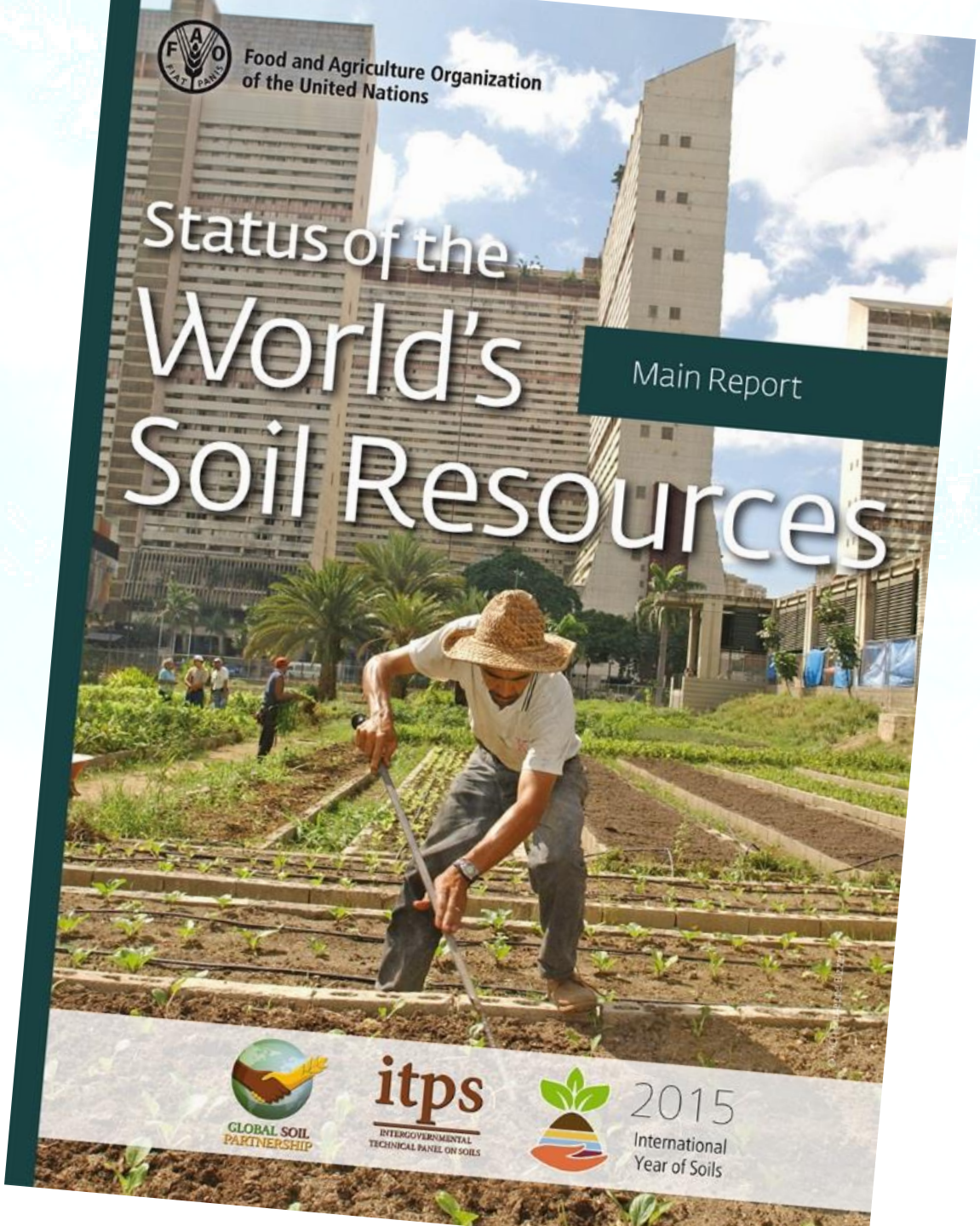


World Soil Day

5 December 2015

Food and Agriculture Organization of the United Nations

Status of the World's Soil Resources

The Intergovernmental Technical Panel on Soils (ITPS), the main scientific advisory body to the Global Soil Partnership (GSP) hosted by the Food and Agriculture Organization of the United Nations (FAO) took the initiative to prepare this first Status of the World's Soil Resources report to make clear the essential connections between human well-being and the soil.

200 soil scientists from **60 countries** worked together to prepare this benchmark against which our collective progress to conserve this essential resource can be measured.

The report provides a global perspective on the current state of the soil, its role in providing ecosystem services, and the threats to its continued contribution to these services.

itps
INTERGOVERNMENTAL TECHNICAL PANEL ON SOILS

GLOBAL SOIL PARTNERSHIP

“The report is aimed at scientists, laymen and policy makers alike.

It provides in particular an essential benchmark against periodical assessment and reporting of soil functions and overall soil health at global and regional levels.

This is of particular relevance to the Sustainable Development Goals (SDGs) that the international community pledged to achieve. Indeed, these goals can only be achieved if the crucial natural resources – of which soils is one – are sustainably managed.”

José Graziano Da Silva
FAO Director-General

Content of the Status of the World's Soil Resources report

Part I *"Global Soil Resources"*

- The report provides an **assessment** of **global soil resources**, set within a framework of **ecosystem services**. It presents the **threats** to soil functions and their **consequences** for ecosystem services.

Part II *"Global Soil change. Drivers, status and trends"*

- The report is based on the best available soil information, including a full **uncertainty evaluation** of the soil information.
- It results in the identification of soil-related **knowledge gaps** that constrain the achievement of sustainable development.

Part III *"Soil change: impacts and responses"*

- The report explores the **implications** of soil conditions for **food** security, **climate** change, **water** quality and quantity, **biodiversity**, and **human** health and wellbeing.

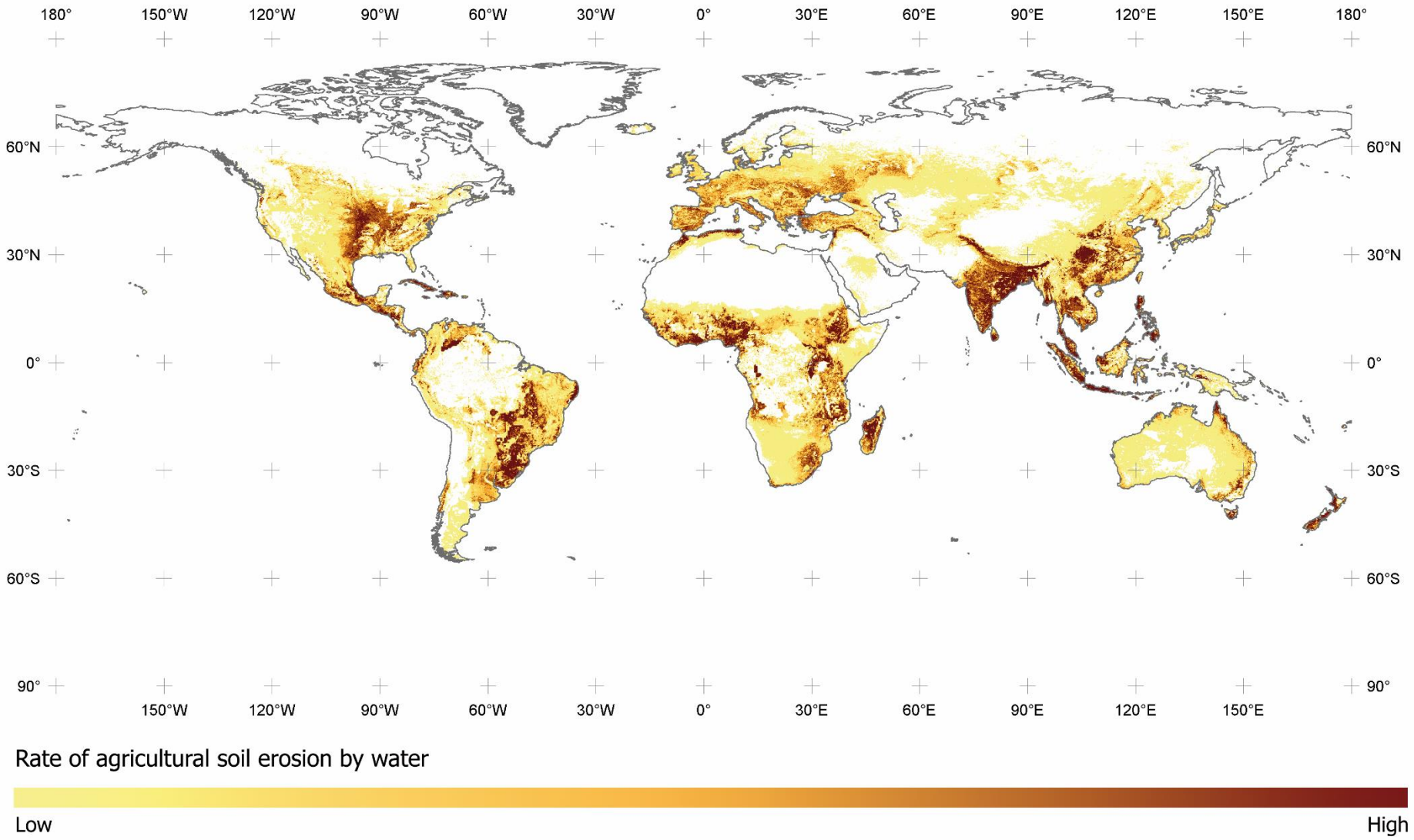
Regional assessment of soil changes

- The report provides a global **scientific** assessment of current and projected soil conditions built on **regional data analysis** and expertise.

The report concludes with a series of **recommendations** for action by policymakers and other stakeholders

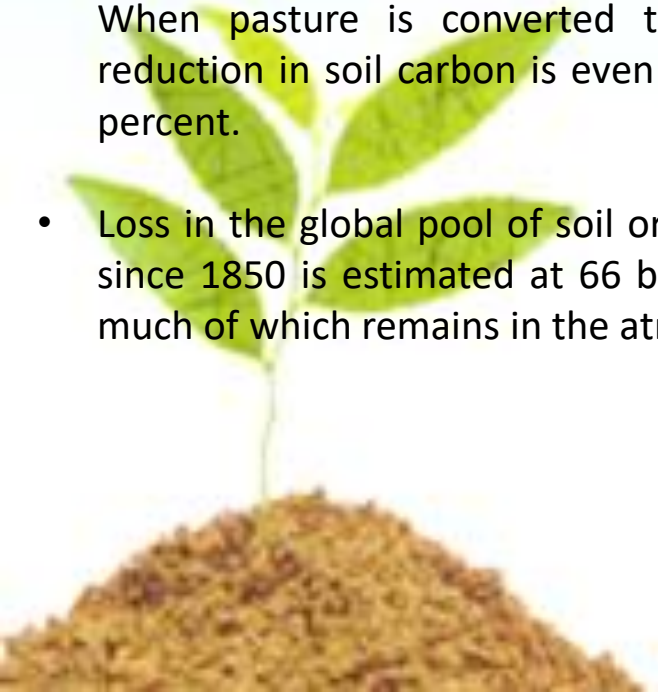
Erosion

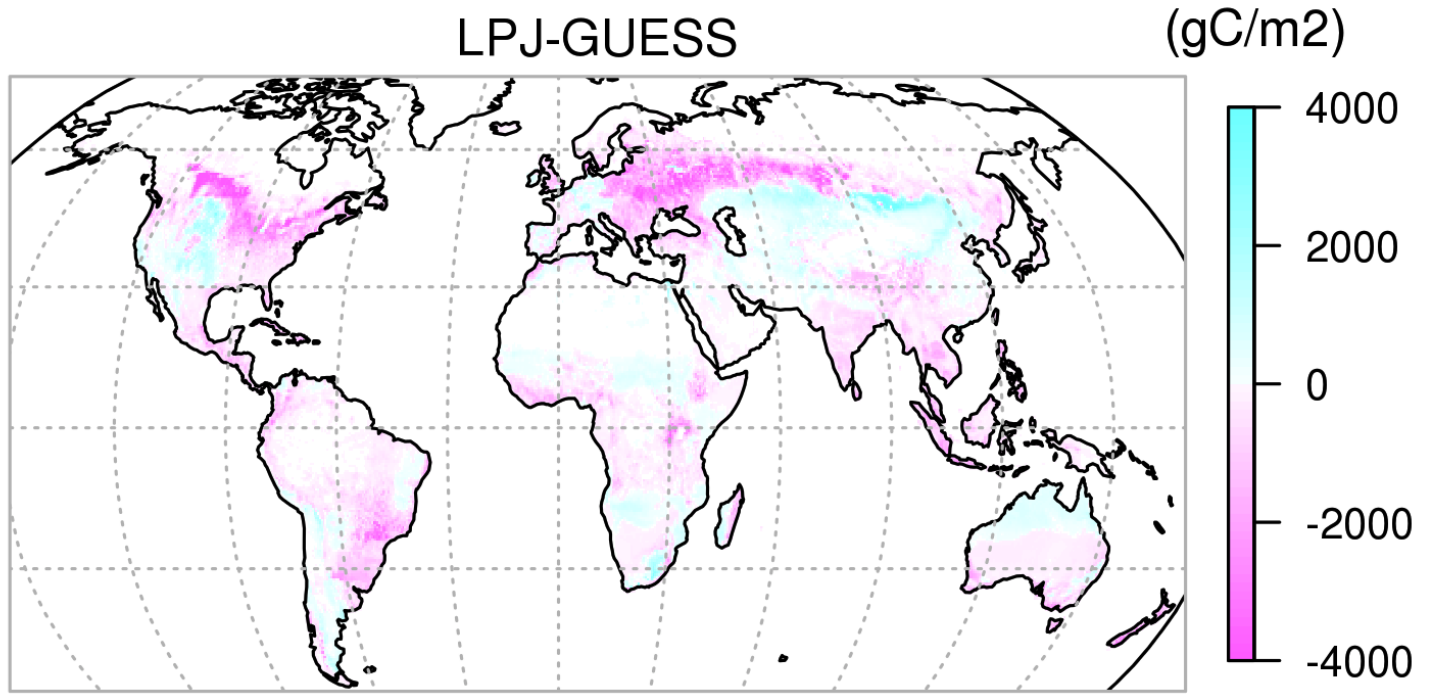
- Erosion is ranked as the most important threat to the soil in Africa, Asia, Latin America and the Caribbean, North America, and the Near East and North Africa.
- Annual crop losses due to erosion have been estimated at 0.3% of crop yields. If erosion continues at this rate, a total reduction of over 10 percent could take place by the year 2050.
- Erosion on croplands and intensively grazed land is 100 to 1,000 times the natural background rate.
- The annual cost of fertilizer to replace nutrients lost to erosion is US$110-US$200 billion.



Soil Organic Carbon (SOC) loss

- Soils contain nearly three times as much carbon as is stored in all terrestrial plants
- The primary driver of loss in soil organic carbon is land use change.
- When land is converted from native forest to crops, soil carbon decreases by 42 percent. When pasture is converted to crops the reduction in soil carbon is even greater – 59 percent.
- Loss in the global pool of soil organic carbon since 1850 is estimated at 66 billion tonnes, much of which remains in the atmosphere.



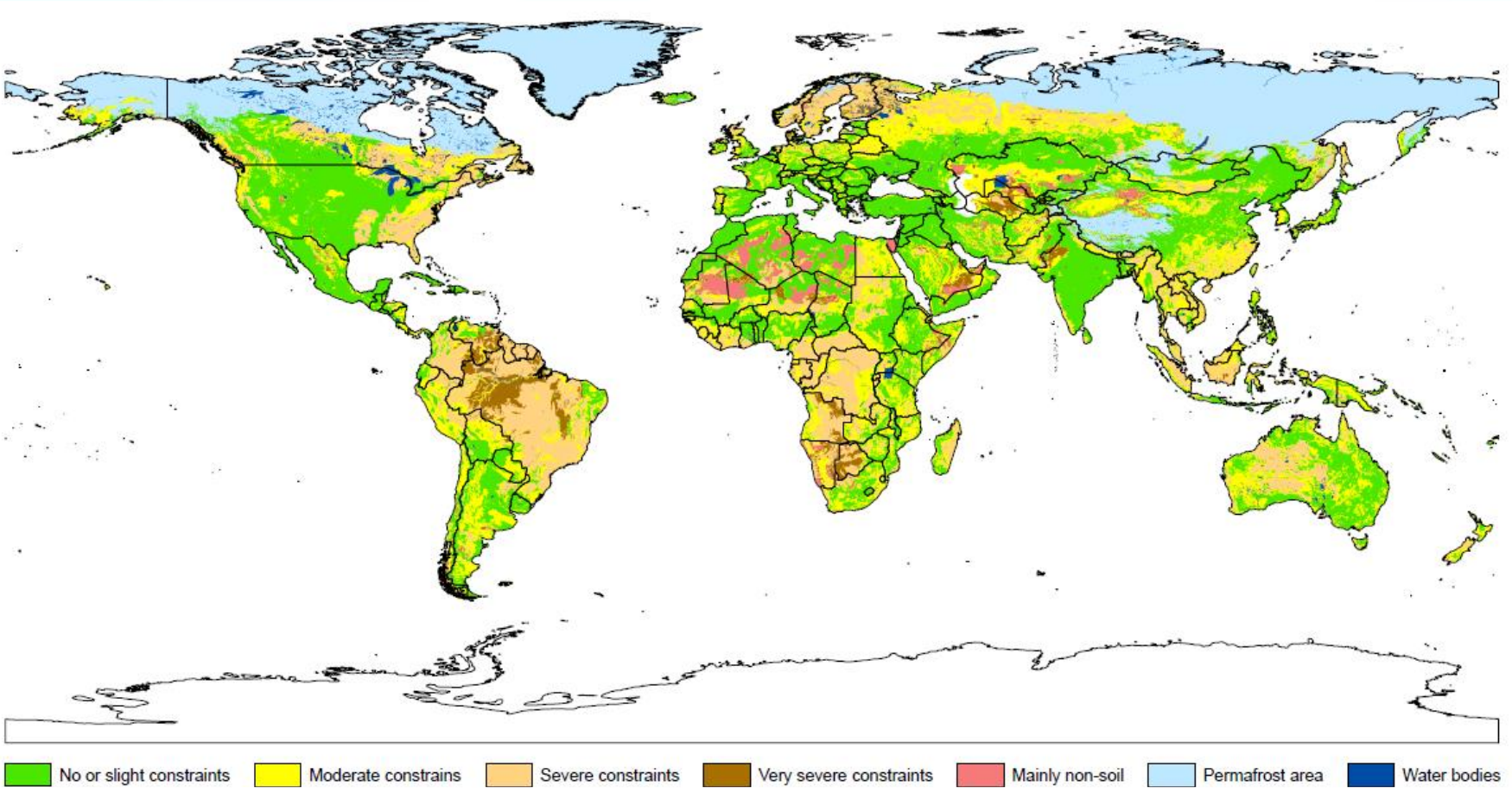


Map of change in soil carbon due to land use change and land management from 1860 to 2010 from three vegetation models.

Pink indicates loss of soil carbon, blue indicates carbon gain.

Nutrient imbalance

- The greatest obstacle to improving food production and soil function in many degraded landscapes is the lack of nutrients, especially nitrogen and phosphorus, and organic inputs.
- In Africa, all but three countries mine more nutrients from the soil every year than are returned through use of fertilizer, crop residues, manure, and other organic matter.
- In other areas, oversupply of nutrients contaminates soil and water resources and contributes to greenhouse gas emissions.
- In 2010, nitrogen oxide emissions from agricultural soils caused by the addition of synthetic fertilizers were the equivalent of 683 million tonnes of CO^2.



Nutrient availability in soils

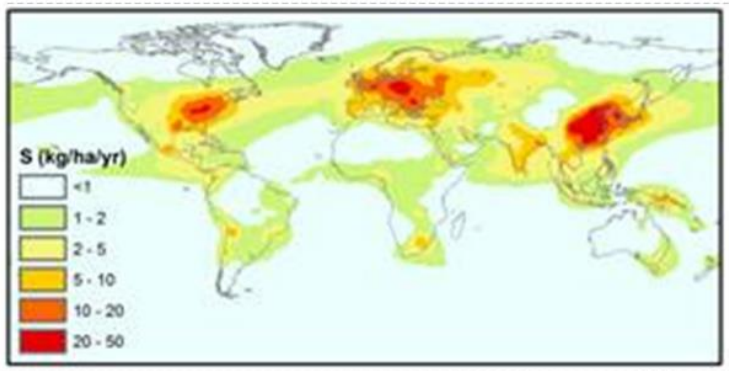
Soil salinization

- An estimated 760,000 km^2 of land worldwide are affected by human-induced salinity – an area larger than all the arable land in Brazil.
- Ill-designed, large-scale irrigation projects are the main cause of human-made salinization.
- Increasing soil salinity takes an estimated 3,000 to 15,000 km^2 of irrigated cropland out of production every year and decreases the production potential of much more land.

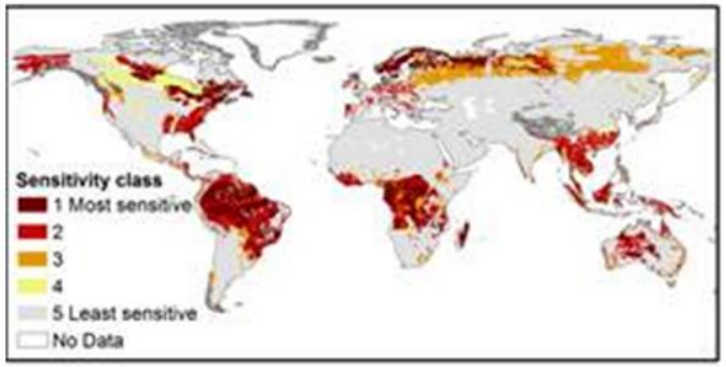
Soil contamination

- Soil contamination damages food security, both because toxic levels of contaminants reduce crop yields and because crops that are produced can be unsafe to consume.
- Nearly a fifth of the farmland in China (19.4%) is contaminated with heavy metals.
- Over 130 million people worldwide routinely consume well-water with arsenic concentrations that exceed WHO recommendations
- More than 2.5 million potentially contaminated sites have been identified in Europe, of which 340,000 are expected to be contaminated.

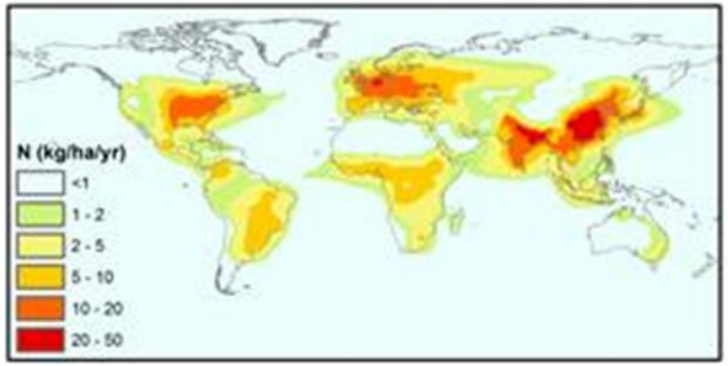
a) Atmospheric sulphur deposition (2001)



b) Soil sensitivity to acidification



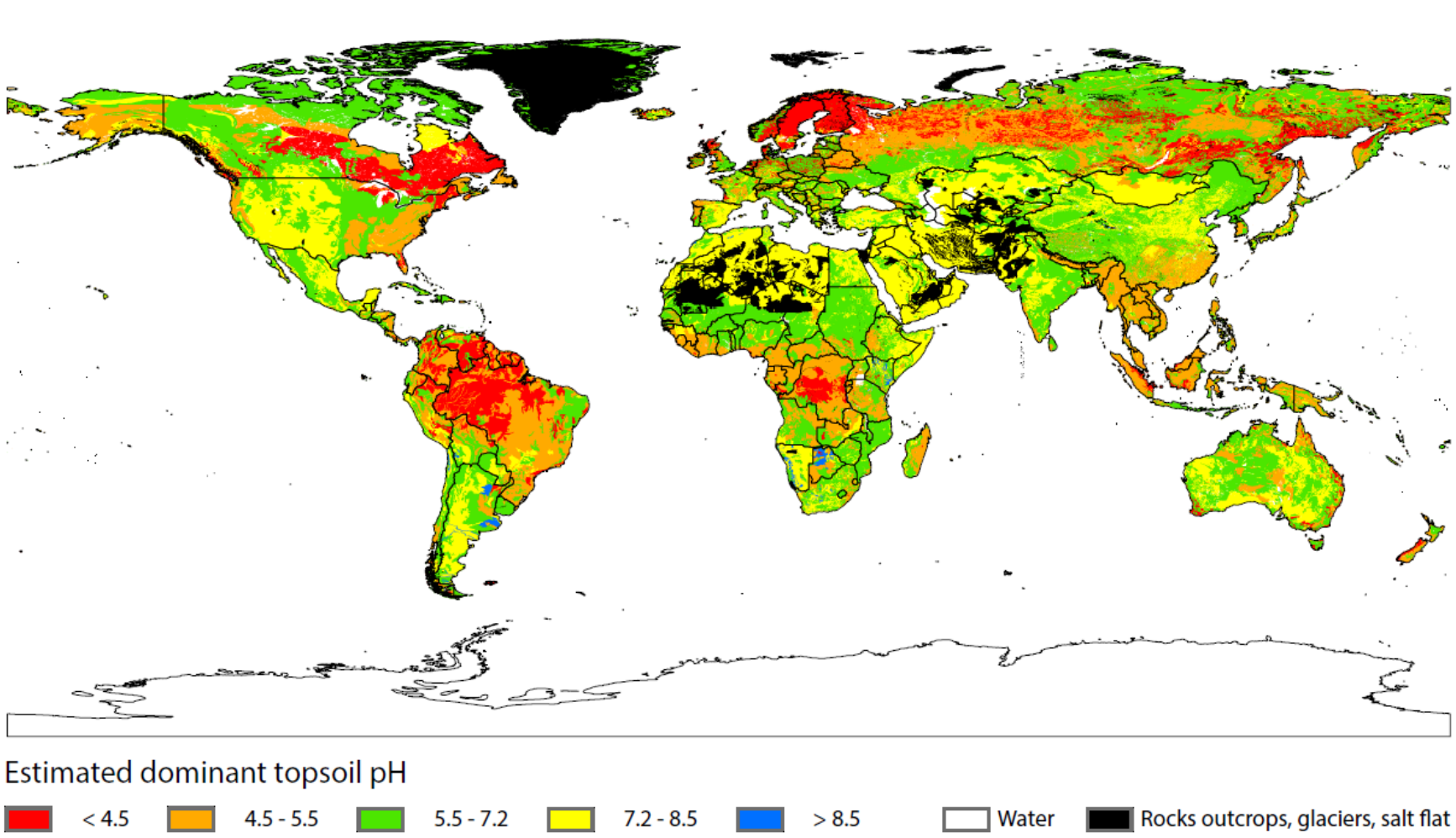
c) Atmospheric nitrogen deposition (2001)



Global distribution of (a) atmospheric S deposition, (b) soil sensitivity to acidification and (c) atmospheric N deposition.

Soil acidification

- Around 30 percent of the topsoil and 75 percent of subsoil on the world's ice-free land is affected by acidity.
- The most acidic topsoils in the world are located in areas of South America that have experienced deforestation and intensive agriculture.
- The main causes of human-induced acidification are acid deposition (commonly called acid rain) and massive application of ammonium-based fertilizers.
- Use of high-nitrogen fertilizers and high rates of product removal increase soil acidity in intensive agricultural areas.



Soil biodiversity

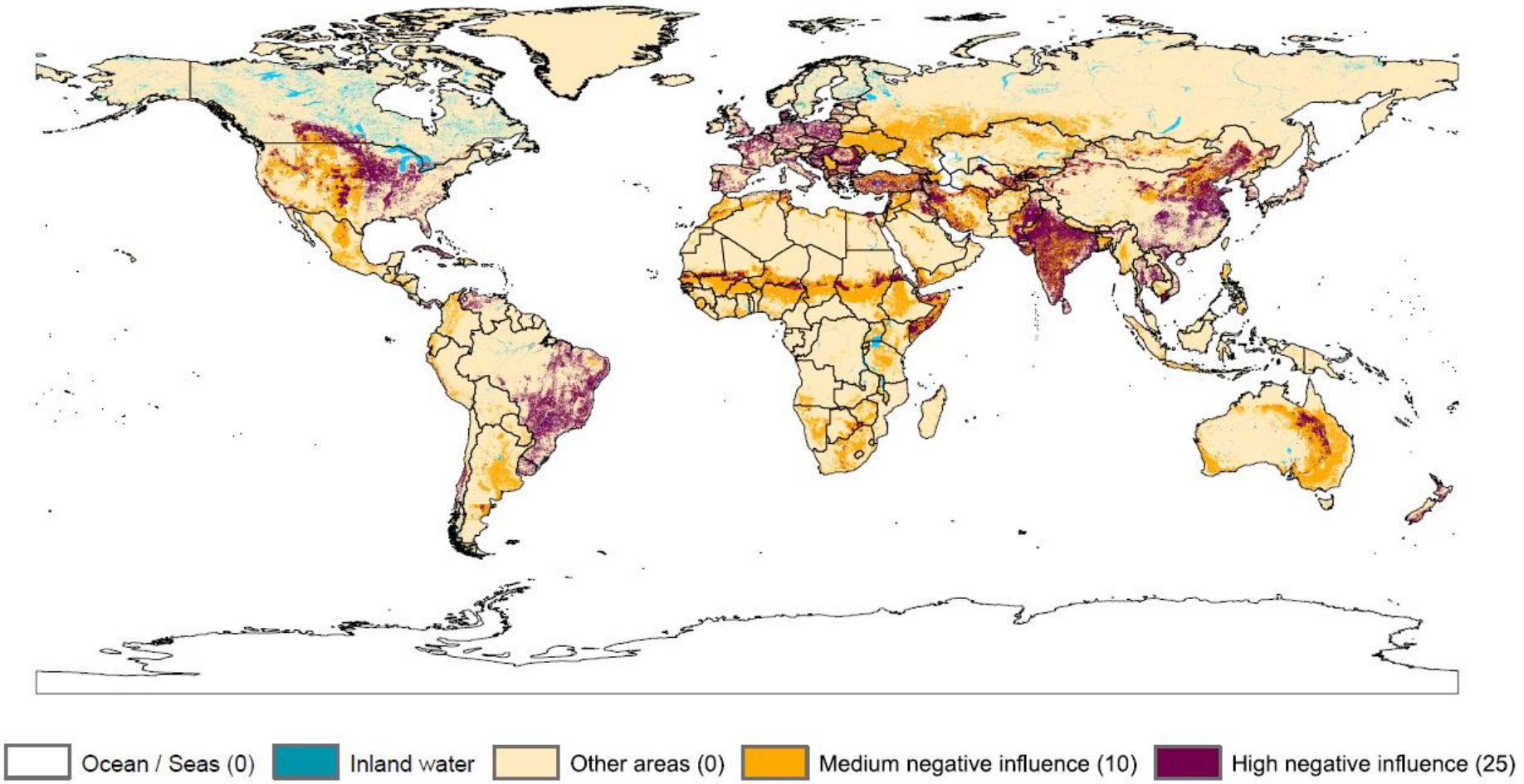
- An estimated 25% of all living species reside in the soil.
- A square meter of soil contains billions of individual organisms and millions of species.
- Fungi and bacteria break down organic waste in the soil, controlling the dynamics of soil organic carbon, and making nutrients available to plants.
- Soil biodiversity is threatened by intensification of land use, and use of chemical fertilizers, pesticides, and herbicides.
- 56% of the European Union has some degree of threat to soil biodiversity.

Soil sealing

- Land take and soil sealing are regarded as the greatest threat to soil functions in Europe and Eurasia.
- Over 70% of the land take in the European Union between 1990 and 2000, and over half of the take between 2000 and 2006 consumed agricultural land.
- In 2000, urban areas covered 657,000 km^2, equivalent to almost 4% of the arable land on the planet.
- Between 1990 and 2006, the total extent of urban area worldwide increased by 58,000 km^2.

Soil compaction

- Soil compaction has degraded up to 330,000 km^2 in Europe.
- Worldwide compaction has degraded an estimated 680,000 km^2 of soil, or around 4% of the total land area.
- Soil compaction can reduce crop yields by as much as 60 percent.
- Cattle trampling and insufficient cover of top soil by natural vegetation or crops account for compaction of 280,000 km^2 in Africa and Asia.
- The damage caused by soil compaction is long-lasting or even permanent. A one-time compaction event can lead to reduced crop yields up to 12 years later.



Soil compaction risk derived from intensity of tractor use in crop land and from livestock density in grasslands.

Waterlogging

- The combined impact of waterlogging with soil salinity has been estimated to cut soil productivity by 30 to 35 percent.
- In Asia, waterlogging and salinization affect nearly 100,000 km^2 of irrigated land in India and Pakistan.

Summary of Status and Trends of Soil Threats by region

Region	Soil erosion	Organic carbon change	Nutrient imbalance	Salinization	Soil sealing	Loss of biodiversity	Soil pollution	Acidification	Compaction	Water-logging
 Sub-Saharan Africa	Poor ↘	Poor ↘	Poor ↘	Fair ⇄	Good =	Fair ↘	Good ↘	Poor ⇄	Good =	Good =
 Asia	Poor ↘	Poor ⇄	Poor ↘	Poor ⇄	Poor ↘	Fair ⇄	Poor ↘	Poor ↘	Poor ↘	Fair ↘
 Europe and Eurasia	Fair ↗	Poor ⇄	Poor ⇄	Poor ↘	Poor ↘	Fair ↘	Poor ↗	Poor ⇄	Fair ⇄	Fair ⇄
 Latin America and the Caribbean	Poor ↘	Poor ↘	Poor ↘	Poor ↘	Fair ⇄	Poor ↘	Fair ⇄	Fair ⇄	Poor ↘	Fair =
 Near East and North Africa	Very Poor ↘	Poor ↘	Good ⇄	Fair ↘	Very Poor ↘	Poor ↘	Very Poor ↘	Good ⇄	Poor ↘	Good ⇄
 North America	Fair ↗	Fair ↗	Poor ↘	Good ↗	Fair ↘	Good ⇄	Good ↗	Poor ↘	Fair ⇄	Good ⇄
 Southwest Pacific	Fair ↗	Fair ⇄	Fair ↘	Good ⇄	Good ↘	Good ⇄	Good ↗	Fair ↘	Fair ⇄	Good ⇄

Technical Conclusions

- *While there is cause for optimism in some regions, the overwhelming conclusion from the report is that the majority of the world's soil resources are in only fair, poor or very poor condition.*

- *The most significant threats to soil function at the global scale are soil erosion, loss of soil organic carbon and nutrient imbalance.*

- *The current outlook is for the situation to worsen unless concerted actions are taken by individuals, the private sector, governments and international organizations*

Technical Recommendations

Eight priority sustainable soil management practices and their benefits	
Soil management practice	**Degradation mitigated**
minimize soil disturbance by avoiding mechanical tillage	erosion, soil organic carbon (SOC) loss, nutrient imbalance, soil biodiversity loss
enhance and maintain a protective organic cover on the soil surface, using cover crops and crop residues	erosion, SOC loss, nutrient balance, soil biodiversity loss
cultivate a wide range of plant species – both annuals and perennials – in associations, sequences and rotations that can include trees, shrubs, pastures and crops	erosion, nutrient imbalance, SOC loss, soil biodiversity loss
use well-adapted varieties with resistance to biotic and abiotic stresses and improved nutritional quality planted at an appropriate time, seedling age and spacing	salinization, nutrient imbalance, soil biodiversity loss
enhance crop nutrition and soil function through crop rotations and judicious use of organic and inorganic fertilizer	nutrient imbalance, SOC loss, soil biodiversity loss
ensure integrated management of pests, diseases and weeds using appropriate practices, biodiversity and selective, low-risk pesticides when needed	soil biodiversity loss, contamination
manage water efficiently	erosion, salinization, waterlogging, SOC loss, nutrient imbalance, soil biodiversity loss
control machines and field traffic to avoid soil compaction	compaction, SOC loss, nutrient balance, soil biodiversity loss

Soil Policy Conclusions and Recommendations

The implementation of the World Soil Charter adopted by FAO member states in 2014 is a core recommendation. In addition, the report suggests seven policy pathways as a starting point for action

1. **Education and awareness** of soil and land resources is the foundation to achieve sustainable management

2. **Monitoring and forecasting systems** are urgently needed as the present capacity to monitor soil change is sorely lacking nearly everywhere.

3. **Informing markets** involving soils (on status nutrients, carbon, contaminants …) will achieve greater efficiency and better resource allocation if they are reliably informed.

4. **Appropriate incentives and regulation** of soil management practices and implementing zoning systems involves technical, institutional and policy challenges requiring good soil information and monitoring.

Soil Policy Conclusions and Recommendations

5. **Ensuring intergenerational equity:** human pressures on soil resources have reached critical limits and the interests of future generations to a healthy soil resource are no longer protected. Policy analysis need to take into account the consequences of current trends in soil condition and natural resource scarcity.

6. **Supporting local, regional and international security:** policy makers responsible for local, regional and international security need to consider the availability of soil resources and the capacity of countries to achieve food security in order to help resolve resource conflicts and achieve peaceful mutual relations.

7. **Understanding interconnectedness and consequences:** a comprehensive global view is needed to deal with the trans-national aspects of food security and soil degradation including climate change effects.

Cross-cutting issues: a more formal recognition of soil resources as a cross-cutting issue in science policy is necessary to ensure it receives sufficient support to serve agriculture, water management and climate change issues.

Priorities

Overall the Intergovernmental Technical Panel on Soils believes the following four actions are the greatest priorities:

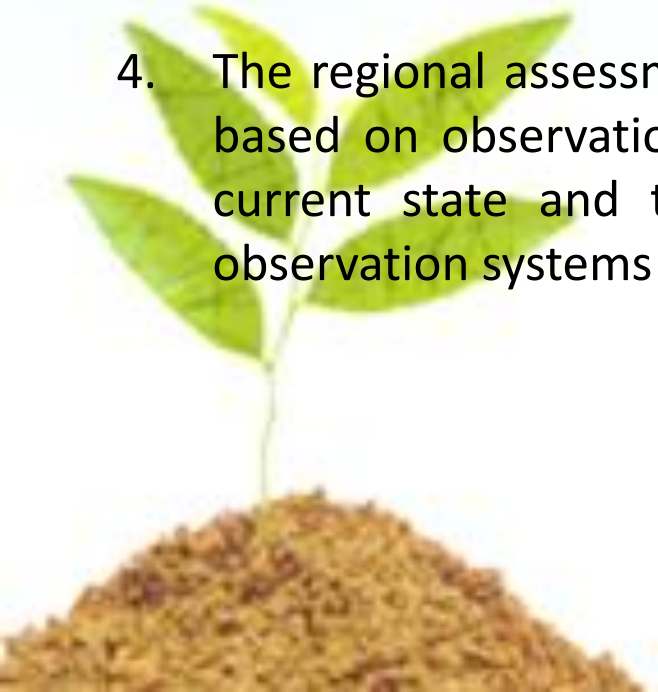
1. Sustainable soil management can increase the supply of healthy food for the most food insecure among us. Specifically we should minimize further degradation of soils and restore the productivity of soils that are already degraded in those regions where people are most vulnerable.

2. The global stores of soil organic matter should be stabilized or increased. Each nation should identify locally appropriate SOC-improving management practices and facilitate their implementation. They should also work towards a national-level goal of achieving a stable or positive net SOC balance.

Priorities

3. Compelling evidence exists that humanity is close to the global limits for total fixation of nitrogen and regional limits for phosphorus use. Therefore we should act to stabilize or reduce global nitrogen (N) and phosphorous (P) fertilizer use while simultaneously increasing fertilizer use in regions of nutrient deficiency. Increasing the efficiency of N and P use by plants is a key requirement to achieve this goal.

4. The regional assessments in this report frequently base their evaluations on studies from the 1990s based on observations made in the 1980s or earlier. We must improve our knowledge about the current state and trend in the condition of soil. An initial emphasis should be on improving observation systems to monitor our progress in achieving the three priorities outlined above.



Thank you

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TO BE COMPLETED: Name & email address of the speaker