

# Combating climate change by restoration of degraded land



**Andres Arnalds**

**Soil Conservation Service of Iceland**

The silent crises of ecosystem degradation, soil erosion and desertification are seriously affecting a growing proportion of the human population. Despite the important linkages with environmental issues like climate change and biodiversity, the severity of desertification has not gained enough attention.

## **Soil erosion - The silent crisis**

- The global community will be unable to achieve goals of food and water security and meet its GHG emission targets without a major improvement in conservation and restoration of the world's soil resources.
- The world will need to double food production by 2050, i.e. more food needs to be produced before the end of the century than combined over the last 10.000 years.
- In the past, increasing food needs have mainly been met by clearing and irrigating more land, converting more natural forests to agriculture, diverting more water resources, using improved varieties and applying more fertilizers. Those options are narrowing, however, and the reallocation of land and water resources from food production to energy production, using biofuels, may have drastic effects.

## **Iceland's century of halting soil erosion and restoring degraded land - an inspiration of hope**

- It has been estimated that at the time of settlement, around 874 AD, about 2/3 of the country was vegetated. Unsustainable land use, interacting with harsh climate and volcanic activity, led to dramatic ecosystem destruction. About 95% of the original woodland cover may have been lost, and possibly half of the soil and vegetation.
- These destructive forces threatened human livelihood in many parts of Iceland. In 1907, a law was passed in the Parliament to halt further woodland destruction and desertification of the country. The success of soil conservation and land restoration in Iceland is remarkable. The advancement of the most threatening sand dunes and other forms of accelerated soil erosion has mostly been stopped and land restoration work is steadily increasing.
- To celebrate Iceland's century of soil conservation and land restoration, the Soil Conservation Service hosted in 2007 an International Forum on Soil, Society and Global Change. It highlighted soil as a key to global sustainability, linking land care with climate, biodiversity, water, food security, poverty reduction and peace

([www.land.is/ssgc](http://www.land.is/ssgc)). The President of Iceland was the Patron of this important Forum.

- Iceland's story was seen as a great inspiration of hope to many nations facing land degradation.

### **CO<sub>2</sub> - A resource out of place - Mitigating climate change by the restoration of land health**

- Carbon dioxide (CO<sub>2</sub>) is the most important greenhouse gas acting in climate change. The carbon atom located in the soil as organic matter is the key to soil fertility and increased food production for the world's ever growing population.
- Iceland has lost immense amounts of carbon due to ecosystem degradation and soil erosion. There is an urgent need to return some of this carbon back to the land, recharging the ecosystems.
- Restoration of land quality by revegetation and / or afforestation might increase annual carbon storage by about 5 million tons CO<sub>2</sub> equivalents and improve land quality for future generations. Combined with Iceland's many options for the urgent task of reducing emissions of greenhouse gases, Iceland could become a carbon neutral country within a few decades - a model country in caring for the environment.

### **The global need to recharge the organic carbon pools**

- Even if we cut our emissions of CO<sub>2</sub> today, the decay of atmospheric CO<sub>2</sub> is slow, and climatic changes would still occur. Desertification control and restoration of degraded soils and ecosystems has a potential to sequester 0.9 to 1.9 billion tons of C/yr (Rattan Lal, Iceland Forum 2007).
- Globally, desertification control and restoration of degraded soils and ecosystems has a potential to store 0.9 to 1.9 billion tons of C/yr (Rattan Lal, Iceland Forum 2007).
- There is an urgent need to increase food security, improve water holding capacity of land and break the poverty trap. Increasing soil organic carbon in degraded land by 1 ton carbon / ha / year can increase global food production by 26-30 million tons / year (Lal, 2007).
- We need to establish ways to use the income stream generated by carbon trading to provide incentives to restore degraded soils and ecosystems. Soils need to be better related to the Millennium Development Goals, and should have high value on the carbon markets. Such markets have the potential to generate a steady stream of income in developing countries.

### **Action plan for linking carbon finance with the restoration of land capability**

- Carbon projects should be planned for multiple benefits, but there are a number of barriers that need to be analyzed and overcome in order to create such multiple win-win situations. These include the need for more research, improved monitoring and severe constraints within the current Clean Development Mechanism of the Kyoto Protocol.
- President Grimsson suggested at the International Forum in Iceland that a „Desertification Control and Carbon Trading Centre“ could be created in order to facilitate scientific exchange and promote the adoption of new technologies.

- At the Forum, an international high level roundtable was also proposed that would bring together business leaders and policy makers to raise awareness on the multiple benefits of land restoration for mitigating climate change, poverty alleviation, ecosystem health and resilience.
- It is also important, as proposed at the Forum, to form a network of projects for demonstrating the role of carbon financing in generating real benefits on rural communities. Iceland would be an important partner in such cooperation.

In the 100 years of halting soil erosion and restoring land quality in Iceland, much experience and knowledge has been gained. Iceland definitely should have an important role in creating an enabling environment for sustaining our future.

This long term experience forms the basis for a land restoration training program that the Ministry of Foreign Affairs is financing as part of its development cooperation, and that will hopefully soon become a part of the United Nations University.

Soil is the vital, but missing link between the key environmental conventions. Let's build the bridges.

**Don't forget the soil!**

**Soils, Society & Global Change**

# **CO<sub>2</sub> – A RESOURCE OUT OF PLACE**



**ANDRÉS ARNALDS**

**SOIL CONSERVATION SERVICE, ICELAND**

# Iceland – Settlement in 874

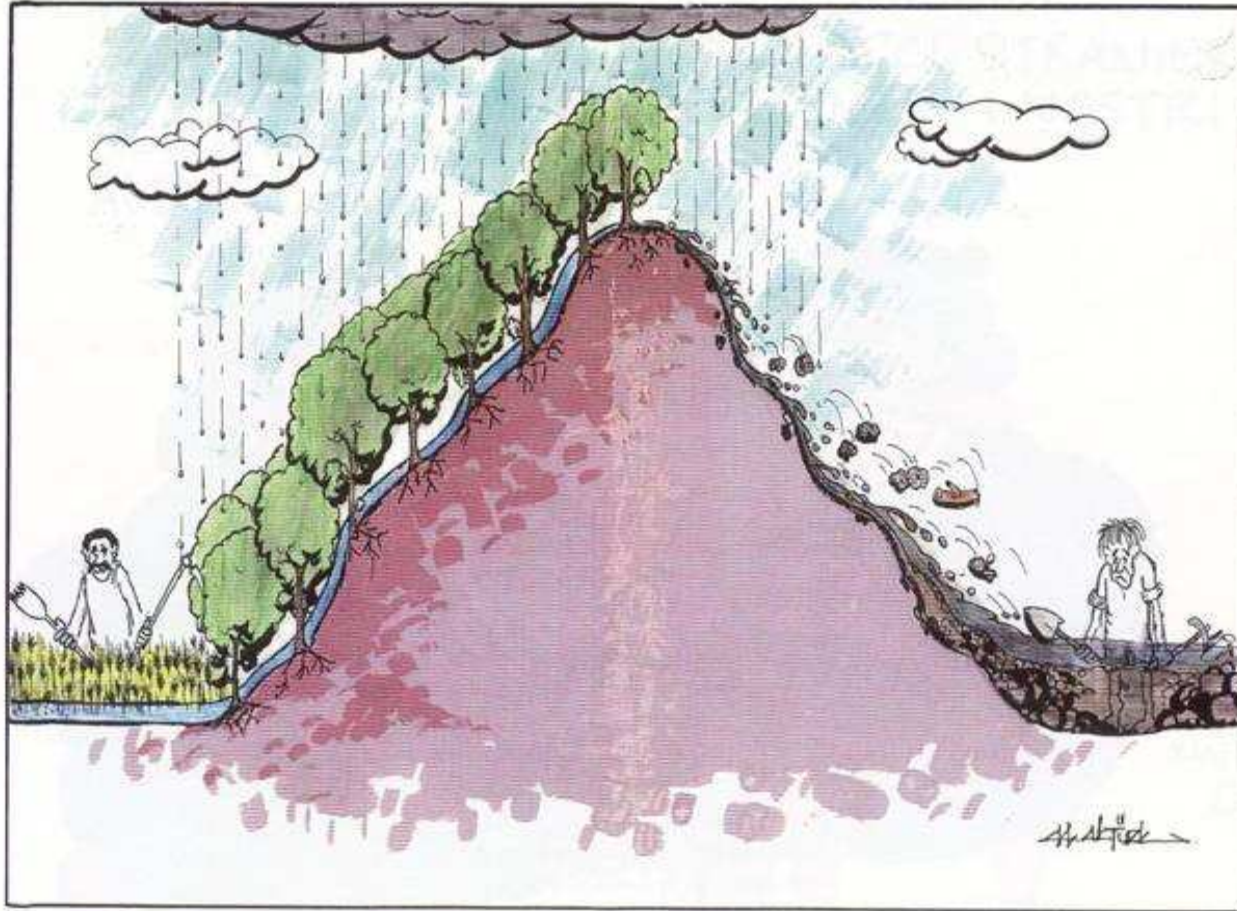


- Up to 2/3 vegetated
- At least 25% of country wooded
- A fertile country
  - Great prosperity
- Delicate balance disrupted





# The Consequences



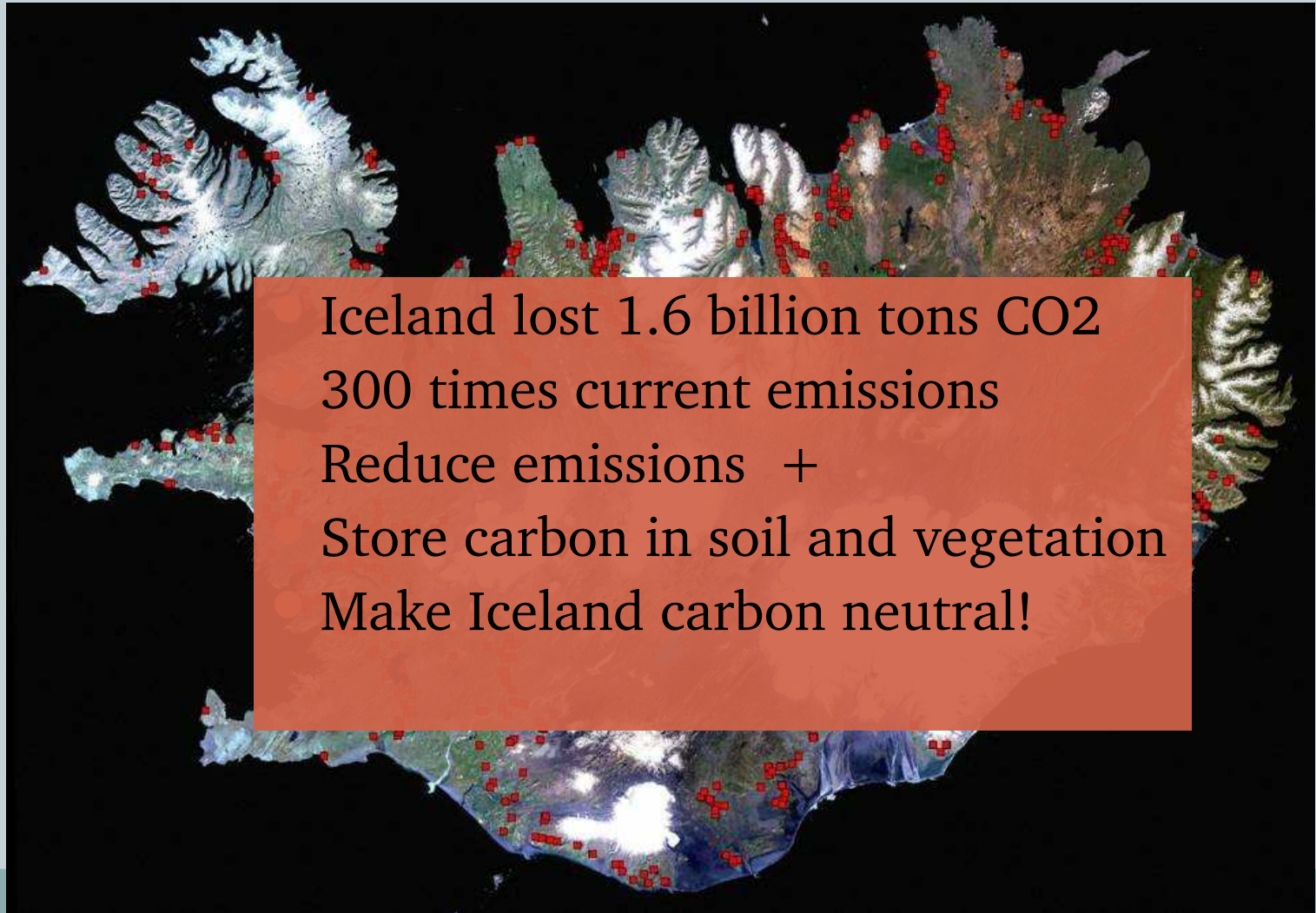
# 1907 – A law on forestry and prevention of soil erosion



The numerous success stories!



# Recharging the organic carbon



Iceland lost 1.6 billion tons CO<sub>2</sub>  
300 times current emissions  
Reduce emissions +  
Store carbon in soil and vegetation  
Make Iceland carbon neutral!



# A long history – A living laboratory



- Iceland – important role in creating an enabling environment
- Training program in land restoration and sustainable land management
- Aiming at becoming part of United Nations University



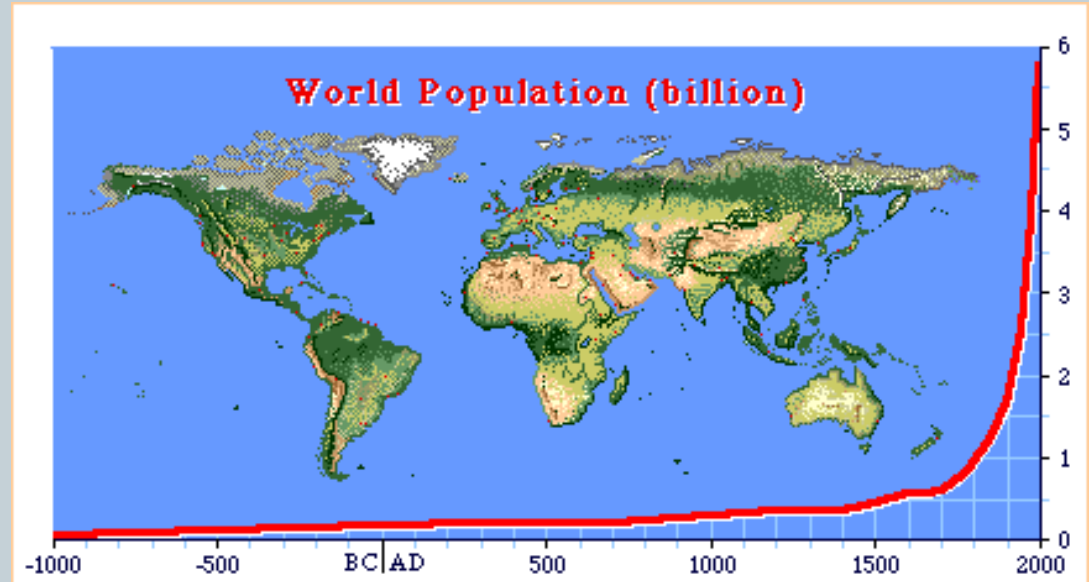
# Soil in Trouble!



# The challenge of food security



- Double food production within next 50 years
- Need to produce more food by 2080 than the total over last 10,000 years!



**Fertile land is  
the foundation**

UNITED NATIONS  
FRAMEWORK CONVENTION ON CLIMATE CHANGE

CCD



Soil is the vital but  
missing link  
between the  
Conventions  
and the MDG's



Convention on

Biological Diversity



# Repaying the Carbon Debt



- Atmospheric CO<sub>2</sub> is too high
- Restoration of degraded soils and ecosystems:
  - 0.9 to 1.9 billion tons C/year
- Increasing Soil Organic carbon pool by 1 ton/ha/yr in the root zone of soil's can increase world food production by 30-40 million ton/yr
- Need to link carbon projects to multiple benefits

*(Lal, 2007)*

# Action Plan



- Overcome barriers, including CDM
- Desertification Control and Carbon Trading Centre
- High level roundtable - bring together business leaders, scientists and policy makers
- Network of demonstration projects – carbon benefits
- Iceland an important partner

# Don't forget the soil!

## A key to Global Sustainability

Linking Landcare with  
Climate, Biodiversity,  
Water, Food Security,  
Poverty Reduction and  
Peace

