

**Committee: Environmental Sub-Commission 1**

**Issue: Preventing soil degradation and erosion**

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## **INTRODUCTION**

The Food and Agriculture Organization (FAO) defines land degradation as “the reduction in the capacity of the land to provide ecosystem goods and services and assure its functions over a period of time for the beneficiaries of these.”<sup>1</sup>

Soil degradation and erosion, a very well-known example of which is desertification, is a problem in many countries, mainly caused by the soil necessary for agriculture and other planting activities being washed away by water, wind and erosion in general. This leads to the earth being incompetent to enable vegetation to grow on it. This process is often set into action by human actions, such as the unsustainable use of land, poor soil and water management, deforestation, removal of natural vegetation, overuse of heavy machinery on the same ground, overgrazing, badly rotated crops and poor irrigation of farmlands.

This problem affects 1.5 billion people globally and it harms both people and nature. The loss of arable land, land opt for the production of crops, affects millions of people every year, because of the lack of food it can create and because of the increasing amount of flooding rivers or other waterways that can destroy complete villages. In addition, many fragile ecosystems are severely affected by the lack of vegetation due to erosion of fertile soil. If all plants disappear and waterways are clogged and polluted, sometimes these ecosystems may even collapse completely.

## **DEFINITION OF KEY TERMS**

### **Soil**

Soil is a mixture of earth, water, liquids, nutrients, bacteria, dead plants and other organic matters, minerals and many organisms that are necessary for plant life. An important correlation exists between the soil and the plant: the soil enables the plant to

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<sup>1</sup> <http://www.fao.org/nr/land/degradation/en/>

grow, and the plant keeps the soil in place with his roots and balanced by subtracting and adding nutrients.

### **Soil degradation**

The term refers to the general bad condition and quality of soil, as a result of natural factors or human activity. When the soil is degraded, its cultivation may become very difficult and/or impossible, thus turning it obsolete. Soil degradation may be caused by a variety of factors, such as erosion, deforestation (see below) etc..

### **Erosion**

The process by which the surface of the earth is worn away by the action of water, glaciers, winds, waves, etc. Soil erosion is the main factor causing soil degradation and is caused by different mechanisms: water erosion, wind erosion, chemical degradation and physical degradation. These mechanisms are often put into effect or intensified by human activities. Erosion is usually a result of deforestation or other activities that weaken the ground. For example, by taking away different barriers that support and protect the soil.

### **Deforestation**

Deforestation is the removal of trees or any other vegetation of parts of a forest and thereafter using the newly won ground for a non-forest use, such as agriculture. For instance, in the Amazon Rainforest, enormous patches of forest are cut down having as a result the destruction of the whole ecosystem and large amounts of soil being lost to the erosion of the Amazon River.

### **Succession**

Ecological succession is the process of change of the species present in an ecosystem, climbing from a pioneering stage to the climax stage, where the whole ecosystem is in a state of completely balanced equilibrium. Most biologists distinguish two different sorts of succession:

**Primary succession** implies the successional dynamics colonizing an area that has not yet been occupied by any living organisms (so there is no ecosystem yet prior to the succession), such as bear rocks that have been exposed due to natural factors like avalanches.

**Secondary succession** is the succession following severe destruction or disturbance of the previous ecosystem. Secondary succession distinguishes itself from primary succession

because of its speed: after most sorts of the removal of parts of an ecosystem, great parts of the soil remain, facilitating the succession and colonization on the earth

## **BACKGROUND INFORMATION**

### **Causes of soil degradation and erosion**

The causes of land degradation can be divided into natural hazards, direct causes, and underlying causes. Natural hazards are the conditions of the physical environment that lead to the existence of a high degradation hazard, for example steep slopes as a hazard for water erosion. Direct causes are unsuitable land use and inappropriate land management practices, for example, the cultivation of steep slopes without measures for soil conservation. Underlying causes are the reasons why these inappropriate types of land use and management are practiced; for example, the slopes may be cultivated because the landless poor people need food, and conservation measures may not be adopted because these farmers lack security of tenure.<sup>2</sup> This shows that the influence of agriculture practices plays a very significant role in the erosion and degradation of the land.

### **Succession and the build-up of soil**

When an ecosystem starts to build up, one of the main factors of defining the amount and species of vegetation living in the ecosystem are the soil, the earth drenched with nutrients and microorganisms. Over the span of many thousands of years, topsoil is build up in which plants can root themselves and that supplies them with all the nutrients they need in order to complete the process called photosynthesis and thus grow. It is because of this enormously long time it takes soil to build up, that the problem of erosion and degradation is such a big one: it is very difficult to enhance and rebuild in artificial 'secondary succession' (as you could call it) soil that was built up over so many years. The main factors following human activity contributing to the erosion of soil are deforestation, poor and outdated farming techniques, the pollution of forests and overgrazing.

### **Deforestation**

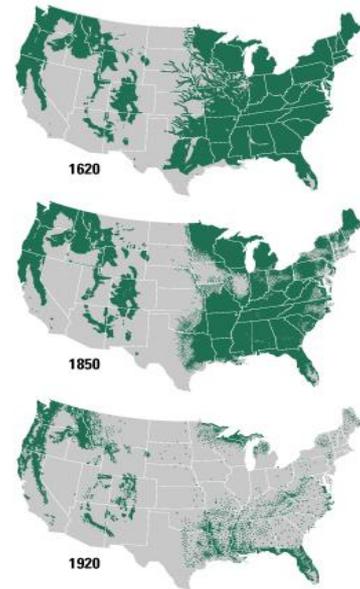
Since its origin, the human race has always exploited the forests in many ways. Forests have been cleared, degraded and fragmented by timber harvest, conversion to agriculture, road-building, human-caused fire, and in multiple other ways too. The effort to use and subdue the forest has been a constant theme in the transformation of the earth, in many societies, in many lands, and at most times. Deforestation has important implications

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<sup>2</sup> <http://www.fao.org/docrep/v4360e/V4360E08.htm>

for life on this planet. Almost the whole world used to be covered in forests, but as figure 1<sup>2</sup> shows, many forests all over the world have disappeared due to human actions. The forests have been mostly removed for fuel, building materials and to clear land for farming. The clearing of the forests has been one of the most historically relevant and changing tasks ever executed by people.

Deforestation plays an important role in the process of the erosion of soil. Farmers cut down many trees in, for example, tropical rainforests and burn the



**Figure 1: Area of primary forests in the USA**

plants they killed, in order for the ground to get more saturated with nutrients. This is called the ‘slash and burn’ method, often used illegally. Without plant cover, the soil and earth lay loose and erosion can occur, with the wind and rain sweeping the land into the rivers. The agricultural plants that often replace the trees after the logging has taken place cannot hold onto the soil and many of these plants, such as coffee, cotton, palm oil, soybean and wheat, can actually worsen soil erosion. And as land loses its fertile soil, agricultural producers move on, clear more forest and continue the cycle of soil loss. That way, deforestation has worsened, causing further soil erosion. Deforestation is especially harmful when the land that is deforested is slightly sloping and has soils that easily wash away or waterways that erode the land.

### **Farming techniques and overgrazing**

“Inappropriate grazing can be defined as the practice of grazing too many livestock for too long a period on land unable to recover its vegetation, or of grazing ruminants on land not suitable for grazing as a result of certain physical parameters such as its slope.”<sup>3</sup> When areas,



**Figure 2: Degraded vegetation and soil as a result of overgrazing in Senegal**

<sup>3</sup><http://www.fao.org/ag/againfo/programmes/en/lead/toolbox/Grazing/overgraz.htm>

whether they were forest before or not, are turned into pasture land for cattle to graze, they can disappear because of erosion in the same way erosion attacks after deforestation: because of the lack of plants holding the roots and the reduction of ground cover the sand and soil can wash away. Animals can also erode the ground themselves with their hooves. The removal of the protective cover of the land to reduce competition for water and nutrients, heavy grazing and deforestation all leave the soil highly vulnerable to wind erosion, particularly during severe droughts. Also, heavy grazing around water points or during long droughts prevents or delays the regrowth of vegetation or favours only unpalatable shrubs. After the soil has been eroded away, the areas that have been overgrazed become barren and desert-like, because the nutrient-rich upper layers have been removed and the plants can not grow back as shown in figure 2.

Type of degradation	Percentage area of degradation type caused by			
	Deforestation	Overgrazing	Agricultural activities	Overcutting of vegetation
Water erosion	61	67	2	44
Wind erosion	21	46	1	98
Soil fertility decline	25	0	75	0
Salinization	34	30	14	87
Waterlogging	0	0	85	33
Lowering of water table	12	22	65	34
All types of degradation	37	46	15	63

**Figure 3: Causes of degradation as given in the GLASOD assessment**

As shown in Figure 3<sup>4</sup>, next to overgrazing and deforestation, agricultural activities can also be very harmful to the soil and cause it to erode. The heavy farming of crops can make soil lose its nutrients and water, thus wearing out the soil. This triggers the erosion as it stops plants from growing on this specific land. The unsustainable use of irrigation sometimes also worsens the erosion and even more the dryness of the land, as water comes to a few places only and is then logged on these spots and not equally dispensed over the whole farmland.

<sup>4</sup> <http://www.fao.org/docrep/v4360e/V4360E08.htm>

## **Effects of soil degradation**

A very important effect of soil degradation is, of course, the food shortages for people. As the possibility to farm crops on the land disappears, the rural villages will come short of food. Also, the complete ecosystem will be damaged and the terrain can even turn into a desert. Research also shows us that the erosion of soil triggers the climate change, for two reasons. Firstly, after the soil has been washed away, no plants will grow there anymore and thus no photosynthesis will take place, reducing the amount of carbon dioxide used by plants and the amount of oxygen produced. Secondly, because of the fact that soil contains very big amounts of stored carbon, a lot of carbon will dissolve into the atmosphere, as the amount of carbon is able to store is depleted.

Furthermore, soil degradation may cause the valuable species to disappear from particular ecosystems, thus breaking food chains and disturbing the equilibrium of the ecosystems. Depleted vegetation in an area may also raise the frequency and/or severity of floods, as well as water pollution.

Taking all these factors into consideration, it is obvious that soil degradation can have severe implications for countries on a societal and economic level; thus dealing with this critical phenomenon is imperative.

## **MAJOR COUNTRIES AND ORGANIZATIONS INVOLVED**

### **Brazil, Indonesia, Ethiopia and Madagascar**

Brazil, Indonesia, Ethiopia and Madagascar are only a few examples of the many countries that struggle with heavy deforestation, erosion and desertification. In Brazil, deforestation could wipe out nearly 60% of the Amazon rainforest by 2030, and the rates are doubling every year. Approximately 80% of the logging in the Amazon rainforest is illegal and many times the deforestation leads to heavy erosion as the topsoil in the tropical rainforest is very thin and vulnerable without plants for cover. The rainforest is logged mostly in order to build new farms and pasture lands, moving into the forest deeper and deeper. In 2005, Indonesia had lost over 72% of intact forests and 40% of all forests, leading to soil degradation. Indonesia has one of the biggest tropical wood stocks in the world, but is losing it at a high rate. Ethiopia has lost 98% of its forests in the last 50 years, mostly due to the enormous population growth in the region, with its people expanding and claiming new ground, slashing away the forests. The loss of the forests means less rain and thus causes erosion more than ever. Lastly, Madagascar has also lost almost all the forests it once had, resulting in erosion and degradation of the soil as well.

### **World Wildlife Fund**

The World Wildlife Fund (WWF) is engaged in this problem mostly because of its effects on flora and fauna, wildlife and nature in general. It works to prevent desert expansion, for example, through projects linking and protecting forests and to eliminate deforestation, although it admits that “Eliminating all deforestation is not possible. Parts of the landscape will need to be reshaped and altered as populations grow and change—but this can be balanced through sustainable forest management, reforestation efforts and maintaining the integrity of protected areas.” Of course, the WWF also plays a large role in promoting sustainable agriculture and raising the awareness of the public concerning this pressing matter.

### **Food and Agriculture Organization of the United Nations**

The Food and Agriculture Organization (FAO) of the United Nations, founded in 1943, is the UN-body aiming to improve food production and agricultural quality globally, thereby employing the following strategic objectives: to help eliminate hunger, food insecurity and malnutrition, to make agriculture, forestry and fisheries more productive and sustainable, to Reduce rural poverty, to enable inclusive and efficient agricultural and food systems, and to Increase the resilience of livelihoods to threats and crises. In striving to reach these objectives, the FAO has identified and confronted the problem of soil erosion as one of the main causes of agricultural failures and food shortages, and thus is a major investigating and solving party for this issue.

### **United Nations Environment Programme**

As a leading global authority on the environmental theme that determines the environmental agenda, the United Nations Environment Program (UNEP), which was founded in 1972, emphasizes and promotes the sustainable development in the field of environmental issues within the United Nations and global pleader and advocate for the concern of the environment. It has formulated its own mission as follows: "To provide leadership and encourage partnership in caring for the environment by inspiring, informing, and enabling nations and peoples to improve their quality of life without compromising that of future generations."<sup>5</sup> It provides research and development programs on regional, national and international level, thus aiming to tackle the biggest environmental issues of our time, including soil degradation and erosion.

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<sup>5</sup> <http://www.unep.org/about/>

## TIMELINE OF EVENTS

Date	Description of Event
1945	The UN Food and Agriculture Organization was founded by the UN in Quebec City, Canada, on the 16 <sup>th</sup> of October which was the first sign of the engagement of the UN in the agricultural aspects of the environmental and economic world.
1992	The UN Conference on Environment and Development (Earth Summit) called upon the United Nations General Assembly (GA) to establish an Intergovernmental Negotiating Committee (INC) to prepare, by June 1994, an international convention to combat desertification in those countries experiencing serious drought and/or desertification, particularly in Africa, to which the GA agreed in December 1992.
1996	The abovementioned Convention entered into force on the December 1996
2006	This year was declared the International year of Deserts and Desertification by the UN General Assembly

## UN INVOLVEMENT: RELEVANT RESOLUTIONS, TREATIES AND EVENTS

- A/RES/62/193 - Implementation of the United Nations Convention to Combat Desertification in Those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa: The main resolution by the UN, as mentioned above, deciding to implement the UNCCD.
- A/RES/44/172 – Plan of action to Combat Desertification: another important resolution by the General Assembly of the UN focusing on desertification and soil degradation.

### United Nations Convention to Combat Desertification

The United Nations Convention to Combat Desertification (UNCCD) was drafted together with the Convention on Biological Diversity (CBD) and the United Nations Framework Convention on Climate Change (UNFCCC) in 1994, to globally combat desertification and soil degradation addressing specifically the arid, semi-arid and dry sub-

humid areas, where the most vulnerable ecosystems and people can be found. A further 10-year strategy in 2007 to be followed from 2008 to 2018 was adopted. The convention consists of 195 signatory parties, which are working together to improve the living conditions for people in dry lands, to maintain and restore land and soil, and to minimize the effects of drought. It focuses on working “bottom-up”, i.e. engaging regional communities in the problem and the solutions. Also, it works closely together with the aforementioned CBD and UNFCCC, as their objectives go hand-in-hand many times.

## **PREVIOUS ATTEMPTS TO SOLVE THE ISSUE**

A significant project that is currently being run by the FAO, the World Association Soil and Water Conservation (WASWC) in collaboration with several institutions and coordinated by the University of Bern, Switzerland, is the World Overview of Conservation Approaches and Techniques (WOCAT). This project aims to promote the integration of successful soil and water conservation approaches and techniques into land use systems worldwide.<sup>6</sup> Since its foundation in 1992, it has built up a global network of soil preservation specialists that collaborate on research and the collection of data. Since August 2014, the network has gained a legal basis and since then it is not just an informal network but has been recognized by the UNCCD as the primary recommended database for Sustainable Land Management (SLM) best practices, including measures of adaptation.<sup>7</sup> This network has proven to be of great value for the results of research and gives a promising sight for the future.

In addition, the UN and signatories to the UNCCD hold an annual conference on Combating Desertification as well as the World Day to Combat Desertification, on the 17<sup>th</sup> of June. This last event is mainly to raise awareness on the issue, while the convention itself focuses more on implementing actual measures to combat desertification as a result of erosion and degradation of the soil, such as supplying information to farmers about proper farming techniques and trying to stop deforestation.

Not to be forgotten either is the Forest Stewardship Council (FSC), an organization that strives for environmentally appropriate forest management, in a socially and economically beneficial way. It aims to do this by standardizing and labeling the wood, supplying an internationally recognized trademark for sustainably cut wood. This way,

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<sup>6</sup> <http://www.fao.org/soils-portal/soil-management/soil-conservation/en/>

<sup>7</sup> <https://www.wocat.net/en/about-wocat.html>

deforestation may be controlled. The FSC is internationally successful because of its great credibility and recognition, which ensures the buyer of the wood that it has been sustainably planted and logged.

## **POSSIBLE SOLUTIONS**

When solving this issue, it is important to try to directly address the main causes of the problem whilst also trying to restore the already lost soil.

To begin with, the practices concerning farming, deforestation and the cutting away of natural vegetation should be called to a stop. By supplying the farmers in the concerned areas with workshops and other kinds of education on how to correctly plant their crops and take care of their farmlands so as to limit erosion as much as possible, which will also benefit the farmers themselves very much, this first point should be solved. Deforestation, however, is an issue that is solved less easily, as most of the logging happens illegally. A certificate such as the FSC should be implemented, endorsed and made legally binding. That way, deforestation might be minimized, although it can never truly be stopped. The removal of natural vegetation because of whatever reason by the rural people should also be stopped, by searching together with the local community for a sustainable alternative in order not to harm the people either.

Furthermore, if soil in some areas can be rebuilt, this should be done as fast as possible, although the buildup of soil usually takes up plenty of time. This can still be achieved, however, by implementing the measures of example the UNCCD or the FAO on this topic. These methods might be more costly and long-term solutions, but they will pay off in the end when implemented correctly (although do take into consideration countries that cannot afford these measures).

While searching solutions on this issue, it is important to always work on a local, national and international level, because a lot of times the population itself knows best how to handle the situation in each different case, whilst the government of the country has a wide overview and the international community can provide the lobby, long-term involvement and the economical aspects of the solutions and measures. Raising awareness should not be forgotten because it is an issue of great importance and in the long term it will affect the entire world.

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