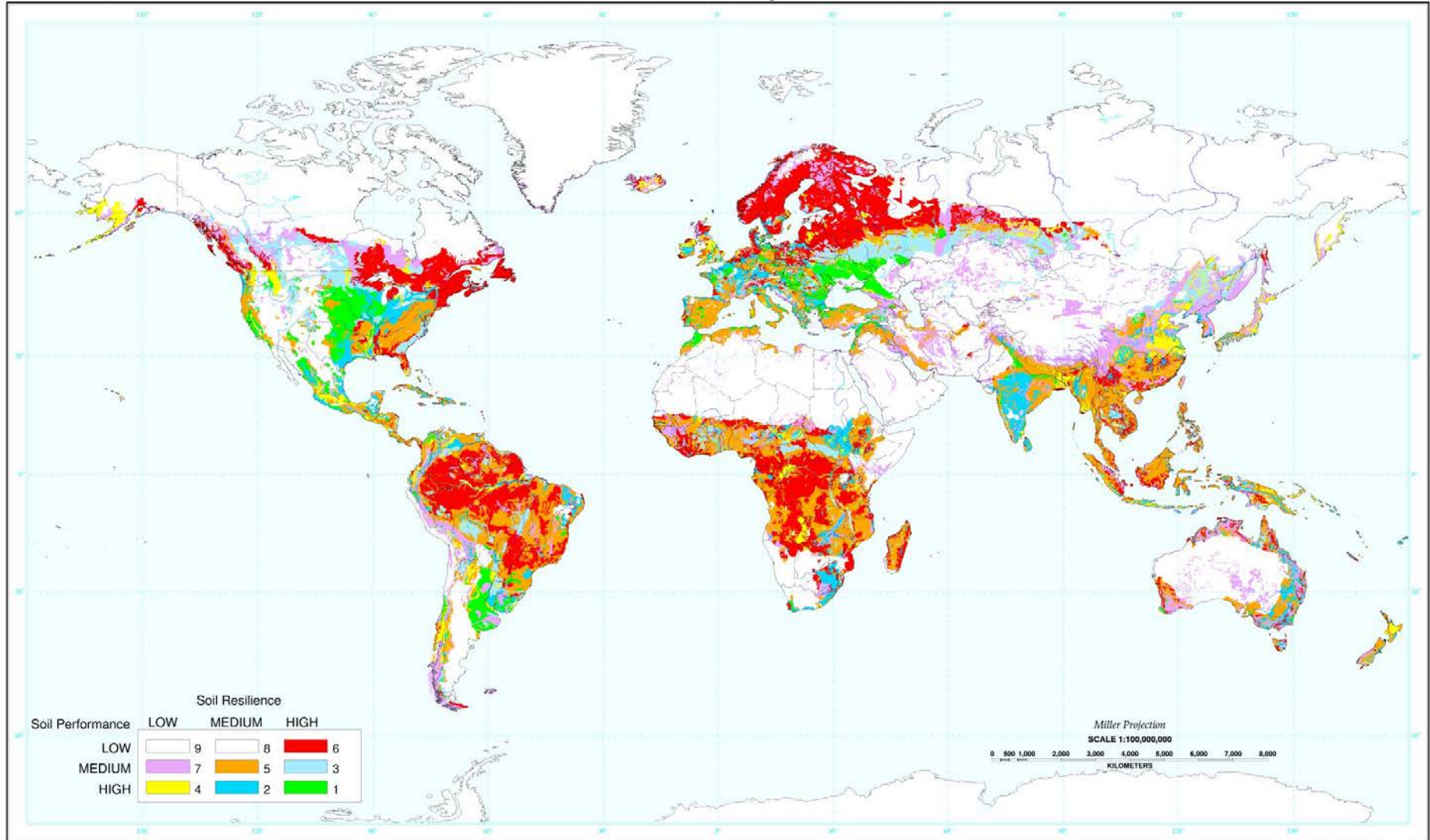
Land Quality Class	Total Land Surface	World Population:
I	2,4 %	6,1 %
II, III	9,5 %	19,0 %
IV, V, VI	33,8 %	53,6 %
VII	9,0 %	11,5 %
VIII, IX	45,3 %	13,1 %

Blum and Eswaran, 2004

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Country boundaries are not authoritative

Washington DC, 1998

Blum and Eswaran, 2004

WHAT IS GLOBAL CHANGE?

SEVEN MAIN FORMS OF GLOBAL CHANGE THREATENING SOIL USE AND FOOD SECURITY:

- 1.increase in world population and change in spatial distribution;
- 2.loss of fertile soils through urbanisation, industrialisation and further human impacts;
- 3.changes in life style and demands for food;
- 4.increasing demands for bioenergy;
- 5.changes in world economy;
- 6.climate change.
- 7.decrease in fresh water supply

1. Increase of world population and changes in its spatial distribution

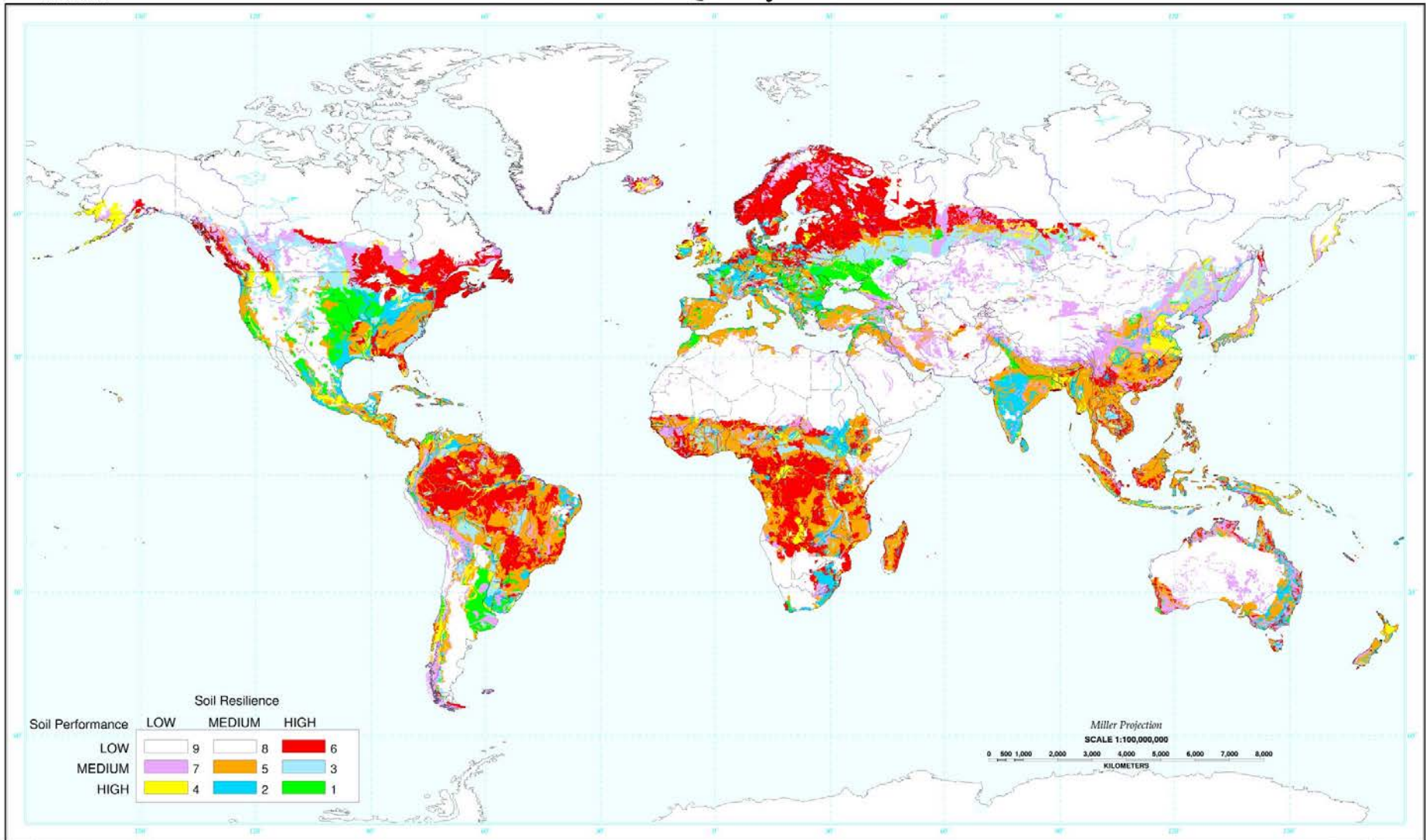
- every year ~ 80-85 millions more = need for
 - more space;
 - more food;
 - more energy.
- every year 100-150 millions move from rural into urban areas or are born there:
 - loss of rural livelihoods (loss of subsistence farming);
 - increased pressure on the local, regional and world food markets

2. Losses of fertile soils through urbanization, industrialisation and further human impacts

Global map of land quality

Inherent Land Quality Assessment

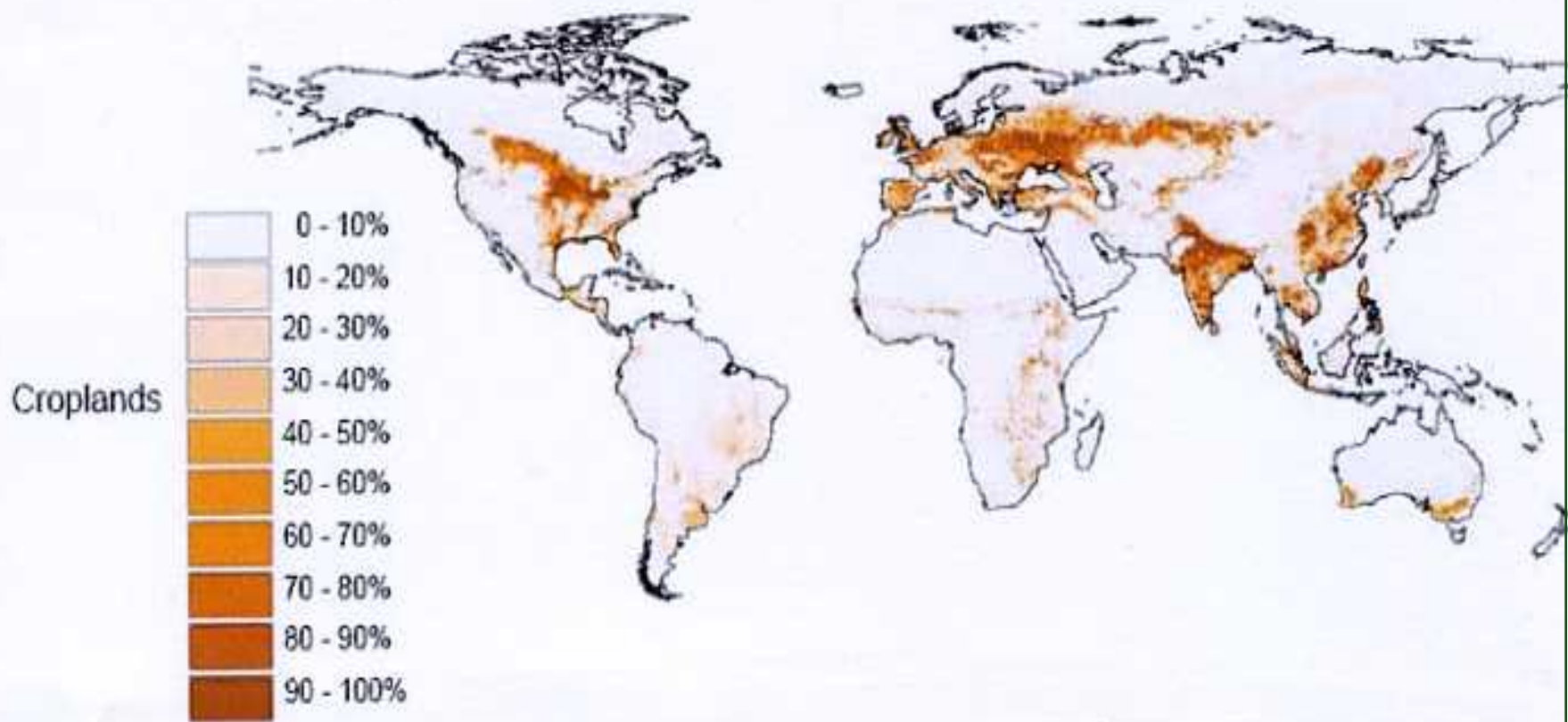
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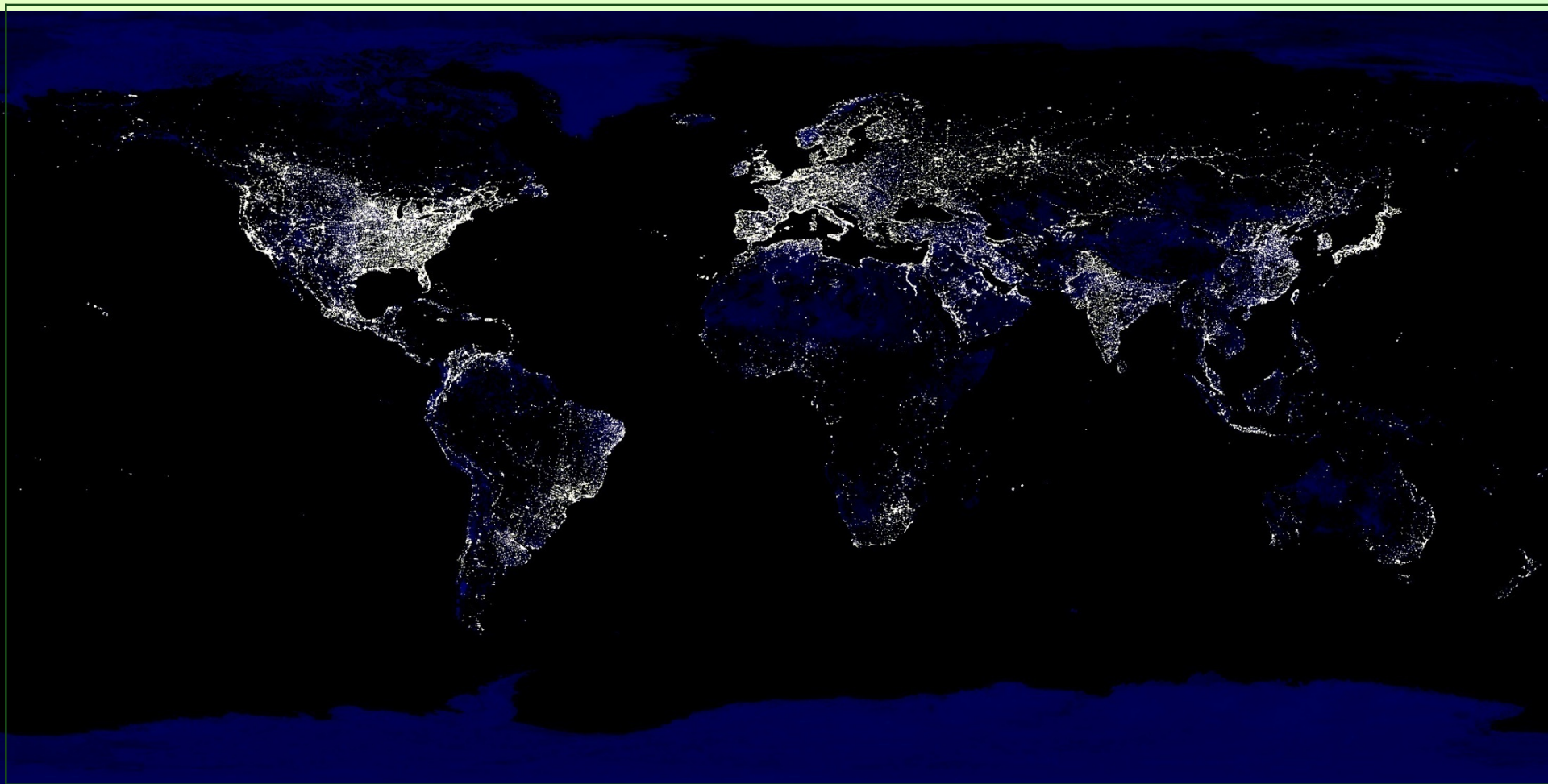
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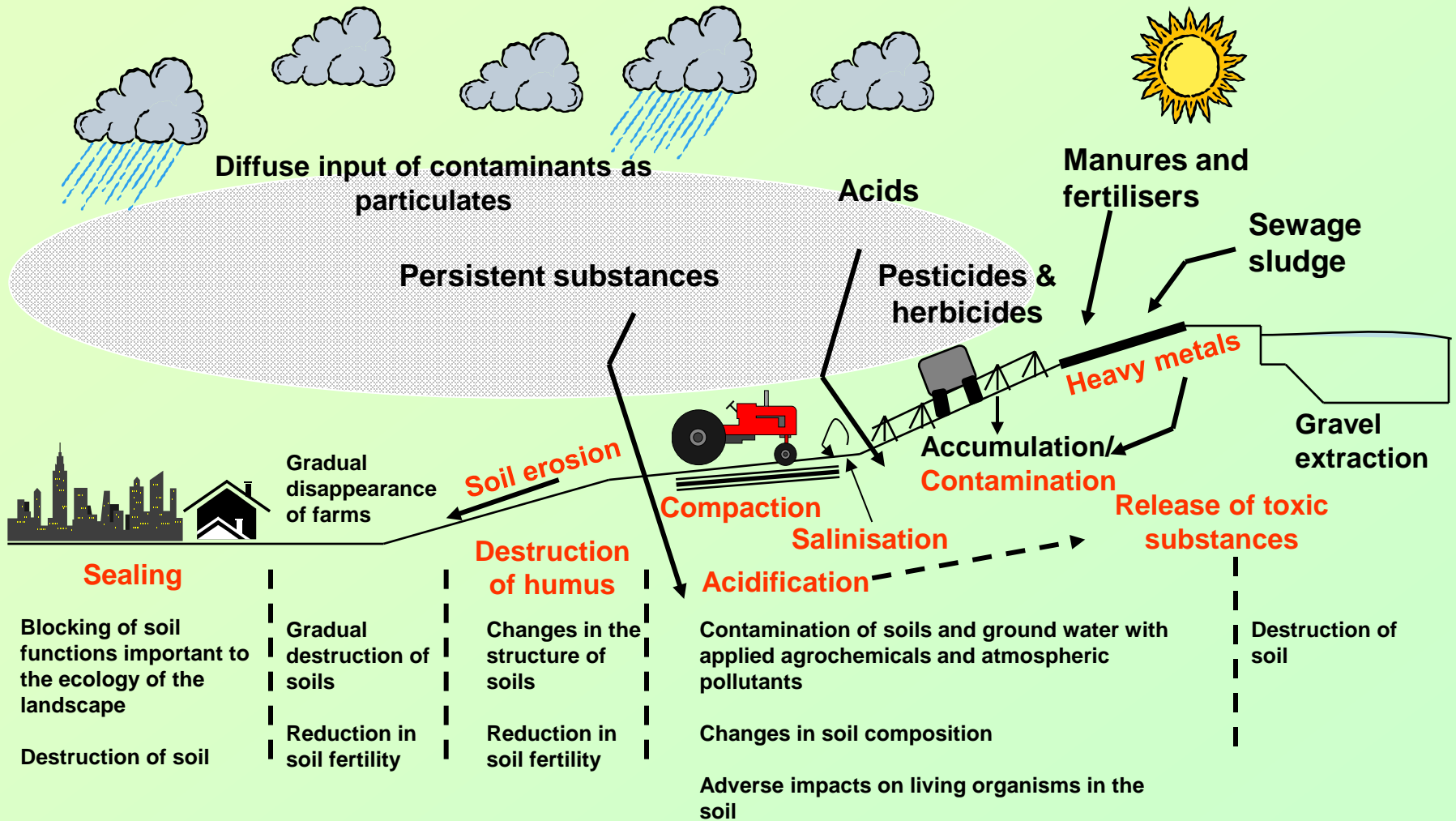
Washington DC, 1998



(Foley et al. 2005)



The impact of human activities on soil



3. Changes in life style and demands for food

- demand for more individual living space = increase of urbanization;
- waste of food in industrialized countries and excessive food consumption, leading to obesity;
- need for more grain because of increasing consumption of animal protein/meat etc.)

Grain for the production of animal protein:

- for 1 kg of chicken meat ~ 2-3 kg of grain
- for 1 kg of pork ~ 4-5 kg of grain
- for 1 kg of beef ~ 7-10 kg of grain

4. Increasing demands for bioenergy [biogas, biofuel (biodiesel, ethanol), fiber]

BIOFUELS WORLDWIDE – PREVISION FOR 2012 (acc. to FAO/OECD)

13% of all grain } for ethanol
35 % of all sugar cane } production

16% of all vegetable oil for biodiesel

Quotation: Pascal Lamy, Dir.Gen. WTO, Feb. 2011 in Berlin (Germany)

5. Changes in world economy and emerging economic trends in food production and marketing

- increasing costs for agricultural land;
- increasing production costs (energy, fertilizers, pesticides, agricultural machinery etc.;
- new financial instruments for agricultural production and marketing of agricultural products (speculative performances, e.g. hedging, derivatives, causing volatilisation of prices, etc.;
- land take in foreign countries = „land grabbing“ for agricultural production.

6. Climate change

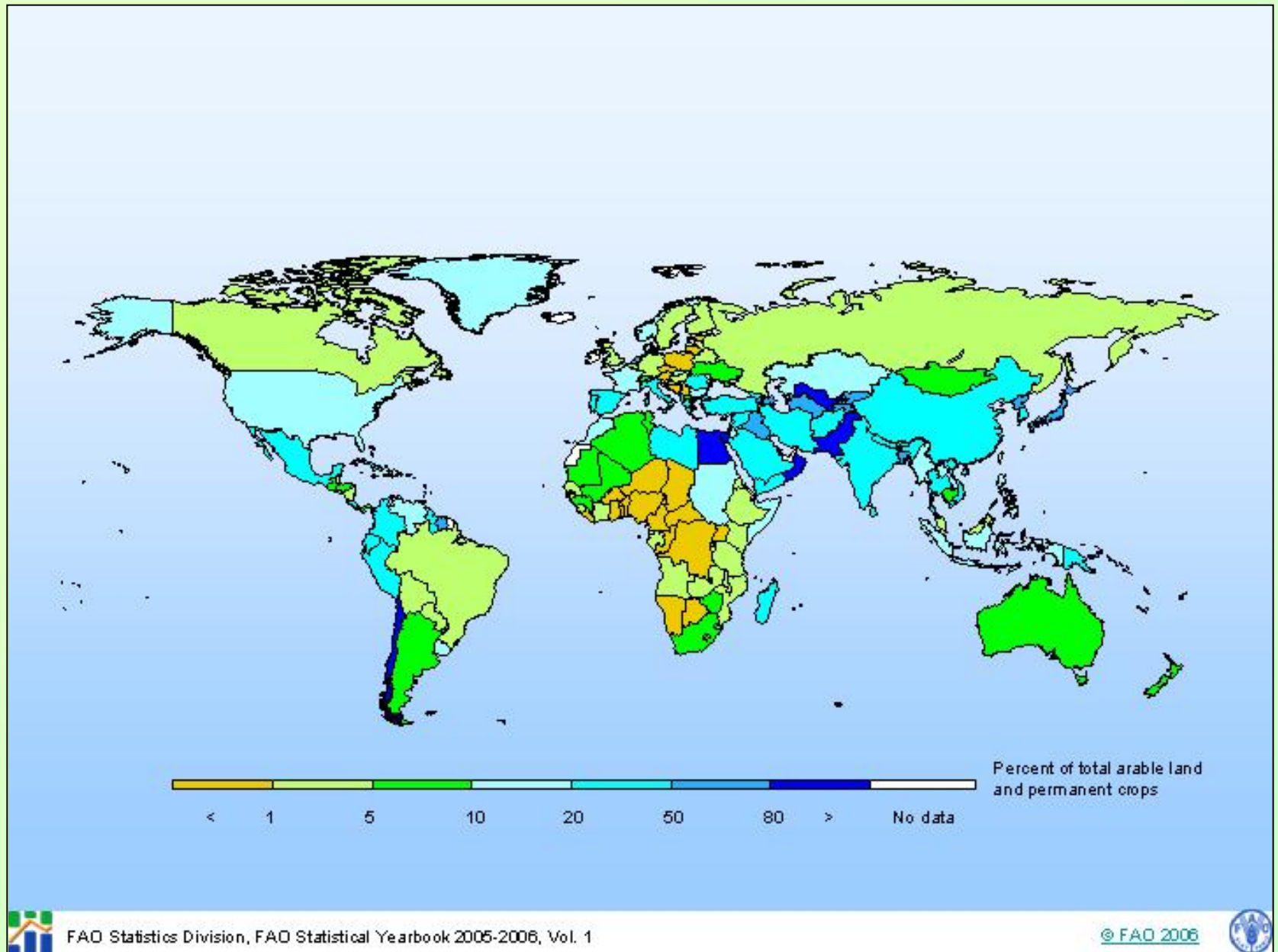
**(temperature, precipitation,
wind) and soil and land
management**

Climate change is causing

- global warming:
 - exceedence of temperature thresholds;
 - increased crop water requirements
 - increased incidence of pests and diseases, invasive plant and animal species;
- alteration in precipitation patterns, soil moisture conditions and surface runoff;
- increased occurrence of extreme weather events;
- increased climate variability

7. Decrease in fresh water supply

Share of Irrigated Land in Arable Land (2003)



SUMMARY AND CONCLUSIONS

1. Through global change, food security will be under threat;
2. These threats will be different for specific world regions and with predominantly negative consequences for many countries in development;
3. Adverse impacts on food production will be caused by:
 - further losses of productive agricultural land by sealing, erosion and other threats;
 - decrease of water resources;
 - increasing costs of energy and fertilizers;
 - severe changes in biodiversity (in and above soil).

4. Adverse impacts will also occur regarding:
 - human health and living conditions in specific world regions;
 - feedback processes between soil and the atmosphere, accelerating climate change.

5. Possible causes of global change derive from world views on the relationship humans-nature, questionable economic and social theories and the increasing globalization of decisions regarding the production and marketing of agricultural/biological commodities without considering regional/local ecological, social and economic conditions.

THANK YOU!

