



INTOSAI
Working Group
on Environmental
Auditing



**Auditing Guidelines
for SAIs on
Land Use and
Soil Quality Management
for Combating Desertification**



This publication was prepared by the INTOSAI Working Group on Environmental Auditing (WGEA). The WGEA aims to encourage the use of audit mandates and audit methods in the field of environmental protection and sustainable development by Supreme Audit Institutions (SAIs). The WGEA has the mandate to

- help SAIs gain a better understanding of the specific environmental auditing issues,
- facilitate exchange of information and experiences among SAIs, and
- publish guidelines and other informative material.

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Foreword

For the International Organisation of Supreme Audit Institutions (INTOSAI) Working Group on Environmental Auditing's (WGEA) 2017-2019 Work Plan, the Supreme Audit Institution (SAI) of the Pakistan volunteered to lead a project on Auditing Guidelines for SAIs on Land Use and Soil Quality Management for Combating Desertification.

We would like to convey our gratitude to all the SAIs who have contributed to this document. We would like to thank their participation in completing the mini-survey distributed by INTOSAI WGEA Secretariat. We also thank SAIs' active participation during the 18th INTOSAI WGEA Assembly Meeting in Bandung, Indonesia especially Mrs. Manako Ramonate from SAI of Lesotho.

Special thanks given to Mrs. Rukhsana Rafique and her team, for without her team's efforts this document could not be completed in time. We would also like to thank the Steering Committee members who have given many valuable inputs to the document during the process.

Last but not least, we would like to convey our gratitude to INTOSAI WGEA Secretariat for their support during various stages in writing this document.

We hope you find this document useful.



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**Quality Assurance Certificate of the
Chair of INTOSAI Working Group on Environmental Auditing (WGEA)**

This is to certify that ***Auditing Guidelines for SAIs on Land Use and Soil Quality Management for Combating Desertification*** which is placed at level three of Quality Assurance as defined in the paper on “Quality Assurance on Public Goods developed outside Due Process” approved by INTOSAI Governing Board in November 2017 has been developed by following the Quality Assurance processes as detailed below:

- i. The project proposal was developed by the team with consultation of INTOSAI WGEA Steering Committee Members;
- ii. The project was discussed during the 15th INTOSAI WGEA Steering Committee Meeting at Washington D.C- USA. in 2017 and further discussed during parallel session of 18th INTOSAI WGEA Assembly Meeting in Bandung-Indonesia;
- iii. The project output draft was circulated among team members, steering committee members, and has gone through more than 30-day exposure (from 22 March to 10 May 2019) for comments at INTOSAI WGEA website and circulated among WGEA members.

The product developed is consistent with relevant INTOSAI Principles and Standards. The structure of the product is in line with the drafting convention of non-IFPP documents.

The product is valid until 30 September 2029 and if it is not reviewed and updated by 30 September 2029, it will cease to be a public good of INTOSAI developed outside the Due Process.

Jakarta, July 2019

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Quality Assurance Certificate

Chair of the Goal 3: Knowledge Sharing and Knowledge Services Committee

Based on the assurance provided by the Chair of the ***Working Group on Environmental Auditing*** and the assessment by the Goal Chair, it is certified that the ***Auditing Guidelines for SAIs on Land Use and Soil Quality Management for Combating Desertification*** which is placed at level **3 (three)** of Quality Assurance as defined in the paper on "Quality Assurance on Public goods developed outside Due Process" approved by the INTOSAI Governing Board in November 2017, has been developed by following the Quality Assurance process as detailed in the Quality Assurance Certificate given by the Working Group Chair.

The product is valid till **30th September 2029** and, if not reviewed and updated by **30th September 2029** it will cease to be a public good of INTOSAI developed outside the Due Process.



Rajiv Mehrishi
Chair of INTOSAI Knowledge Sharing and
Knowledge Services Committee

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Executive Summary

Desertification has been neatly defined in the text of United Nations Convention on Combating Desertification (UNCCD) as, "Land degradation in arid, semi-arid and dry sub-humid regions resulting from various factors, including climatic variations and human activities".

The phenomenon of desertification becomes evident when a comparatively dry land loses its water contents and vegetation and is converted to an arid zone. Land performs multiple functions to sustain the mankind on earth. The interaction among land resources is vital for determining the productivity and sustainability of agro-ecosystems. Deforestation, soil erosion, clearing land for construction, demographic and biological pressures are among the main causes of land degradation and desertification.

Combating desertification is dependent on how effectively management strategies are employed. The strategies need to be devised at both international and national levels for exercising all existing options to avoid or reverse desertification and its negative impacts. In this regard, managing land use and soil quality are two important strategies to assess the size of the issue and adopt reversal process accordingly.

This is due to the acknowledgement of limited land resources and thereby, adoption of a wise use of available resources. Few examples, in this regard, are Sustainable Land Management, Integrated Landscape Management (ILM), Land Governance and Land Use Planning, and Soil Quality Management. The importance of improved soil is evident from the fact that out of 17 Sustainable Development Goals (SDGs) adopted by United Nations in 2015, four goals have targets specially related to soils.

Lastly, Chapter 3 and 4 provide understanding to Supreme Audit Institutions as how to conduct environment audits of initiatives aimed at combating desertification and offer several audit topics and case studies related to combating desertification.

Acronyms and Abbreviations

CBD	Convention on Biological Diversity
CITES	Convention on Trade of Endangered Species
CSIRO	Common Wealth Scientific & Industrial Research Organization
EIA	Environmental Impact Assessment
EPA	Environmental Protection Agency
EU	European Union
FAO	Food and Agriculture Organization
FAOSTAT	Food and Agriculture Organization Corporate Statistical Database
GIS	Geographical Information System
GPS	Global Positioning System
HCEFLCD	High Commissioner for Water, Forests and Combating Desertification
ILM	Integrated Landscape Management
INTOSAI	International Organization of Supreme Audit Institutions
LDN	Land Degradation Neutral
MDGs	Millennium Development Goals
MEAs	Multilateral Environmental Agreements
NAO	National Audit Office
NAP	National Action Programs (NAPs)
NPA	Natural Protected area
PRSP	Poverty Reduction Strategy Papers
SAI	Supreme Audit Institution
SDGs	Sustainable Development Goals

SLM	Sustainable Land Management
SOC	Soil Organic Carbon
UN	United Nation
UNCCD	United Nations Convention on Combating Desertification
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNSD	United Nations Statistics Division
USD	United States Dollar
WGEA	Working Group on Environmental Auditing

Chapter 1

Introduction

DESERTIFICATION: A PHENOMENON

With the increase in population size, human activity is modifying the natural environment unprecedentedly, producing what is known as the built environment. The potential of natural environment to sustain the human induced changes, while continuing to function as an ecosystem is an issue of major worldwide concerns. Key environmental areas of interest include climate change, water issues, air pollution, waste management and land use issues such as deforestation, desertification and urban sprawl. The world is trying to respond to these changes effectively and bring sustainability to natural environment. One of the major challenges faced by mankind is the phenomenon of desertification which is the result of climate change and human activities.

Desertification has been neatly defined in the text of United Nations Convention on Combating Desertification (UNCCD) as, "Land degradation in arid, semi-arid and dry sub-humid regions resulting from various factors, including climatic variations and human activities".

Land in this concept includes soil and local water resources, land surface and vegetation or crops.

Degradation implies reduction of resource potential by one or a combination of processes acting on the land. These processes include water erosion, wind erosion and sedimentation by those agents, long term reduction in the amount or diversity of natural vegetation, where relevant, and salinization and sodification.

The phenomenon of desertification becomes evident when a comparatively dry land loses its water contents and vegetation and is converted to an arid zone. An arid zone is too dry to support vegetation and becomes unproductive.

Land degradation is loss of biological and economic productivity of dry lands.

Vegetation plays an important role in determining the biological composition of the soil. Without vegetation, dry soils are blown away with wind or washed away with flooded water; thus leaving behind the soil layer which is highly unproductive.

These definitions are not confined to advancing frontiers of sand that swallow up pastures and agricultural land, as is popularly known. Indicators of desertification are mainly belong to physical, biological and socioeconomic domains, as listed below, which give better understanding of the desertification process.

Physical indicators

- Decrease in soil depth
- Decrease in soil organic matter
- Decrease in soil fertility
- Soil crust formation/compaction
- Appearance/increase in frequency/severity of dust sandstorms/dune formation and movement
- Salinization/alkalization
- Decline in quality and quantity of ground and surface water
- Increased seasonality of springs and small streams
- Alteration in relative reflectance of land (albedo change)

Biological indicators

a. Vegetation

- Decrease in cover
- Decrease in above-ground biomass
- Decrease in yield
- Alteration of key species distribution and frequency
- Failure of species successfully to reproduce

b. Animal

- Alteration in key species distribution and frequency
- Change in population of domestic animals
- Change in herd composition
- Decline in livestock production
- Decline in livestock yield

Social/economic indicators

- Change in land use/water use
- Change in settlement pattern (e.g. abandonment of villages)
- Change in population (biological) parameters (demographic evidence, migration statistics, public health information)
- Change in social process indicators - increased conflict between groups/tribes, marginalization, migration, decrease in incomes and assets, change in relative dependence on cash crops/subsistence crops

Source: Reining (1978) and Kassas (1987)

To calculate the change in the above mentioned indicators i.e. physical, biological and social, it is suggested that the variation may be assessed in the study period in comparison with a base period.

Land offers limited resources which may diminish or degrade if used unsustainably. Sustainable land use and land management practices are keys to avoid further deterioration of already pressured land resources and well researched actions are required to restore the previously degraded land. Land use, which generally relates to land cover, has great influence on desertification risk. By affecting the soil, climate and human activity of a particular land, land use may lead to high risk of desertification. The three actions, which can be taken place, to combat desertification are as follows.

- 1. Avoid the risk of desertification:** Avoiding relates to prevention measures taken to avert the degradation of land. Such measures are taken at both micro (local) and macro (policy) levels. Prevention is more advisable as restoration is costly and it produces limited results. This approach is focused on sustainable use of land ecosystem services. Improved agricultural practice is one of the preventive measures.
- 2. Mitigate the Land degradation:** The areas where desertification process has just started are easier to restore. Major policy interventions and management approaches are needed to overcome the challenges of desertification.
- 3. Rehabilitate the degraded land:** Rehabilitation requires repairing the damaged or degraded land with the primary goal to achieve regaining of ecosystem services. It is costly and demands specialized techniques and management practices.

Drylands

The United Nation Environment Program (UNEP) defines dry lands in terms of an Aridity Index (AI), which is the ratio between average rainfall and potential evapotranspiration (loss of water to the air from soil and plants etc.). (see figure 1.1)

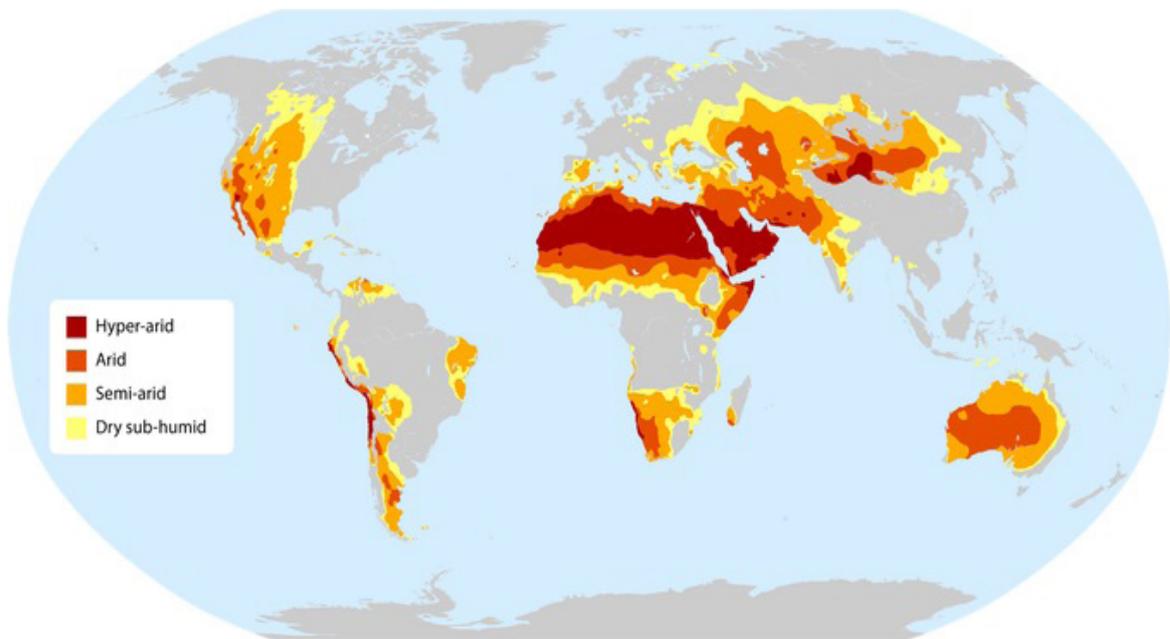
Combating desertification does not cover hyper arid land i.e. natural deserts.

Dry lands are lands with an AI of less than 0.65. Dry lands are further divided, on the basis of AI, into

1. Hyper arid land
2. Arid land
3. Semi-arid land
4. Dry sub humid land

Dry lands are found in most of the world's biomass and climatic zones and constitute 41% of the global area.

Figure 1.1: Map of drylands across globe

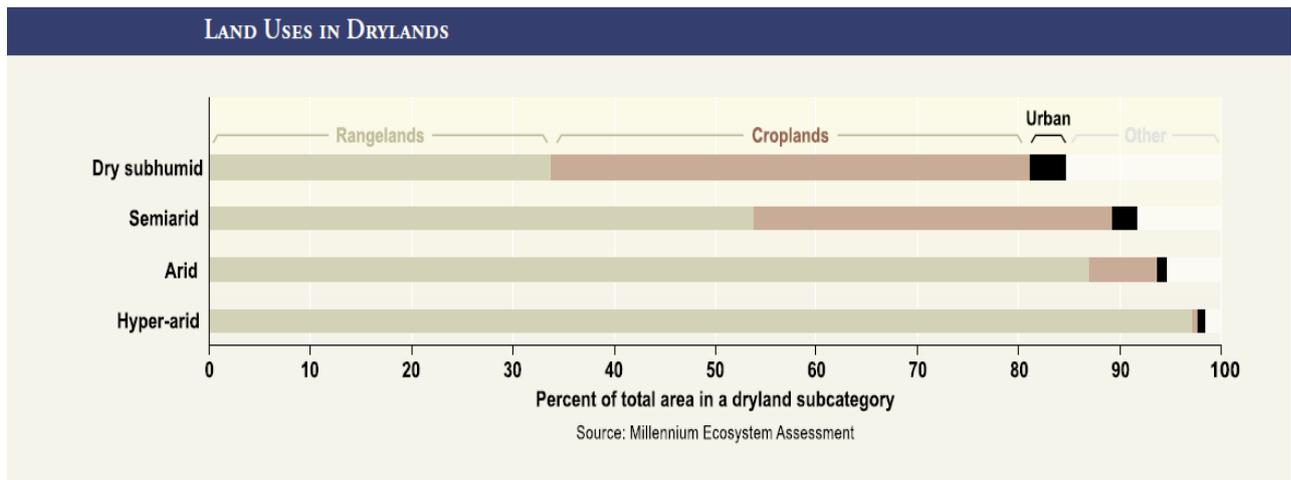


The world's dry lands and subtypes, prepared using spatial data from UNEP-WCMC(2007)

It is pertinent to mention here that the term desertification does not cover the existing natural desert cover (hyper arid land) as it is already non-productive and cannot be rehabilitated. Desertification covers only arid, semi-arid and dry sub humid land, which if managed properly, may remain sustainable for future food production.

The figure 1.2 explains the distribution of different categories of land in a dryland.

Figure 1.2: Land uses in drylands



LAND AND ITS RESOURCES

The canvas of land is so big that it houses a vast variety of human activities and provides support to agriculture, habitats and natural resources. Land is the basis for agriculture and other rural land uses, encompassing soils, climate, vegetation, topography and other natural resources. Food and Agriculture Organization of the United Nations (FAO) defines land as, “Land and Land Resources refer to a delineable area of the earth’s terrestrial surface, encompassing all attributes of the biosphere immediately above or below this surface, including those of the near surface, climate, the soil and terrain forms, the surface hydrology (including shallow lakes, rivers, marshes and swamps), the near-surface sedimentary layers and associated groundwater and geo-hydrological reserve, the plant and animal populations, the human settlement pattern and physical results of past and present human activity (terracing, water storage or drainage structures, roads, buildings etc.)”

Land performs multiple functions to sustain the mankind on earth. The interaction among land resources is vital for determining the productivity and sustainability of agro-ecosystems. The resilience of the system to endure and adapt to natural (e.g. climate change and variability) and human-induced (e.g. land use and management) changes and fluctuations is determined by the status and endurance of the land resource components and their interactions.¹

Inland water, urban, cultivated, and other systems are integral parts of dry lands and thus are critically linked to desertification processes.

The different functions performed by land and the interaction among land resources are as under:

Land and Climate

The role of land in maintaining/regulating the climate is significant. According to United Nations, a century and a half of industrialization including clear felling of forests and certain farming methods, has driven up quantities of greenhouse gases in the atmosphere; thus bringing climate change on our planet.

¹ <http://www.fao.org/land-water/land/en/>

The factors responsible for temperature change on earth are the direct result of how land and its resources are used. The process is reciprocal and multifaceted where the climate change is also affecting the land by drying its water contents and disturbing the soil flora and fauna. Therefore, a direct relation exists between desertification and climate change.



The land functions play a vital role in maintenance of climate on earth. The surface of land heats up and cools down faster than water or air; thus influence climate severely.

The type of land cover that receives energy from the sun affects the amount of energy that is reflected or transferred to earth. Different land cover show different reflectivity which is measured as **Albedo**. From the table, it is shown that forest cover shows comparatively low reflectivity rate and controls rise in temperature of a particular surroundings therefore, recommended for maintaining climate.

Land Cover	Albedo
Forest	10-15%
Grassland	15-20%
Sandyland	25-40%

Land use by humans also plays a crucial role in the regional and global climate. Densely populated cities are warmer and create urban heat islands that have effects on the precipitation, cloud cover and temperature of the region.

Land is a co-determinant in the global energy balance² and the global hydrological cycle³, which provides both a source and a sink for greenhouse gases.⁴

Five of the eight slow onset events identified by the United Nation Climate Change Convention (UNCCC) as potential future sources of huge losses and damage are manifestations of declining land productivity. These are desertification, salinization, land and forest degradation, biodiversity loss and rising temperatures. Globally, about Two billion hectares of land have been degraded. Most of these tracts can be restored back to health.

Land also plays an important role in the process of carbon sequestration. Carbon sequestration is a long-term storage of carbon in plants, soils, geologic formations, and the ocean. Carbon sequestration occurs both naturally and as a result of anthropogenic activities and typically refers to the storage of carbon that has the immediate potential to become carbon dioxide gas. In response to growing concerns about climate change resulting from increased carbon dioxide concentrations in the atmosphere, considerable interest has been drawn to the possibility of increasing the rate of carbon sequestration through changes in land use and forestry and also through geo-engineering techniques such as carbon capture and storage.

Land and Economy

For many people, healthy land is a primary asset which is central to economic rights and supports livelihood around the globe from food to job. Agricultural income is a primary means of living and is a source of food, clothing and housing and guarantee a basic income for everyone. Land is also a storehouse of minerals and raw material for human use. Failure to effectively prevent and mitigate impact of land use and climate change could drastically reduce access to land and its resources, especially for marginalized groups.

2 The global energy balance is the balance between incoming energy from the Sun and outgoing heat from the Earth. The global energy balance regulates the state of the Earth's climate, and modifications to it as a result of natural and man-made climate forcing, cause the global climate to change.

3 The hydrologic cycle describes the continuous re-circulating transport of the waters of the earth, linking atmosphere, land and oceans.

4 Gases that contribute to the greenhouse effect by absorbing infrared radiation. Carbon dioxide and chlorofluorocarbons are examples of greenhouse gases.

The FAO see the role of mankind is as a steward rather than exploiters, charged with the responsibility of safeguarding the rights of unborn generations and conserving land as a basis of the global ecosystem.

"Everything we produce and consume has a land footprint. A bicycle requires 3.4 square meters of land. Ten square meters of land are used to produce a laptop. Producing one kilogram of beef takes twenty two square meters," but few people give thought to these daily processes "because the losses are not visible – or at least not accounted for - in the products we consume".⁵

The global economy will lose a whopping USD23 trillion by 2050 through land degradation, a review by the United Nations Convention to Combat Desertification (UNCCD) warns. To take urgent action now and halt these alarming trends would cost USD4.6 trillion – only a fraction of the predicted losses.

Land and Ecosystem

To understand the process of the desertification of a dry land, it is important to understand the concept of ecosystem. An **ecosystem** is a combination of living and non-living environment in a particular area. It is a complex interaction of vegetation, animals, fungal and micro-organisms with its associated non-living environment in one place.

An ecosystem is weaved in a way that disturbance of one component may lead to spoiling of whole system. The land ecosystem provides support to livelihood from food to jobs and any disturbance in land ecosystem or land degradation affects the supply of benefits land provides to a population. The diminishing ecosystem services or land benefits (including food and water) increase the poverty and ultimately give rise to human migration at a massive scale.

Ecosystem Services are benefits people get from an ecosystem. Land ecosystem provides many ecosystem services as mentioned below.

Provisioning Services are the products which any ecosystem provides such as food, fodder, fiber and water.

Regulating Services are obtained from regulating ecosystem processes like regulating climate, flood and disease control.

Cultural Services are the non-material services people gain from ecosystems like recreation and aesthetic fulfillment.

Supporting Services are necessary for the production of all other ecosystem services for example biomass and atmospheric oxygen production, soil formation and retention, nutrient and water recycling and provisioning habitat for wildlife.

In dry lands, the water supply is irregular and scarce. And it becomes difficult to fulfill the human demand for the supply of ecosystem services like food, forage, fuel, building materials, and water for humans and livestock, for irrigation, and for sanitation without disturbing the balance of land resources.

The increase in population with unorganized land use patterns and climatic changes at global level are leading factors contributing towards desertification of dry lands. If unsustainable agricultural practices and untenable urbanization go unchecked, the phenomenon may lead to further land deterioration and socio political troubles.

Land and Water Flow

Land plays a crucial role in regulating the storage and flow of surface and ground water. The effective harnessing of water, either from rain or snow, is a key to the successful and sustainable management. The rain water is collected in an area of land called Watershed (a drainage basin) and drained off into a common outlet, such as a river, bay or other body

⁵ Monique Barbut, Executive Secretary, UNCCD.

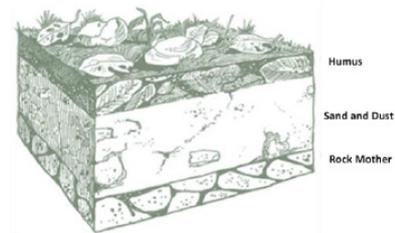
of water. Such management of water is called **Watershed Management** and it ensures the availability of water from the high supply season to the high demand season to give sustainability to the land function and avoiding desertification.

The rain water is stored in large surface reservoirs from which it is further distributed through canals etc. This process is costly and land reservoirs are also subjected to excessive evaporation and sedimentation which may result into flooding. The alternate can be to store water undergrounds. The ideal solution is to use both the storage methods conjunctively and give continuity to the land.

Land and Soil

According to FAO, the word soil has several meanings. Its traditional meaning is defined as the natural environment for the growth of plants. It has also been defined as a natural body consisting of layers of soil (horizons of the soil) composed of weathered mineral materials, organic matter, air and water. The soil is the final product of the influence of time and combined with climate, topography, organisms (flora, fauna and human being), of parent materials (rocks and original minerals). As a result, the soil differs from its parent material in its texture, structure, consistency, color and chemical, biological and physical properties.

Soil is an essential component of the "Earth" and "Ecosystems". Both are broader concepts that encompass vegetation, water and climate in the case of land, and also encompass social and economic considerations in the case of ecosystems.



The picture shows soil layer that consist of rock mother, sand and dust, and humus. The soil is composed of minerals, organic matter, tiny plant and animal organisms, air and water. The plants and animals that grow and die inside and on the ground are decomposed by microorganisms, transformed into organic matter and mixed with the soil.

Soil is one of the important natural resource among the major resources of the land. Soil plays a crucial role in the economy of countries. Crop production and Forestry are two important economic land uses that are dependent on the soil. Crop Production has risen dramatically in the last fifty years in order to cope with the demands of an equally rapidly growing global population.

Soil is composed of three main elements:

1. **Minerals** - come from rocks below or nearby
2. **Organic Matters** - remain of plants and animals that use the soil
3. **Living Organisms** - that reside in the soil

Soils can be classified into numerous soil types which are determined mainly by the proportion of each of the above element. The other factors influencing and affecting the formation and the types of soil are climate, vegetation, time, the surrounding terrain, and even human activities like farming, grazing, gardening etc. However, organic matter, also called humus, is the most important constituent of soil as it is rich in nutrients.

The Top 20cm of soil is all that stands between us and extinction.

(Luc Gnacadja)

Executive Secretary of UNCCD

As the soils differ regionally based on numerous factors, it may be classified into many types in different ways. There are no universal standards for soil classification, but two good efforts were made by the American' classification System published in 1960, and the Food and Agriculture Organization Classification in the 1970s. Although these two are widely discussed and referred to, many countries still use their own national classification systems by preference.

The demand for more crops has increased the demand for plant nutrients in the form of fertilizers. The use of artificial fertilizers, however, cannot replace the need for more trees which are usually longer term "crops" in which an important relationship is built up with the soil to establish a nutrient balance.

The quality of our water is also closely linked to the quality of the soils. There are several stages in the interaction of water with the soil. Firstly, water enters the soil through a process called as **Infiltration**-the higher the rate of infiltration, the more water is absorbed by the soil, and will be available to the plants. Also, less water will run off the surface, eroding the soil, and washing away nutrients. Secondly, water is stored in the soil and released when required by plants. Soil can vary greatly in their ability to perform these functions

Research by soil scientists has shown that soil can have a major role in the transport of pollutants. It is also effective at filtering urban pollutants like oil and metals. Oil in particular an organic substance which soil microbes can break down into carbon dioxide and water. Metals such as lead from petrol cannot be broken down in such a manner, but the soil can often retain them until they can be absorbed into plants, which can be disposed of safely.

As a major storehouse for carbon, soils also help regulate emissions of carbon dioxide and other greenhouse gases, thus fundamental for regulating climate.

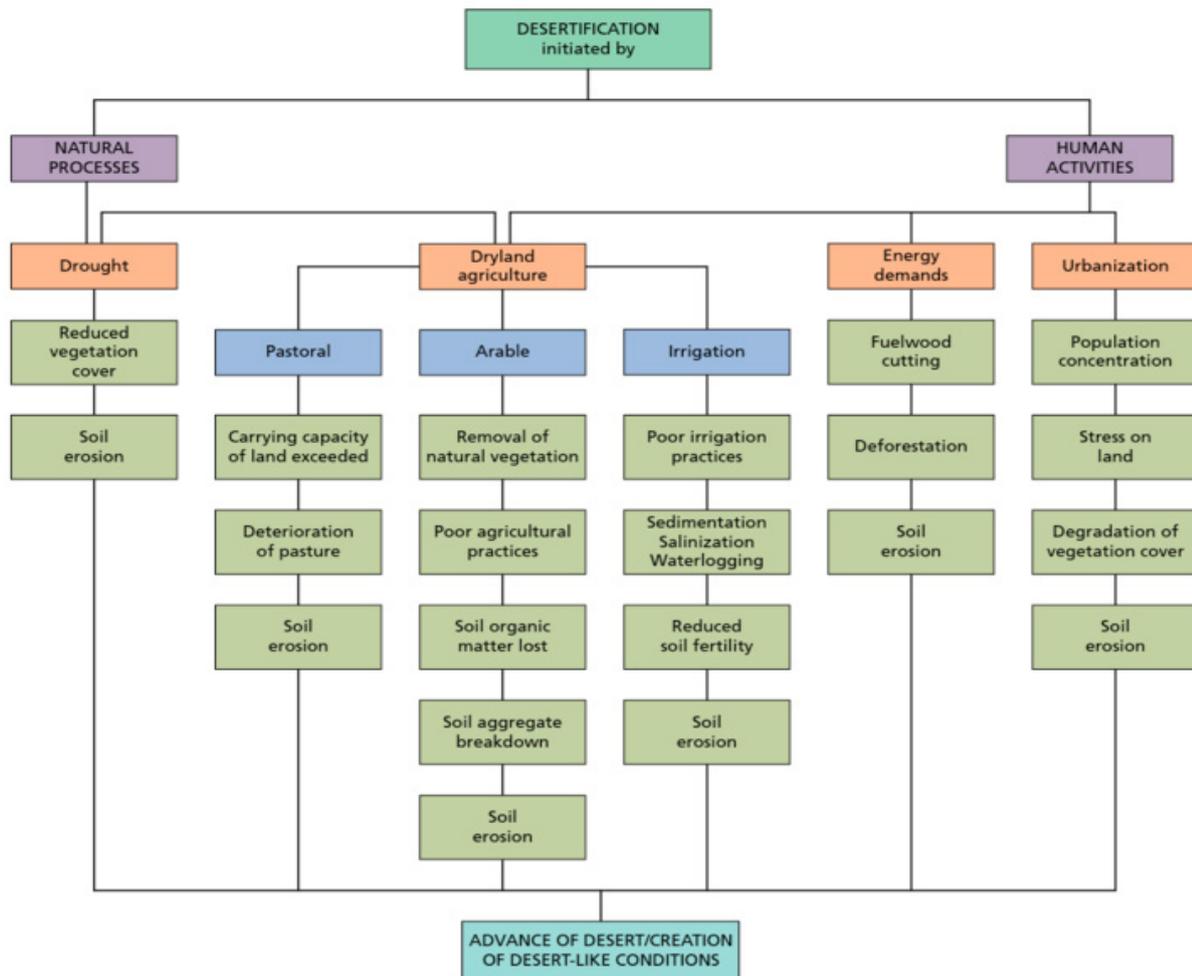
Land and Settlements

The role of land in provision of physical space for settlements, industry and recreation is multifarious. However, when population increases in a given area, the increased demand on production and change in land use can induce stress and consequent degradation of land resources. It follows that an ample supply of land of suitable quality and appropriate production technologies are essential if the increasing demands of a growing population are to be met. The forest land is being converted to agricultural land at an alarming pace; the unsustainable agricultural practices are further deteriorating soil cover of land thus leaving the land into a desert of highly unproductive limit.

MAIN CAUSES OF DESERTIFICATION/ LAND DEGRADATION

Excessive land degradation is a transcript of long term impacts which translate into grave global socio-environmental concerns. Climate change in addition to anthropogenic (human induced) activities have caused degradation of land over the years. It involves loss of biological and economic activity and complexity in croplands, pastures and woodlands. Deforestation, soil erosion, clearing land for construction, demographic and biological pressures are among the main causes of land degradation and desertification.

Figure 1.3: Causes of desertification



(Source: United Nations University)⁶

Figure 1.3 shows causes of desertification mapped based on what causes it. Some of the causes of desertification are **direct factors** while the others are indirectly contributing to the land degradation. These factors, individually or in combination, keep on changing with time and by location. Examples of indirect factors are population pressure, socioeconomic and policy while direct factors include climate and land use patterns/practices.

The **indirect factors** like increased population contribute to unsustainable use of land resources. The situation is further aggravated by global climate change. The land users, if remain unable to respond adequately to factors causing desertification, may end up in decreased land productivity. Some of the direct and indirect causes of desertification are as under:

Climate Change

Natural activities like climate variability, climate change, or drought are directly affecting the land. Climate variability refers to the natural fluctuations that appear in the atmosphere for a designated period of time. Fluctuations may occur in any or all of the

⁶ <https://unu.edu/>

atmospheric variables (such as precipitation, temperature, wind speed and direction, evaporation, etc.). A result of those fluctuations may be the alteration of land ecosystem, and this could eventually affect human activities that have been developed to exploit the productivity of that ecosystem.

It is important to note that during the annual dry season the characteristics of the atmosphere in an arid or semiarid area are like that of a desert-like region (low precipitation, high evaporation, high solar radiation, etc.) and if improper use of the land occurs during this period, degradation results.⁷ Thus, short-term fluctuations in climatic factors as well as seasonal dry periods, when combined with improper land-use practices, can give the appearance of the impact of a climate change when none may have occurred at all.

Climate change refers to the average state of the weather for a relatively longer period of time, and that desertification is primarily a result of such natural shifts in climate regimes. It has been suggested, for example, that there has been a trend towards increasing aridity in the West African Sahel, a natural desiccation of the region that man can do nothing to stop. Usually cited as evidence for longer term climate changes in that area in the past are fossil dune fields near the West African coast far from the active dunes close to the desert. The debate over long-term climate change in the West African Sahel continues.

Drought episodes have also been cited as a major cause of desertification, since during such extended dry spells desertification becomes relatively more severe, widespread, and visible, and its rate of occurrence increases sharply. The probability of droughts increases as one moves from the humid to the more arid regions and so does the vulnerability to desertification. Land forms, soils, and vegetation are often transformed during such extended drought periods.

Change in land use patterns

World population is increasing day by day. The increased population has more demand for food. So plant life is killed for agriculture products. There is a strong relationship between population of a dryland and the development pressure on land by human activities. The more is the population, the bigger is the risk of degradation. The ratio is specifically high in Asia and Africa. As in 1900 Seventy percent of land was available for forest and twenty seven percent for agriculture product, while in 2000, forty six percent for forest and forty six percent for agriculture. The data confirms the change of land use trend. (see table 1.1)

Table 1.1: Change of land use trend

A Century of Land Use Change			
Sr. No.	Category	1900	2000
1	Natural and secondary forests; mountains; deserts; tundra, sloping lands and those unsuitable for agriculture	70.1 %	46.5 %
2	Crop and grazing lands; sedimented, logged and afforested lands	27.2 %	46.5 %
3	Urban and peri-urban land; transport, mining, energy and water infrastructure	2.7 %	%

(Source : Global Land Outlook)

Policies leading to unchecked land use and lack of supportive infrastructure are major contributors to land degradation. Thus agriculture can play either a positive or a negative role, depending on how it is managed. This in turn depends on the socioeconomic resources available, the policies adopted, and the quality of governance. Local institutions, such as community-based land-use decision-making bodies and social networks, can contribute to preventing desertification by allowing land users to manage and use ecosystem services more effectively through enhanced access to land, capital, labor, and technology.

⁷ (Aubreville, 1949).

Deforestation

Deforestation is the removal of a forest or stand of trees where the land is thereafter converted to a non-forest use. Deforestation occurs for multiple reasons. According to the United Nations Framework Convention on Climate Change (UNFCCC) secretariat, the overwhelming direct cause of deforestation is agriculture. Subsistence farming is responsible for forty eight percent of deforestation. Moreover trees are cut down to be used as fuel or for construction of buildings. Causes of deforestation may vary from region to region however its impact is adverse globally.

Deforestation without sufficient reforestation has harsh impact on soil fertility. As trees roots maintain soil structure and can limit soil erosion since they help water infiltration, which reduces water run-off, encouraging the composition of rich, productive soil. Leaves falling from trees reduce the action of the wind on the soil surface. Alteration to the vegetation cover also results in ecological changes which in turn leads to degraded soil/land degradation.

Overgrazing

Overgrazing occurs when plants are exposed to intensive grazing for an extended period of time or without sufficient recovery period. Overgrazing may be caused by poorly managed livestock or immobile, travel restricted populations of native or non-native wild animals.

Overgrazing is one of the major causes of desertification or soil erosion. It reduces soil depth, soil organic matter and soil fertility and damages the land's future natural and agricultural productivity. Soil fertility can sometimes be mitigated by applying the appropriate lime and organic fertilizers. However, the loss of soil depth and organic matter takes centuries to correct.

Unsustainable agriculture practices

Some farmers do not know how to use the land resources effectively. Research in this field finds increase in the area cleared for annual crops resulted in lack of soil cover as the main causes of soil erosion. Moreover, shorter fallows by farmers mean that less vegetation is able to regenerate between cropping periods. Mono-crop farming, excessive fertilizer use and over-dependence on irrigation are some other examples.

Frequent and intensive fires can be an important contributor to desertification, whereas controlled fires play an important role in the management of dryland pastoral and cropping systems.

Large-scale irrigation has also resulted in many environmental problems—such as waterlogging and salinization, water pollution, eutrophication, and unsustainable exploitation of groundwater aquifers—that degrade the drylands' service provisioning.

EFFECTS OF DESERTIFICATION-A GLOBAL PERSPECTIVE

Desertification has environmental impacts at the global and regional scale. Affected areas may sometimes be located thousands of kilometers away from the desertified areas. Some of the facts and figures are as below⁸:

- 2.6 billion people depend directly on agriculture, but 52 per cent of the land used for agriculture is moderately or severely affected by soil degradation

8 <https://knowledge.unccd.int/publications/goal-15-life-land-facts-and-figures-targets-why-it-matters>

- Arable land loss is estimated at 30 to 35 times the historical rate
- Due to drought and desertification each year 12 million hectares are lost (23 hectares per minute), where 20 million tons of grain could have been grown
- 74 per cent of the poor are directly affected by land degradation globally

Land degradation reduces productivity and food security, disrupts vital ecosystem functions, negatively affects biodiversity and water resources, and increases carbon emissions and vulnerability to climate change.⁹

Land degradation directly affects 1.5 billion people worldwide, with a disproportionate impact on women, children and the poor, and it reduced the productivity of the world's terrestrial surface by about twenty five percent between 1981 and 2003. Moreover, desertification may cause displacement of about fifty million people within the next 10 years. Losing land has an economic cost and declining effect on livelihood for billions worldwide.

According to UNCCD, over the last two decades, approximately twenty percent of the earth's vegetation surface shows persistent declining trends in productivity, mainly as a result of land/water use and management practices.

Over 1.3 billion people are trapped on degrading agricultural land: farmers on marginal land, especially in the drylands, have limited options for alternative livelihoods and are often excluded from the wider infrastructure and economic development of a nation. The scale of rural transformation in recent decades has been unprecedented. Millions of people have abandoned their ancestral lands and migrated to urban areas, often impoverishing cultural identity, abandoning traditional knowledge, and permanently altering landscapes.¹⁰

9 FAO

10 <https://sustainabledevelopment.un.org/index.php?page=view&type=30022&nr=1237&menu=3170>

Chapter 2

National and International Response Towards Desertification

The threat desertification pose to the mankind is wide in its effects. It directly threatens the most vulnerable population in **Asian and African Region** and puts at risk the rest of the population through climate change, human migration and food insecurity, affecting all who belongs to this globe.

Combating desertification is dependent on how effectively management strategies are employed. The strategies need to be devised at both international and national levels for exercising all existing options to avoid or reverse desertification and its negative impacts. In this regard, managing land use and soil quality are two important strategies to assess the size of the issue and adopt reversal process accordingly.

Land allows for a variety of uses and can satisfy a diverse range of objectives. Land use is a basic element in human activity. Much of what we humans do requires land, therefore it is important to use land sustainably.¹¹

Land Use is characterized by the arrangements, activities and inputs by people to produce, change or maintain a certain land cover type. Land use defined in this way establishes a direct link between land cover and the actions of people in their environment.

Land Cover is the observed (bio) physical cover on the earth's surface and Actions of the people involve the practices they followed on land.¹²

By understanding the importance of the use of land, the world has moved to sustainable use of land from unrestrained use. This is due to the acknowledgement of limited land resources and thereby, adoption of a wise use of available resources. Few examples, in this regard, are as under:

SUSTAINABLE LAND MANAGEMENT

Both the land use and managing soil quality are covered in Sustainable Land Management Techniques adopted by the governments, executives and locals. The United Nations defines sustainable land management (SLM) as

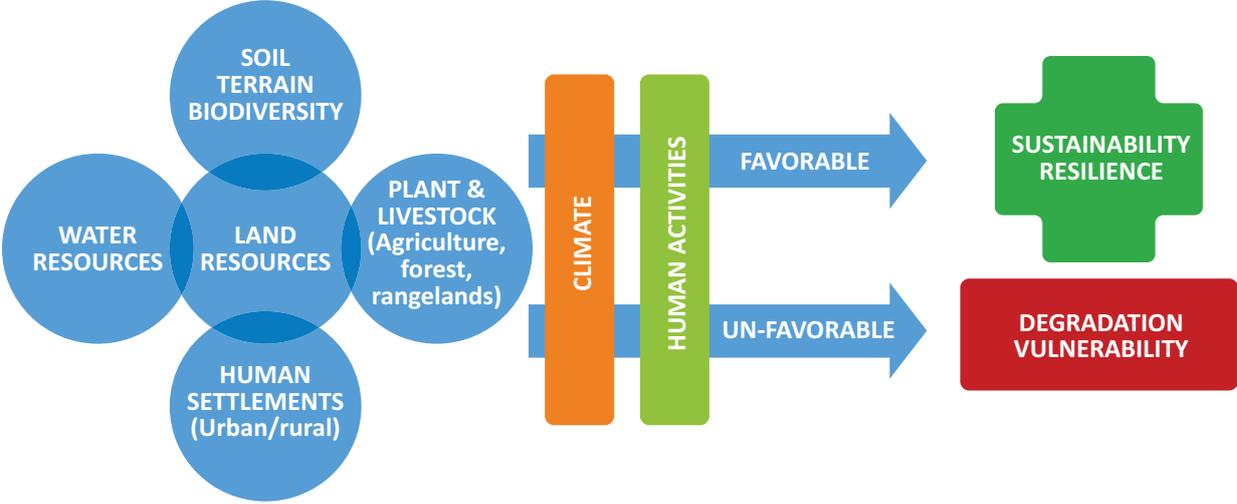
“The use of land resources, including soils, water, animals and plants, for the production of goods to meet changing human needs, while simultaneously ensuring the long-term productive potential of these resources and the maintenance of their environmental functions”.

¹¹ Young, (1998).

¹² Di Gregorio and Jansen, (1998)

Figure 2.1 shows that the productivity and sustainability of a land-use system is determined by the interaction between land resources, climate and human activities as described in the following diagram.

Figure: 2.1: Sustainable land use and management



Source: FAO, CLIMATE-SMART AGRICULTURE Sourcebook, Module B.7 Sustainable Soil/Land Management for Climate-Smart Agriculture

Especially in the face of climate change and variability, selecting the right land uses for given biophysical and socio-economic conditions, and implementing SLM, are essential for minimizing land degradation, rehabilitating degraded land, ensuring the sustainable use of land resources (i.e. soils, water and biodiversity) and maximizing resilience.

Promisingly, after many decades of on-the-ground work on SLM approaches and practices, many SLM options are available such as soil and water conservation, natural resource management and integrated landscape management (ILM). FAO is prioritizing the identification of affected communities and target areas for implementing locally suitable SLM options for managing land resources with the overall goal of scaling up SLM over large areas.

Sustainable Land Management Programme to Combat Desertification in Pakistan phase II

Sustainable Land Management Programme to Combat Desertification in Pakistan phase II project is an up-scaling phase of the UNDP/GEF SLMP pilot phase project to be implemented in 14 dryland districts in 4 provinces. It will assist the Government of Pakistan to achieve the long-term goal – “to combat land degradation and desertification in Pakistan.” The project covers fourteen sites in four provinces of Pakistan.

Pakistan is faced with daunting challenges of combating desertification, with more than 80% of the arid and semi-arid landscape severely affected by desertification, land degradation and drought. Rural landscapes across the country are characterized by moderate to severe erosion, deforestation, overgrazing, depleted ground water reserves, reduced surface water quantity and quality, raised salinity, low levels of soil fertility, and the loss of biodiversity. All of these are linked to unsustainable land use practices. This project will assist the Government of Pakistan to achieve its long-term goal, “to combat land degradation and desertification in Pakistan”. It aims:

1. To enable policies and institutional mechanisms for SLM to be put in place at federal and provincial levels.
2. To enhance skills to scale up SLM through an institutionalized, multi-tiered capacity-building programme.
3. To scale up SLM practices through effective knowledge management.
4. To develop participatory GIS-based district and village land use plans.
5. To develop a climate-resilient SLM decision support system.
6. To mobilize local communities for scaling up SLM activities.
7. To improve water conservation and on-farm practices.
8. To provide new livelihood opportunities through improved ecosystems opportunities.

(Source: www.slm.org)

UN agencies and Conventions are working to provide support to countries in assessing current status of land resources and projecting future trends in land use. The focus is on managing knowledge and developing land resource planning tools and decision support system. The availability of reliable and timely information on utilization of land resources is crucial for decision making at all levels from farmers to national governments.

INTEGRATED LANDSCAPE MANAGEMENT (ILM)

It is a way of managing a landscape that brings together multiple stakeholders, who collaborate to integrate policy and practice for their different land use objectives, with the purpose of achieving sustainable landscapes. This approach recognizes that the root causes of problems may not be site-specific and that a development agenda requires multi stakeholder interventions to negotiate and implement actions.

For example, one river basin can supply water for towns and agriculture, timber and food crops for smallholders and industry, and habitat for biodiversity; the way in which each one of these sectors pursues its goals can have impacts on the others. The integrated approach goes beyond traditional sector-based practices that manage these different land uses independently of each other, even where they depend on the same resource base. The intention is to manage landscapes in a joined-up way, so that society's needs can be met in the short term, and in the long term.

Integrated Afforestation and Eco-development Project Scheme (IAEPS) in India

The scheme is intended to promote afforestation and development of degraded forests by adopting an integrated approach to the development of land and other related natural resources on watershed basis through the micro-planning process. The scheme is 100% Centrally Sponsored. The revised Ninth Plan allocation for the scheme is Rs. 273.87 crores (proposed physical target is 1.88 lakh ha). 104 projects have been sanctioned so far to the States in the Ninth Plan with a total outlay of Rs. 211.35 crores.

Source: National Action plan of India

Ecosystem-friendly and socially-appropriate production systems and practices are the building blocks for integrated landscape management. Sustainable practices at the farm/field level-such as tillage regimes, input application, crop rotations, agro-forestry, harvesting methods, and animal management-confer multiple environmental and social benefits. They protect wild habitats, sustain land quality, efficiently use water and energy, and minimize pollution from nutrients, pest control, and waste.¹³

LAND GOVERNANCE AND LAND USE PLANNING

Land governance concerns the rules, processes and structures through which decisions are made about access to land and its use, the manner in which those decisions are implemented and enforced, and the way in which competing interests in land are managed. Land Use Planning is a systematic assessment of land and water potential in order to cater the needs of the community while safeguarding natural resources.

¹³ <http://www.un.org/esa/ffd/wp-content/uploads/sites/2/2015/10/IntegratedLandscapeManagementforPolicymakers>

A crucial challenge for averting land, soil, water and vegetation degradation – one of the main contributing factors to large-scale food insecurity – is to strengthen policies on, and the governance of, land management and to address land-use conflicts. FAO promotes informed policy-making on SLM by supporting the provision of national, regional and global data and assisting national institutions to develop knowledge management systems on land resources.

Geographical Information Systems in Fiji

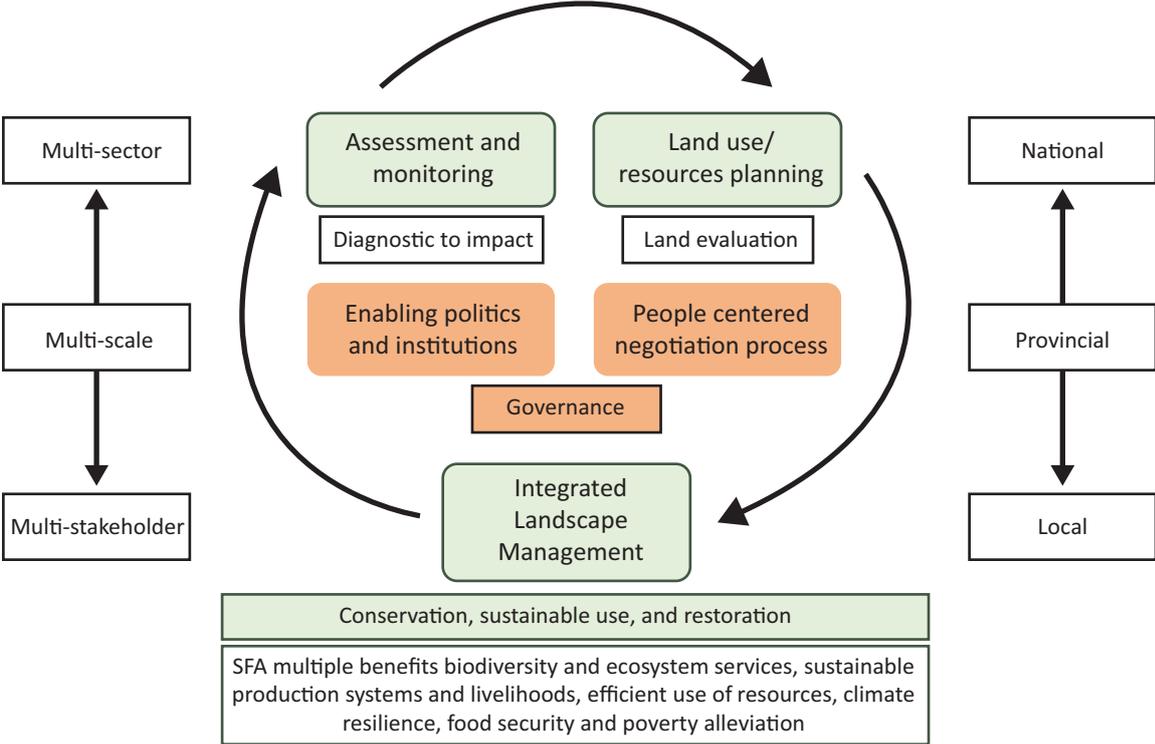
In 1994 with the assistance of the AUSAID of Australia, the NZODA of New Zealand and the Fiji Government through the Soil and Crop Evaluation Project established the MAFF Geographical Information Systems and it was housed under the Land Use Planning Section of the Research Division and now of the Department of Land Resources Planning and Development. To date the Land Use Section have digitised and have stored the database of Taveuni Island and the two main island of Viti Levu and Vanua Levu and several small islands in the Lau Group.

The Land Use Section have also imported information such as the cadastral mapping systems, roads, river systems, native land mapping systems, forest inventory, geological information and other information from data custodians such as the Native Land Trust Board, Forestry Dept. Fiji Land Information Systems and others. These stored database is retrieved, manipulated and analysed for different outputs according to the needs of the clients, to make informed quality decision for the sustainable uses of their resources.

Source: National Action Plan of Fiji

Land-use planning is part of the integrated land resource management continuum, which starts with an assessment of the land resource base (land evaluation) and the identification of needs and challenges and is followed by the selection and implementation of optimum SLM approaches and decision-support systems, from farm to landscape to the national level, and the monitoring and assessment of impacts to inform decision-makers and stakeholders. The process is scale-dependent and integrates multiple stakeholders and sectors. The guiding principles are that people should be at the center of the process and that governance and enabling policies and institutions support the realization of the land-use plan.¹⁴ Figure 2.2 below shows how integrated land resources planning and management could be done to combat desertification.

Figure 2.2: Integrated land resources planning and management



14 www.fao.org

SOIL QUALITY MANAGEMENT

Mausbach and Tugel (1995) defines Soil Quality as “it reflects the capacity of a specific kind of soil to function within natural or managed ecosystem boundaries, to sustain plant and animal productivity, maintain or enhance water and air quality, and support human health and habitation”. The definition of soil quality lists six diverse simultaneous functions that must be optimized to achieve a high rating of soil quality; however the Soil Survey Staff (1997) lists biodiversity and productivity, partitioning water and solute flow, filtering and buffering, nutrient cycling, and structural support as other critical function.

Contrary to popular belief, soil is not an inexhaustible resource which needs no caring for. Soils were taken for granted for a long time but now there is a reversal in attitude realizing the soils as foundation of some vital functions as food production, climate regulation, biodiversity support and largest water filtration and storage tank. In this regard, FAO prepared the first global assessment ever on soils and related issues named as “Status of the World’s Soil resources

The report offers evidence that the loss of soil resources and functions can be avoided. Sustainable soil management, using knowledge and evidence base, proven approaches and technologies, can increase food supply, provide valuable lever for climate regulation and safeguarding ecosystem services.

The specific threats considered in the report are soil erosion, compaction, acidification, contamination, sealing, salinization, waterlogging, nutrient imbalance (e.g. both nutrient deficiency and nutrient excess), and losses of soil organic carbon (SOC) and of biodiversity. The most significant threats to soil function at the global scale are soil erosion, loss of SOC, and nutrient imbalance.

FAO defines, “Soil management is sustainable if the supporting, provisioning, regulating, and cultural services provided by soil are maintained or enhanced without significantly impairing either the soil functions that enable those services or biodiversity. The balance between the supporting and provisioning services for plant production and the regulating services the soil provides for water quality and availability and for atmospheric greenhouse gas composition is a particular concern”.

Soil Erosion is the displacement of the upper part of the soil.

Soil compaction, also known as **Soil Structure Degradation** is the decrease in porosity of soil due to externally and internally applied loads.

Soil Acidification is a process where the soil pH decreases over time due to excess use of fertilizers.

Soil contamination or Soil Pollution is the presence of human made chemicals or other alteration in the natural soil.

Soil sealing is defined as covering of soils by building, constructions and layers of impermeable material.

Soil Salinity is the increase in the salt content of the soil due to mineral weathering and irrigation.

Water logging is the saturation of soil with water.

Nutrient Imbalance in Soil is the disturbance of nutrient input and output entering/leaving the farming system.

Loss of Soil Organic Carbon is the disturbance in the exchange of carbon between soils and atmosphere.

Loss of Biodiversity is the loss in the variability of living organisms in/on the soil.

Soil Fertility Initiative (SFI)

The Soil Fertility Initiative (SFI) process, launched over the last years through a multi-partner process in some 20 countries in Sub-Saharan Africa, clearly illustrated the need for addressing soil productivity decline in Eastern and Southern Africa from an integrated perspective in order to address declining productivity as well as structural and biological degradation of the soil. To address these interrelated issues, changes are required to the wide array of land management practices that are adopted by farmers to optimise productivity and income as well as resource use in the short and long term.

Source: Soil productivity improvement programme through farmer field schools, Food and Agriculture Organization of the United Nations

Land-use plan in Ethiopia

Following the drought of 1973/74 and the subsequent famine, the Government of Ethiopia became more aware of the serious degradation of soil in the highlands.

An ambitious soil conservation programme has concentrated on protecting steep slopes by bunding and afforestation. This has made a substantial impact on soil erosion but has not contributed much to increased agricultural production. Large-scale afforestation is also unpopular with local people because it reduces the area available for livestock grazing while forest protection implies denying access for fuelwood collection. A balance between the competing requirements of conservation and production is clearly needed if popular support for soil conservation work is to continue without inducements such as the Food-for-Work Programme.

A land-use plan to conserve steeper slopes by restoring good vegetative cover through closure, followed by controlled grazing, has been found to be more acceptable to the local people than large-scale afforestation applied in isolation.

Source: Guidelines for land-use planning, Food and Agriculture Organization of the United Nations Rome, 1993

IMPORTANCE OF SOIL QUALITY MANAGEMENT IN SUSTAINABLE DEVELOPMENT GOALS:

The importance of improved soil is evident from the fact that out of 17 Sustainable Development Goals (SDGs) adopted by United Nations in 2015, four goals have targets specially related to soils.

SDG 2 (Zero Hunger) Target 2.4 is to ensure sustainable food production systems and implement resilient agricultural practices that progressively improve land and soil quality.

SDG 3 (Good Health and Well Being) Target 3.9 envisages substantial reduction in the number of deaths and illness from hazardous chemicals and air, water and soil pollution and contamination by 2020.

SDG 12 (Responsible consumption and production) Target 12.4 seeks to achieve the environmentally sound management of chemicals and all waste throughout their life cycle, and significantly reduce their release to air, water and soil.

SDG 15 (Life on Land) Target 15.3 aims at combating desertification, restoring degraded land and soil including land affected by desertification, drought and floods and envisions achieving a Land Degradation Neutral world.

The UNCCD is the custodian agency for SDG indicators 15.3.1 with focus on “**Proportion of land that is degraded over total area**” to monitor progress towards achieving SDGs target 15.3. The failure of UNCCD in measuring the performance of the initiatives taken before 2010 urged the need to develop and refine the methodology and standardized national official data against which proportion of degradation/restoration can be assessed.

In this regard, UNCCD sought help from Terrestrial Ecosystem Research Network (TERN) & Common Wealth Scientific & Industrial Research Organization (CSIRO) for the very sake of facing-off desertification. Both the organizations assist UNCCD in the development of methodologies and guidance indicators for sustainable development. **Specifically, goal number fifteen of SDGs is a priority i-e., Protect, restore & promote sustainable use of terrestrial ecosystem, sustainably manage forests, combat desertification and half reverse land degradation as well as biodiversity loss.**

Table 2.1: Goal 15 of SDGs

Goal 15	Life on Land
Target 15.3	By 2030, combat desertification, restore degraded land and soil, and strive to achieve a land degradation-neutral world.
Indicator 15.3.1	Proportion of land that is degraded over total land area
Sub-Indicators to report on Indicator-1	<ol style="list-style-type: none"> 1. Land Cover 2. Land Productivity 3. Carbon Stock

The UN Convention on CCD also provides a framework for collaborative action against environmental degradation and acute poverty in the marginalized dry lands. A legally binding instrument, the Convention calls for the formulation of National Action Plans and the setting up of national desertification funds.

While managing funding from wealthy nations, UNCCD also expects poor nations to roll up their sleeves and tackle their soil loss problems with the resources they have. In this regard, comprehensive **National Action Programs (NAPs)** are required to be prepared as a road map for local strategies to combat desertification and these programs need to be integrated with national strategies. Specially, the Convention calls on the programs to “provide an enabling environment by strengthening existing legislation and enacting new laws, if required. The strategies incorporated by the nations in their NAPs are further supported by international cooperation and partnership arrangements.

UNCCD provides support to the nations by establishing global default data but at the same time encourages nations to prepare its own national data with the help of internationally recognized environment standards (ISOs). In this regard, countries have adopted UNCCD’s Land Degradation Neutral (LDN) Target setting approach in which countries follows a baseline data to assess the change in the sub indicators. The UNCCD also provides assistance to affected developing country Parties, particularly those in Africa and Asia. This is important when compiling information and reports required under the Convention.

UNCCD Reporting Process

The countries are required to report on the progress towards five strategic objectives related to the condition of ecosystems and population, drought, global environment benefits and the mobilization of financial a-nd non-financial resources to support the implementation of The Convention.

The progress towards the strategic objectives will be measured through indicators. UNCCD will provide templates for reporting on the three biophysical indicators as follows.

The measurement unit for this indicator is the spatial extent (hectares or km²) expressed as the proportion (percentage or %) of land that is degraded over total land area.

The baseline year for the indicator is 2015

- Trend in land Cover
- Trends in land productivity
- Trends in carbon stock

Land cover refers to the observed physical cover of the Earth's surface which describes the distribution of vegetation types, water bodies and human-made infrastructure. It also reflects the use of land resources (i.e., soil, water and biodiversity) for agriculture, forestry, human settlements and other purposes.

Land productivity refers to the total above-ground net primary productivity defined as the energy fixed by plants minus their respiration which translates into the rate of biomass accumulation that delivers a suite of ecosystem services.

Carbon stock is the quantity of carbon in a "pool": a reservoir which has the capacity to accumulate or release carbon and comprised of above- and below-ground biomass, dead organic matter, and soil organic carbon.

For making assessment of trends in three sub-indicators and reporting purposes, all the countries are required to establish baselines, either by using national data or global default data provided by UNCCD or its partners. The aim of this data provision is solely to assist countries in complementing and enhancing national data, subject to validation and reporting by national authorities. The sources of global default data provided to LDN-TSP countries are:

- Land cover and land cover change from the European Space Agency's Climate Change Initiative on Land Cover;
- Land productivity from the Joint Research Centre of the European Commission initiative on Land Productivity Dynamics; and
- Soil organic carbon from the International Soil Reference and Information Center's SoilGrids250m dataset.

One of the distinguishing characteristics of UNCCD is that it champions the virtues of bottom-up programs. Local population has valuable knowledge that needs to be tapped. Even the best policies go futile without active participation of locals. The Convention is working on the principles of participation, partnership and decentralization which is indeed the backbone of Good Governance and Sustainable Development.

Role of National, Regional and sub regional Programmes in Combating Desertification:

National Action Programmes (NAP) are one of the key instruments in the implementation of The Convention (UNCCD). They are further strengthened by Action Programmes on Sub-regional (SRAP) and Regional (RAP) level. National Action Programmes are developed in the framework of a participative approach involving the local communities and they spell out the practical steps and measures to be taken to combat desertification in specific ecosystems.

The UNCCD has organized its implementation around five world regions. These action programmes provide a framework for regional coordination and collaboration. Though the country Parties of the regions define together how the UNCCD will be implemented, most action takes place at the national level. The five regions are as under.

Table 2.2: UNCCD Regions and Sub-Regions

Regions	Sub-Regions
Africa	<ul style="list-style-type: none"> • Northern Africa • Southern Africa • Western Africa • Eastern Africa • Central Africa
Asia	<ul style="list-style-type: none"> • South Asia • East Asia • West Asia • Central asia • South East asia • Pacific Asia
Latin America and Caribbean (LAC)	<ul style="list-style-type: none"> • Andean • Meso America • Southern Cone • Caribbean
Northern Mediterranean	Affected and Developed Country Party
Central and Eastern Europe(CEE)	<ul style="list-style-type: none"> • Central and Eastern Europe • Affected and Developed Country Party

The Land Degradation Neutral Target Setting Programme (LDN-TSP)

The LDN Target Setting Programme was developed by UNCCD in 2015 in which implementation of the Convention was linked to the SDGs in general, and target 15.3 in particular. Currently, 100 countries have joined the programme and its implementation is being made with the help of numerous partners.

To address the multiple Sustainable Development Goals in a synergistic and cost effective manner, countries can now formulate voluntary targets to achieve LDN, according to their specific national context and development priorities. These targets will also further strengthen the implementation of the countries' UNCCD National Action Programmes.

Under the LDN Target Setting Programme, participating country Parties receive:

- Support for conducting a multi-stakeholder consultation process and identifying leverage opportunities
- Access to the best available data on the LDN baseline and trends
- Technical guidance and specialized expertise
- Assistance in identifying LDN investment opportunities, in order to link LDN target setting with LDN implementation.

The Great Green Wall - UNCCD Initiative

The Great Green Wall is a symbol of hope in the face of one of the biggest challenges of our time – desertification. Launched in 2007, this game-changing initiative aims to restore Africa's degraded landscapes and in the process transform millions of lives in one of the world's poorest regions, the Sahel. Once complete, the Wall will be the largest living structure on the planet – an 8000km natural wonder of the world stretching across the entire width of the Continent.

The Great Green Wall for the Sahara and Sahel initiative is now being implemented in more than 20 countries across Africa's Sahel region and more than 8 billion dollars have been mobilized and/or promised in its support. The initiative brings together African countries and international partners, under the leadership of the African Union Commission.

By 2030, the ambition is to restore 100 million hectares of currently degraded land, sequester 250 million tonnes of carbon and create a minimum of 350,000 jobs in rural areas.

(Source : <https://www.unccd.int/actions/great-green-wall-initiative>)

Chapter 3

Environment Audit–Key Elements and Activities

This chapter provides understanding to Supreme Audit Institutions as how to conduct environment audits of initiatives aimed at combating desertification.

Environmental audit may be planned as performance, compliance or financial audit addressing the approach taken by responsible bodies (e.g. government) to a specific environmental problem, or environmental policies, or programmes, as well as their performance in managing environmental issues. In an environmental audit attention may be paid to the disclosure of environmental assets and liabilities, compliance with national and international legislation and conventions, the implementation and effects of environmental policies and programs, and to measures instituted by the audited entity to promote economy, efficiency and effectiveness. The full range of available auditing tools can be applied to environmental auditing.

Generally, the environment problems are related to air, water and land. In each case, there are multifaceted issues and a good audit starts with the understanding of the issue and identification of major threats to the environment asset. It allows an assessment of the problem and risk, possible sources of evidence, auditability, and the materiality or significance of the area considered for audit. The most important aspect which relates to the activity and functions of the entity is the risk. Risk based auditing is the most suitable audit type in environment audit because an activity, for example, improving water quality would bring explicit as well as implicit impacts. The concept of externalities in the environment cannot be overlooked.

STEP BY STEP GUIDE TO CHOOSE AND DESIGN AUDIT:

The WGEA Guide for developing WGEA Guidance gives a four steps approach to narrow down the auditable areas and adopt different lines of inquiry. The steps involved in choosing and designing Audit of Combating desertification are as under:

Step 1 : Identifying the country's land and major threats to it

As detailed in Chapter 1, Desertification is a complex phenomena resulting from various factors induced by human and natural activities. Several techniques and practices are in vogue to combat desertification; some of them have been discussed in Chapter 2. The certain variables like soils, climate and land types must be known in order to formulate effective control methods. Locally applied methods and research are considered as the best source of information required to find suitable practices for each site.

Since desertification is the degradation of land and has a direct impact on land and other natural resources, which results in loss of vegetation cover and bio-diversity, reduced agricultural productivity, decline of ground water and availability of water in the affected regions. All these lead to decline in the quality of life, ultimately affecting the socio economic status of the region. It is important for the auditor to identify the country's land, soil types, climate and major issues/threats to land. The documents and agencies which may be useful to SAI in giving an orientation and understanding of the land of a country are as under:-

- Regional Action Programme (RAP) on Combating Desertification
- Sub-regional action Programme (SAP) on Combating Desertification
- National Action Programme (NAPs) to combat desertification
- National Policy documents on Forest Management, Soil Conservation and Water Management
- Agencies involved in controlling and overseeing desertification
- International Organizations (FAO, UNCCD etc)
- Research Institutions
- Local NGOs/Farmers

The National Action Programme of Pakistan calls for a systematic and comprehensive area development approach with people's participation at grassroots level with a bottom-up mechanism for sustainable management of natural resources especially in fragile ecosystems so as to combat desertification and halt land degradation. It also gives a detailed account of geography, physical features, climatic regions, agro-ecological zones, soils and land capability of Pakistan.

Pakistan is characterized by a continental type of climate, which is arid and semi-arid. There is an extreme variation in temperature depending on the topography of the country, which experiences an overall deficiency in rainfall. One fourth of the country's land area, which is suitable for agriculture, is seriously subjected to wind and water erosion, salinity/sodicity, water logging, flooding and loss of organic matter. Watersheds in upper Indus and its tributaries suffer from unfavorable soil and moisture regimes. Accelerated surface erosion due to deforestation in the catchments is reducing the life of Tarbela and Mangla reservoirs that provide water for 90% of food and fibre production.

Table 3.1: Statistics from Pakistan

Total Area of Country	79.61 million hectares
Total arid Area*	41 million hectares (51.5 % of total land area)
Semi arid Area*	29 million hectares (36.9% to total land area)
Dry sub humid areas*	4 million hectares (5.4% of total land area)
land cover Forest Area Agriculture land	Less than 5% of total land area About 20% of total land area

Land capability: as per land capability classes, about 3/4th soils of Pakistan are unfit for forest, agriculture and rangelands.

Delineation is on the basis of ecological conditions and not on precipitation.¹⁵

¹⁵ Source: Umar Farooq, Munir Ahmad, and Ikram Saeed. 2009, Enhancing Livestock Productivity in the Desert Ecologies of Pakistan: Setting the Development Priorities, The Pakistan Development Review, 48: 4 Part II (Winter 2009) pp. 795-820.

Outside the Indus basin, water mining without groundwater recharge has resulted in a sharp decline in water availability in areas like Balochistan. Overharvesting and misuse of rangelands extending over vast areas is seriously constraining livestock production, thus adversely affecting the livelihood of pastoral communities. Then there are the coastal strips and mangrove areas that are again under increased environmental stress from reduced freshwater flows, increased sewage and industrial pollution in addition to overharvesting of other natural resources. The accelerating rate of land degradation in the fragile ecosystems like sandy deserts, Rodh Kohi, and coastal areas is rendering many areas unproductive and is threatening the agricultural economy of the country.

A variety of natural and human factors are contributing to desertification, including drought, overgrazing, overexploitation of land and water resources, over cultivation of marginal lands, deforestation, soil erosion, water logging and salinity and the use of inappropriate agricultural technologies such as excessive use of chemicals and irrigation water. Consequences of this being: abandoned croplands affected by waterlogging and salinity; abandoned villages; traditional irrigation systems and croplands desertified by deteriorated groundwater aquifers or lowering of water table; siltation of rivers, irrigation systems and reservoirs; and landslides in hilly areas. Desertification leads to losses in agricultural productivity and exacerbates poverty. It also causes significant reductions in carbon storage in soils, contributing to global warming and loss of biodiversity.

Step 2: Understanding the Government Response and Determining the Key Players

For an audit institution, the policy of the government is the starting point. If no environmental policy has been formulated, there is not anything to audit, or at least auditing becomes difficult. Since SAIs are not policy-setting institutions, they derive audit criteria from policy documents of the government, such as policy notes, laws and regulations, international agreements that are ratified by their country, or any other formal government documents.

In case of desertification, both international and national actors are involved to address the issue. It is not only the responsibility of the national government, but often also of local, regional, or provincial governments, as well as other public and private entities. Involvement of multiple tiers of government and players may improve the support for the desertification measures, but at the same time it becomes more complex to realize results. For SAIs, the consequence is that such audits might include several public authorities as the subject to the audit, making the audit more complex. A clear division of tasks, the cooperation between actors involved, and the coordination by the national government are important to understand and determined for audit aimed at combating desertification.

Pakistan is party to conventions on biodiversity; climate change; desertification; endangered species; hazardous waste; wetlands; etc. At the national level, many laws and legislations pertinent to the desertification have been formulated and approved by the Federal and provincial governments. Some of the initiatives of the government to address desertification under UNCCD in Pakistan are as under:

1. National Forest Policy and Provincial Forest Policies of Punjab and Khyber Pakhtunkwa have included measures to prevent land degradation and desertification through massive afforestation programmes, improved land use planning, increased research on dryland planting and treatment of degraded lands.
2. Recently approved National Water Policy also focuses on improving natural resources in the country (including land) through judicious use of water.
3. New protected areas are being established and management of existing ones are being improved.

4. Long term programmes on controlling salinity and waterlogging are regularly implemented.
5. Area development programmes implemented by different agencies mostly include measures on improving the productivity of land. Such programmes/agencies include National Rural Support Programme, Aga Khan Rural Support Programme in Gilgit-Baltistan, Balochistan Area Development Programme, Agency for Barani Area Development.
6. The Forest Acts of provinces are being amended to prevent cutting of trees, prohibit change of land use, conserve soil and land resources, enhance punishments for increasing deterrence.
7. Range Utilization Model in Pothowar Plateau
8. Gully land management through soil conservation and water harvesting
9. Range improvement through community participation
10. Salinity control and reclamation of affected areas
11. Rehabilitation of desert ranges through reseeded Forage Reserve establishment in arid highlands of Balochistan
12. Reclamation of Salt-affected areas
13. Desertification control in Cholistan
14. Restoration of land productivity in Barani lands.

The Ministry of Climate Change (MoCC), Government of Pakistan is implementing a full-scale GEF-UNDP and GoP funded "Sustainable Land Management" project to Combat Desertification in Pakistan" to be implemented in two phases over a period of 8 years. A wide range of stakeholders are involved in the implementation of the project. They include relevant federal ministries, provincial line departments, local communities (farmers, livestock herders, forest communities and nomad pastoralists), arid-zone research institutions, civil society and community organizations, and the private sector. Various approaches have been attempted to combat the menace of desertification, for example, introduction of fast-growing tree species and grasses for stabilization of shifting sand dunes and creation of microclimates through shelterbelt plantation. For sustainable land management (SLM), soil and water conservation, afforestation and rehabilitation of degraded land, repetitive high resolution satellite images, delineation and mapping of affected areas, are suitable tools for combating desertification. Efforts already underway to combat desertification need to be strengthened and integrated through a nationally supported, coordinated and monitored management system.

Key Players

- Ministry of Climate Change (MoCC)

Forestry Wing of MoCC mainly deals with UNCCD in Pakistan. Inspector General of Forests (IGF) is the national focal point for the convention. The main function of the office of IGF is to facilitate inter-provincial and inter-ministerial coordination on the issues related to forestry, wildlife, biodiversity conservation, and desertification control as well as ensuring national compliance with international conventions to which Pakistan is a party.

- Economic Affairs Division, Ministry of Finance

The EAD is responsible for providing and promoting effective donor coordination for initiatives related to land degradation and ensuring timely release of funds for Projects.

Planning Commission, Ministry of Planning, Development & Reforms

The Planning Commission is the main coordinating body for cross-sectoral investment programs and for making budgetary allocations.

- Ministry of National Food Security and Research (MoNFSR)
- Ministry of Water and Power
- Ministry of Science & Technology
- Ministry of Inter-Provincial Coordination

With the adoption of 18th Constitutional Amendment, the national government dramatically increased provincial autonomy. Under this Amendment, many of the federal ministries such as the Ministries of Environment and of Food Agriculture and Livestock have now been dissolved and their functions at the federal level have now been entrusted to the MoCC and MoNFSR, and other federal ministries relevant to land degradation. These federal Ministries help in creating a conducive enabling environment and support sectoral policy reforms through integration of Sustainable Land Management (SLM) principles and practices into respective policies and plans.

- Provincial Planning and Development Departments

Provincial P&D departments are responsible for leading the implementation of the programme activities related to land degradation in the respective provinces and coordination of on-the-ground interventions. They also provide support to integrate SLM into their policy, planning and budgetary processes.

- Provincial Forestry, Agriculture, Environment, Irrigation and other line Departments

Technical and extension services are provided by the provincial line departments for undertaking on the ground activities related to land degradation at the local level and with communities.

- Research and Academic Institutions

R&D institution related to agriculture, plant sciences, forest, irrigation provide technical support to dryland agriculture, rangeland improvement, forestry on degraded land, efficient water management practices. Targeted research studies are conducted on on-the-ground SLM innovations particularly in relation to climate change mitigation and adaptation needs and documentation of local knowledge.

- NGOs and CBOs

They provide necessary technical and financial support in mobilization of local communities. Key NGOs/CBOs include: the Society for Conservation and Protection of Environment (SCOPE), BaanhanBeli, Sindh, Sungi Development Foundation, Aga Khan Foundation, Aurat Foundation, Pakistan Poverty Alleviation Fund (PPAF), National Rural Support Programme (NRSP), Rural Support Programme Network (RSPN), Trust for Volunteer Organizations (TVO), Strengthening Participatory Organization (SPO), and the Taraqee Foundation Balochistan.

The city of Islamabad signed Islamabad Green Charter to adopt United Nations Urban Environmental Accords. By signing this charter Capital City has become the 101 city of the world and first of the country to adopt action plan based upon UN Urban Environmental Accords to improve environment and rectify the damages to the Mother Nature so that a safe and healthy environment could be transferred to the next generation. Similarly different local governments and housing societies have also made it mandatory in their master plans to have specific percentage of land area under green cover. The Punjab Plantation and Maintenance of Trees Act, 1974 requires planting and maintenance of three trees per acre by any occupier of land.

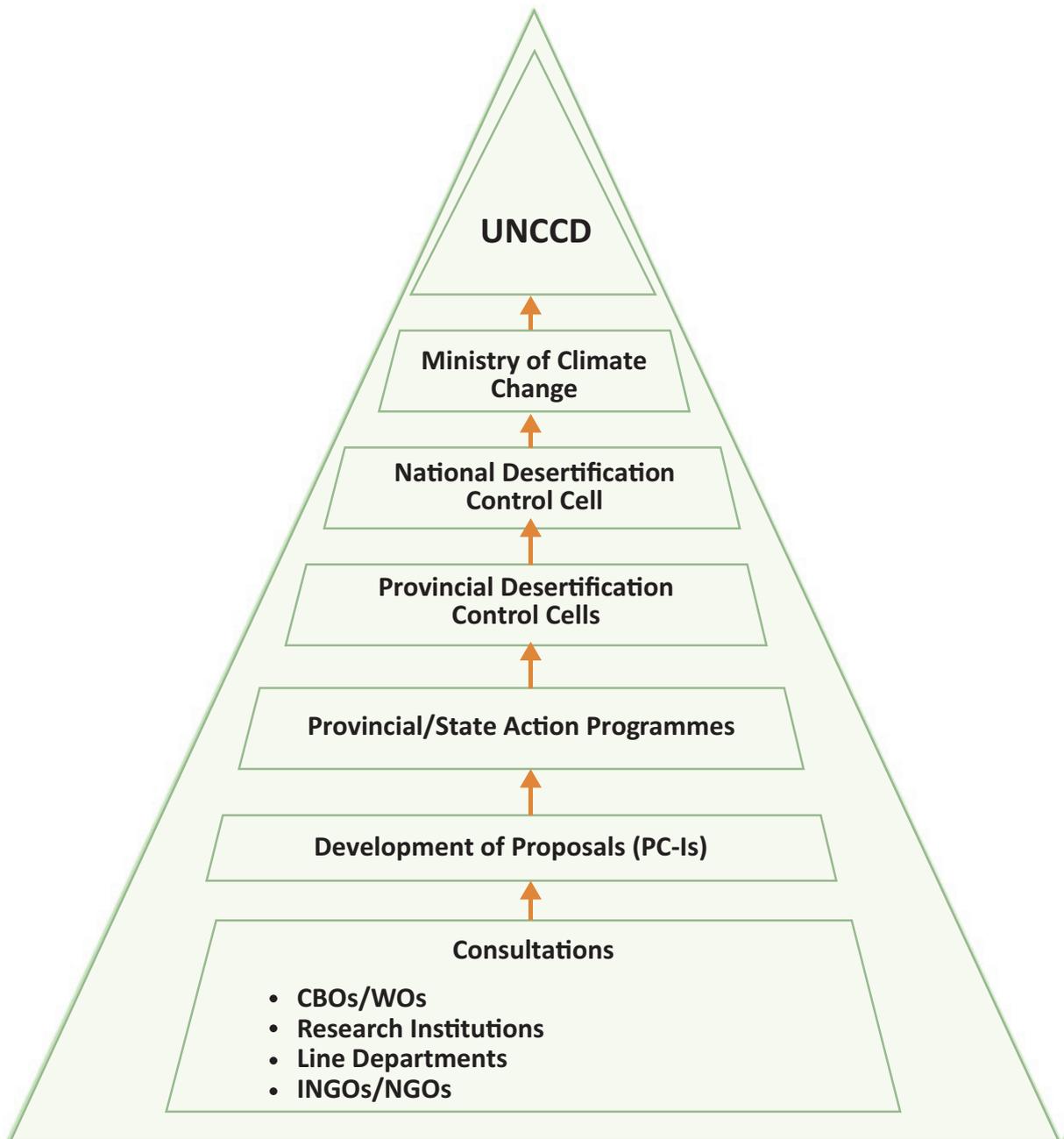
- Local communities

The main beneficiaries of interventions and improvements related to land degradation are the local farmers, herders, pastoralists. They are engaged in planning and implementation of village level interventions related to land use based on existing good practice.

- Media

Media plays an important role in mobilizing commitment for conservation and sustainable management of natural resources among general public. It regularly highlights desertification issues as a major threat to humanity, biological diversity and contributor to rural poverty.

Figure:3.1 The Bottom Up approach for NAP Implementation ¹⁶



¹⁶ National Action Program on Combating Desertification in Pakistan

STEP 3 : SELECTING AUDIT TOPICS (SUB-THEMES) AND SETTING PRIORITIES THROUGH RISK ANALYSIS

Step three explains how the auditor select audit topics. The selection of audit topics is based upon the particular threats faced by country and government response towards these threats; this step is performed with the help of risk assessment tool that analyses the information gathered in step 1 and step 2.

In the context of a performance audit, risk assessment can be defined as the identification and analysis of the key risks to the achievement of objectives concerning economy, efficiency and effectiveness, thus forming a basis for developing potential audit objectives, audit questions and determining the potential audit scope

Desertification is a complex phenomenon and as shown in Chapter 1, there are many physical and biological indicators of the occurrence of desertification. In the same way, the policy devised to combat desertification requires the understanding of different policies, agreements and operations along with the understanding of key actors involved. Inland water, urban, cultivated, and other systems e.g. soil, land cover & land use, are integral parts of drylands and thus are critically linked to desertification processes.

Keeping in view the multiple operations and actors involved in combating desertification, this document offers broader auditable areas for auditing combating desertification. An SAI can plan audit of combating desertification, check compliance of national governments with international bindings or evaluate the different policies/operations taken up by the governments in combating desertification. SAIs can also conduct cooperation or joint audits as the issue of desertification is transnational and affecting countries across the borders.

The guidance has chosen eight areas (Sub-themes) which are directly or indirectly linked with combating desertification; they are as under:

1. Audit of Combating desertification
2. Audit of Implementation of MEAs related to combating desertification
3. Audit of Reforestation/Aforestation
4. Audit of Soil conservation (water and wind erosion, soil compaction, soil salinity)
5. Audit of Watershed Management
6. Audit of Sustainable Land Management
7. Audit of Rangeland Management
8. Audit of Natural Protected Areas

STEP 4: DESIGNING THE AUDIT:

After Choosing the Audit topic, the SAI will take the detailed understanding of the auditable area by preparing a background information, its significance, understanding of the existing government laws, guidelines and regulations, key initiatives and actors involved and will carry out the risk analysis of important issues for audit.

Through risk analysis process, an SAI set its audit objective. The **audit objectives** broadly define the extent of audit examination and the approach to be adopted by the auditors. All performance audits try to focus on economy, efficiency and effectiveness. However, in each assignment there could be other significant objectives as well. The auditors list down all these objectives. Audit objective provides what will be analyzed in the audit. Setting an audit objective at the start is necessary to maintain the focus of auditor throughout the audit process.

Audit Scope refers to the extent of audit coverage in terms of time period, stage of the project of program or organization, the locations and facilities to be included in audit coverage and any aspect which will not be covered with reasons for exclusion. Audit scope determines the responsibility of the audit team in the assignment.

Decide on Audit Approach

While auditing combating desertification, SAI can take both result oriented or problem oriented approach. A result oriented approach focuses on planned objectives of audit entity, its programs or projects and the result achieved while in problem oriented approach, SAI collects data on facts for a problem, analyze the problem, determine its causes and suggests possible remedial actions. In other word, SAI tries to understand the causes of the problem and during the audit may also look for problems in existing law, rules and procedures and suggest changes to modify them.¹⁷

In each audit, SAI will decide any of the approaches related to Financial Management and regularity, Compliance, Agreements, Laws, and policies, Policy, Performance Measurement and results, Accountability, Coordination and capacity building etc at any of the following levels:

- International Level
Treaties, Conventions, Laws etc
- National Level
Adoption of International obligations and devising local policies, laws
- Management Level
Devising programs and initiating projects
- Implementation Level
Meeting deadlines and achieving goals
- All of the above

Contrary to Regulatory Audit, there is no single source of **audit criteria** in Performance Auditing. The auditors have to undertake a sort of research to determine the benchmarks against which they would assess the performance of the auditee. In their research, they may review such sources as follows:

- Objectives of the organization, project or program
- Generally accepted management practices
- Past performance standards
- Standard operating procedures (SOPs) of the organization

¹⁷ performance Audit Manual by Akram Khan, SAI pakistan.

- Rules and regulations applicable to the organization (Multilateral/Bilateral Agreements)
- Sector studies
- Comparison with similar organizations, projects or programs
- Resident's/ farmer's agricultural output before and after the program can be used as a benchmark to identify if the program was successful
- State-of-the-art studies
- Academic pronouncements of the profession
- Performance specifications of manufacturers of an equipment

For practical reasons it is useful to assemble these elements into one table, which is often referred to as an Audit Design Matrix (ADM) – a tool commonly used in the audit planning phase. This document has attempted Audit design matrices for different audit issues related to Sustainable Land Management Project (SLMP) in Pakistan which may be seen at Appendix-I.

Chapter 4

Audit topics and Case Studies

AUDIT OF COMBATING DESERTIFICATION

Background:

Desertification is defined by the United Nations Convention to Combat Desertification (UNCCD) as “land degradation in arid, semi-arid and dry sub-humid areas (drylands) resulting from various factors, including climatic variations and human activities”. The causes and consequences of desertification are discussed at length in earlier chapters. However it’s important to note that there are fine lines between dry land, desertified land and deserts, however once these lines are crossed its difficult to restore them.

Desertification is global issue and requires immediate remedies to sustain life on earth. Audit of combating desertification is a direct way to address the issue of desertification at national level.

Audit Objective:

Whether the risk of desertification is being addressed effectively and efficiently.

Auditable Questions:

1. Whether the government has developed action plans against the conventions/ multilateral environment agreement signed by government.
2. Whether government has developed a mechanism to measure its effects committed in national action plan on desertification.
3. Whether the program launched to fight against desertification is achieved its objectives.
4. Whether the strategic plans of entities responsible for land management be linked with the National Action Plan and the concerned SDGs

Audit Criteria:

International conventions:

United Nation Convention on Combating Desertification.

Below are audit case studies related to the UNCCD implementation:

SAI Morocco

Audit of the High Commissioner for Water, Forests and Combating Desertification (HCEFLCD)

Background:

The HCEFLCD has the following tasks:

- Develop and implement government policy in the fields of conservation and sustainable development of forest resources, pastoral activities in the land under the forest regime,
- Coordinate the establishment of institutional mechanisms for the preparation, implementation, monitoring and evaluation of government policy in the fight against desertification;
- Participate in the development and implementation of government policy on rural development.

Objectives of audit

1. Evaluate strategy in reforestation and protecting forest ecosystems.
2. Evaluate programs and plans to protect forests and fight against desertification.
3. Evaluate human and material resources to achieve HCEFLCD missions.
4. Evaluate if the management of the office meet the standards of efficiency, economy and efficiency..

Audit criteria:

The audit criteria were largely derived from the reforestation plans for 1970, 1997

Audit findings:

The objectives of the national reforestation plan were only partially completed. This plan was adopted in 1970, and was intended to reforest 662.000 hectares per year. However, the achievement of these objectives has known fluctuations, and was reinforced by others reforestation plans (1989-1991), who made the annual rate of reforestation up to 20,000 hectares per year. Delay in achieving the objectives. Despite the reforestation of more than 500,000 hectares since 1970, the success rate did not exceed 60%. Launch of a second scheme since 1997, extending over 30 years: by adopting a participatory approach, in order to plant 1,500,000 hectares. However, it was observed that the objective of planting 500.000 hectares during the first 10 years (1998-2009) was only partially completed.

Morocco does not cover its wood requirements; because of the inability of the HCEFLCD to plant 230.000 hectares dedicated to industrial exploitation.

The level of reforestation remains inadequate: the forest area is estimated at 8% of the area of Morocco. This ratio is not sufficient in view of the standard adopted to achieve ecological and environmental balance (set between 15 and 20%).

Inadequate procedures for monitoring the health of the forest, which increases the spread of diseases and reduces productivity and biodiversity

Some forest species are threatened with extinction, as is the case of the Argan tree and Cedar Tree

Non-allocation of part of forest incomes recovered by local government to reforestation.

In spite of the insufficient of staff in charge of litigation; the importance of forest offenses highlights the level of forest degradation. An average of 25 000 to 30 000 reports are drawn up annually by the Forest officers. However, only 10% of final judgments against violators are executed.

Source: INTOSAI WGEA research project "Land use and Land management practices in Environmental perspective" July 2012

SAI European Court of Auditors: Desertification in EU

In 2018 European Court of Auditors aimed an audit on the EU's strategic framework for combating desertification – where previously fertile land becomes increasingly dry and unproductive.

Audit Objective:

Examine whether the risk of desertification in the EU was being effectively and efficiently addressed. In particular, the audit assessed whether:

1. the Commission and the Member States had made adequate use of the available data;
2. the EU had taken steps to combat desertification in a coherent way;
3. projects addressing desertification in the EU had had a positive impact;
4. the EU commitment to land degradation neutrality by 2030 was likely to be achieved.

Scope of Audit:

Thirteen EU Member States have so far declared themselves to the UNCCD as affected by desertification. The audit includes five states: Romania, Cyprus, Italy, Spain and Portugal between September 2017 and May 2018.

Finding of Audit:

1. The Commission and Member States collect data relevant to desertification and land degradation, but the Commission does not make adequate use of it
2. The Commission and the Member States collect data related to desertification on the three UNCCD subindicators
3. There is no agreed methodology for assessing desertification and land degradation within the EU
4. The EU is taking steps to combat desertification, but with limited coherence
5. No specific legislation on desertification and soil exists at EU level
6. EU strategies, policies and spending programmes contribute to combating desertification, but do not specifically focus on it
7. EU-financed projects related to desertification can have a positive impact, but there is no relevant performance information on desertification
8. EU projects can have a positive impact on combating desertification But there are concerns about their long-term sustainability
9. Limited use and scope of cost-benefit analysis
10. Projects' performance on desertification and land degradation was not assessed by Member State authorities The Commission has not assessed progress towards meeting the commitment to land degradation neutrality by 2030

https://www.eca.europa.eu/Lists/ECADocuments/BP_DESERTIFICATION/BP_DESERTIFICATION_EN.pdf

AUDIT OF IMPLEMENTATION OF CONVENTIONS/ MEAS RELATED TO COMBATING DESERTIFICATION

Background:

International conventions are agreements between the states. These agreements may impose legal binding for signatories' countries. If these agreements impose legal bindings instruments concluded under international law otherwise these agreements are declarations, adopted by bodies such as the United Nations General Assembly, which are not legally binding although they may be politically so as soft law.

Although there is no legal binding for nations on desertification, however different declarations bind the nations to put effort to combat desertification. These are as followings:

1. United Nation Convention to combat desertification
2. Bon Challenge
3. The CBD Aichi Target 15
4. The Rio+20 land degradation neutral goal
5. The UNFCCC REDD+ goal

Many SAIs decide to audit their government's progress in developing action plans in response of their international bindings on desertification. These audits start by comparing the obligations under conventions/declaration with the government's actions, Kyoto Protocol,

The present project particularly targets the government response on the main convention of desertification, the United Nation Convention on Combating Desertification.

Audit Objective:

Does government has efficiently and effectively translated its commitment of combating desertification

Auditable Questions:

1. Whether government has developed a national strategy on Combating desertification as required under the international accord ratified by the government
2. Whether government has developed national combating desertification strategies and actions plans, as required under the international accord ratified by the government
3. Does government has implemented its strategy and action plans;
4. Does government has implemented the Combating Desertification commitments through legislation
5. Does government has measured the results of their actions in combating desertification
6. Does government has set priorities to achieve Bon challenge of combating desertification
7. Does government has developed programs to educate the public on the importance of combating desertification.

Audit Criteria:

1. United Nation Convention to combat desertification
2. Bon Challenge
3. The CBD Aichi Target 15
4. The Rio+20 land degradation neutral goal
5. The UNFCCC REDD+ goal

Below are audit case studies related to combating desertification commitment:

SAI Bhutan
Multilateral Environmental Agreements Audit Report

Background:
Bhutan is a party to twelve MEAs. The first environmental convention negotiated by the Ministry of Foreign Affairs was the Final Act and the Law of Sea Conventions signed on 10th December 1982. Since then the country has ratified/acceded to twelve environmental conventions.

Audit Objective:
Report on Economy, Efficiency & Effectiveness of MEA's

Scope of Audit:

1. UN Framework Convention on Climate Change (UNFCC)
2. Kyoto Protocol to the United Nations Framework Convention on Climate Change
3. UN Convention on Biological Diversity (CBD)
4. Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)
5. Basel Convention on the control of Trans-boundary Movements of Hazardous Wastes and their Disposal.
6. UNESCO World Heritage Convention
7. International Plant Protection Convention (Adherence)
8. The Final Act and the Law of Sea Conventions
9. Statute of the Centre for Science and Technology of the Movement of Non-Aligned Countries and other Developing Countries
10. Statutes of the International Centre for Genetic Engineering and Biotechnology
11. Vienna Convention for the Protection of the Ozone Layer
12. United Nations Convention on Combating Desertification (UNCCD)

Audit Findings:

1. Inadequate study for ratification of Multilateral Environmental Agreements
2. Non/Partial compliance in meeting the obligation under MEAs.
3. Un- clear roles and accountabilities of focal and implementing agencies.
4. Non-development of criteria for selecting a focal agency for a particular convention
5. Lack of effective coordination amongst agencies.
6. Non-dissemination of outcome of Meetings and Conference of Parties
7. Inadequate public awareness on the MEAs
8. No Change in the Organizational structure and functions within the focal agencies.
9. No system of reporting to parliament on the MEAs.
10. Training need assessments found not done.
11. Possible lack of funding for meeting obligations under the MEAs.
12. Lack of proper documentation.
13. Inadequate Regional Cooperation

Source: <https://www.environmental-auditing.org/audit/>

AUDIT OF REFORESTATION/ AFFORESTATION:

Background:

Forest plays vital role in combating desertification. Forest absorb and store carbon, during times of heavy rainfall forests help to absorb water and slow flood flows, preventing damage to soil and trees also help to hold soil in place reducing erosion by both water and wind. Deforestation is the removal of a forest or stand of trees. Deforestation occurs for multiple reasons and contributes in climate change and desertification. To overcome the effects of deforestation two methods have been employed e.g. reforestation and afforestation.

Reforestation is the natural or intentional restocking of existing forests and woodlands (forestation) that have been depleted, usually through deforestation and Afforestation is the establishment of a forest or stand of vegetation in an area where there was no previous tree cover.

Audit objective:

Does forest are managed efficiently and effectively?

Auditable questions:

1. Does government has strategy/action plan to manage the forests?
2. Does the action plan is achieving its objectives?
3. Does the inventory of forests have increased with the targeted rate?

Audit Criteria:

There is currently no comprehensive legally binding instrument on forests. Negotiations on convention of forest management were initiated in 1990 by the G-7 countries. However in 1992 during United Nations Conference on Environment and Development (UNCED) it became apparent that the international community was far from reaching consensus on the contents of a forest convention.

The potentially most important global conventions related to forests are:

1. United Nations Framework Convention on Climate Change (UNFCCC)
2. Convention on Biological Diversity (CBD)
3. United Nations Convention to Combat Desertification in those Countries Experiencing Serious Drought and/or Desertification, particularly in Africa (UNCCD)
4. Kyoto Protocol

Below are examples of audit case study performed on reforestation/afforestation:

SAI India

Compensatory Afforestation in India:

In October 2002, Supreme Court of India directed that a 'Compensatory Afforestation Fund' (CAF) shall be created in which all the monies received from the user-agencies towards compensatory afforestation, additional compensatory afforestation, penal compensatory afforestation, net present value of forest land, catchment area treatment plan funds, etc. shall be deposited. CAF was to compensate for the loss of tangible as well as intangible benefits from the forest lands which were diverted for non-forest use. Such funds were to be used for natural assisted regeneration, forest management, protection, infrastructure development, wildlife protection and management, supply of wood and other forest produce saving devices and other allied activities. The Court observed that the fund would not be part of general revenues of the Union of the States or part of the consolidated Fund of India. Ministry of Environment and Forests (MoEF) notified the Compensatory Afforestation Management Funds Management and Planning Authority (CAMPA) in April 2004 for the management of the compensatory afforestation fund.

Audit objectives

1. Whether the diversion of forest land for non-forest use was permitted as per extant laws and all conditions in this regard were complied with;
2. Whether measures taken for conservation, afforestation and preservation of forest lands consequent to diversion of portions of these lands for non-forest use were as per provisos of extant legislation, rules and supreme court judgments in this regard;
3. Whether the collection, utilization, monitoring, accounting and the arrangement for safeguarding of compensatory afforestation funds was in compliance with applicable legislation, rules and supreme court judgments permitting diversion of forest land for non-forest purposes, and
4. Whether proper financial procedures had been followed in investing funds.

Audit criteria

1. Forest (Conservation) Act, 1980 as amended in 1988
2. Forest (Conservation) Rules, 2003 as amended in 2004
3. The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006
4. Wild Life (Protection) Act, 1972
5. Indian Forests Act, 1927
6. Supreme Court orders on the subject issued from time to time
7. Various guidelines and orders issued by MoEF from time to time, as per directives of the Supreme Court of India etc.

Audit Findings:

1. The total forest land diverted during the period 2006-12 was 1,14,877.26 hectare. Non-forest land measuring to 1,03,381.91 hectare was receivable after excluding exempted categories, but against this only 28,085.90 hectare was received. Hence non-forest land measuring to 75,905.47 hectare was not received which was 73 per cent of receivable non-forest land. It was observed that neither the State Nodal Officer nor MoEF ensured the receipt of non-forest land. Thus, MoEF failed in ensuring the compliance of its own regulatory provisions for forestry clearance.
2. In the scrutiny of records of MoEF it was observed that 1,022 proposals involving forest land measuring to 2.54 lakh hectare which had not complied with the first stage conditions for more than five years and were not rejected/ revoked.
3. As per Section 3A of the Forest (Conservation) Act, 1980, whoever contravenes or abets the contravention of any provisions of Section 2, is punishable. As per the monitoring reports of the MoEF Regional Office (RO), Bhubaneswar, user agencies were utilizing forest land in excess of the approved area. No remedial action was taken by MoEF or any penal provision under Section 3A of the Forest (Conservation) Act, 1980 was invoked.
4. It was observed that, despite the orders of the Supreme Court on the subject, no time bound program for eviction of encroachments was devised by MoEF/RO. The State Forest Departments also did not prepare a comprehensive list of encroachments of the forest land in order to proceed with the implementation of the orders of the highest Court of the country.
5. It was observed that even after reporting by the Regional offices, MoEF did not initiate any action against the defaulting agencies and granted final clearance without ensuring environmental clearance.
6. It was observed from monitoring reports of RO Bhubaneswar on four mining leases, it was reported that the mining activity in the project was affecting the flora & fauna, forest and wildlife adversely. However, as of December 2012, no action in this regard had been taken by MoEF, despite, adverse comments in the monitoring report in these projects.
7. MoEF allowed the diversion of the forest land of 100 hectare for mining to M/s Elray Minerals & Company in an arbitrary manner flouting the general and specific provisions of the forestry clearances overriding the recommendations in the site inspection report of its Regional Office not to divert the fresh area for mining.
8. Audit also observed instances where express orders of the Supreme Court were flouted by Electricity Board in Andhra Pradesh where the diversion of forest land in National Parks and Sanctuaries was allowed without seeking prior permission of the Supreme Court. In five other cases unauthorized renewal of mining leases in Rajasthan and Odisha were noticed, where the approval of Central Government was not obtained by the State Government as was directed by the Supreme Court.

Source: <https://www.environmental-auditing.org/media/3995/cag-report-on-compensatory-afforestation-in-india.pdf>

SAI Malaysia**A Study on Sustainable Forest Management in Malaysia:****Introduction:**

Forestry is important to maintain life on earth. On other hand trees are harvested for woods, herbs and medicine that contribute to economic sector. There are dilemmas in meeting the demand for forests resources such whereas at the same time protecting it. Sustainable Forest Management (SFM) comes as an approach where it is aimed at achieving management objectives so as to obtained sustainable production of the expected forests products without reducing the inherent values of the forest and future mass productivity as well as its impact on the physical and social environment.

Forestry office in Malaysia has place a lot of effort towards sustaining forest and used restoration, rehabilitation and reclamation in order to achieve the sustainable management.

Objective of the Study

The audit objective is to assess and report the efficiency and effectiveness of forest Management and its environmental impacts.

Audit Scope and Methodology

The Audit is carried on forest management of permanent reserved forest (including production forest and protection forest) of 10 states.

Files, records and relevant documents for the period 2006 to 2008 were scrutinized and reviewed.

Observation, site visit, interview and distribution of questionnaires were also conducted in order to collect the information.

Aerial view from the helicopter was carried out to capture the geographical location of forest.

Audit Criteria:

1. National Forestry Act, 1984 (amended 1993)
2. Wood-based Industries Act, 1984
3. Water Enactment, 1935,
4. Land Conservation Act, 1974
5. Protection of Wildlife Act, 1972
6. National Parks Act, 1980.
7. Audit findings
8. Exploitation of forests for certain activities has caused accelerated land erosion and increases the rates of denudation which lead to sedimentation.
9. Logging activities has caused the river water become muddy.
10. The dust from the explosion in quarry polluted the air. The trees especially the leaves were covered by the dust. This will distract the process of photosynthesis as the leaves cannot decompose carbon dioxide into oxygen that is needed by all living things.
11. Clear felling and burning have a cumulative impact on flora and fauna.

Source: <https://www.environmental-auditing.org/audit/>

SAI Nepal**Forest Management and Conservation (District Forest Office- Bara, Chitwan, Nawalparasi, and Rupandehi) Final report of Environment Audit, 2016 (2072)****Objective:**

The audit objective is to assess whether the activities undertaken in the area of forest management and conservation are performed efficiently and effectively on the basis of environmental aspects.

Scope - The audit scope includes District Forest Offices- Bara, Chitwan, Nawalparasi and Rupandehi.

Audit has covered the forest conservation and management activities of the offices conducted during the 3 year period between 2012/13 and 2014/15

Key Performance Indicator (KPI)

1. Systematic demarcation of forest
2. Removing Forest Encroachment
3. Implementation of Agreement
4. Protection and monitoring of afforestation
5. Controlling grazing and forest fire
6. Controlling export smuggling
7. Scientific forest management

Methodology:

1. Inquiries/discussions with the related stakeholders and field observations.
2. Facts and data have been collected through questionnaires and necessary analytical procedures have also been followed.
3. Performing field observations, study/ analysis of records, and using computation & comparison methods.

Audit findings:

The conservation of forests have been affected due to

1. Lack of clear demarcation between forests area and cultivated land area or disappearance of previously fixed boundaries due to lack of regular care taking and maintenance;
2. Inability to remove the encroached areas of forests and no proper recording of the increasing on-going encroachments;
3. Non accomplishment of replacement afforestation
4. Not attaining of receivable replacement lands
5. Non accomplishment of afforestation and forest protection works in accordance with targets set and not undertaking of adequate protection works for the planted saplings; and non-monitoring of the distributed saplings.
6. Not managing of animals grazing properly;
7. And inadequate preventive and curative measures taken to control of forest fire.

Source: https://www.environmental-auditing.org/media/5068/forest-management-audit_2016.pdf

AUDIT OF WATERSHED MANAGEMENT

Background:

By considering, in a comprehensive way, all the natural resources in a watershed, especially water, land and soil, watershed management provides a framework for assessing the ways in which those resources are used, what affects them, and how they can best be used and protected.

Most people agree that natural resources of the soil are under increasing pressure. Rising demand for agricultural land to produce at least 70 percent more food by 2050 in order to feed the growing world population competes with an increasing need for land and water for urban expansion, industrial development and tourism. At the same time, recognition is growing that a substantial proportion of cultivated lands is already highly or moderately degraded due to unsustainable agricultural practices leading to soil erosion, nutrient depletion and the loss of productivity. Unsustainable agricultural practices also have off-site impacts, such as changes in runoff patterns, river hydrology and groundwater recharge rates, and the pollution and siltation of downstream water bodies.

Watershed management promotes the adoption of sustainable land and water management practices and encourages investment in better land husbandry that supports, not harms, the ecosystems on which productivity depends. Efforts to improve efficiency in the use of natural resources, especially water, are required to reduce pressures on the natural resource base and to restore the health and quality of freshwater ecosystems.

The key purpose of watershed management is to negotiate a balance among the interests and often competing needs of stakeholders and to jointly identify options for resource use that balance economic, social and environmental objectives and for which the highest consensus can be achieved among stakeholders. Effective watershed management identifies degraded areas in need of restoration, as well as areas with high ecological value that must be protected from degradation or conversion to other uses. Watersheds have long been recognized as an appropriate spatial unit for management, and they are also increasingly recognized as the key scale for resource governance.

Audit objective:

1. Does watershed Management is effectively and efficiently managed?
2. Auditable questions:
3. Does government have its strategy and action plan regarding Watershed Management?
4. Does watershed management program effectively identify degraded areas in need of restoration?
5. To what extent degraded land areas are restored?

Audit Criteria:

The Convention on the Protection and Use of Trans-boundary Watercourses and International Lakes (Water Convention)

Below is the audit case study example of the water convention:

SAI India
Performance Audit of 'Integrated Watershed Management Programme

Introduction:
The Integrated Watershed Management Programme (IWMP) was launched (April 2009) by Government of India (GoI) to restore the ecological balance by harnessing, conserving and developing natural resources such as soil, vegetative cover and water. This would help to prevent soil run-off, regeneration, rain water harvesting and recharging of ground water table. This enables multi-cropping and introduction of diverse agro-based activities, which help to provide sustainable livelihoods to the people residing in the watershed areas.

Audit objectives
The Performance Audit of the IWMP was taken up with the objective of assessing the

1. Adequacy and effectiveness of the planning process for promoting resource conservation and regeneration through development of watersheds;
2. Whether watershed projects were implemented efficiently with multi tier approach as envisaged in programme guidelines within the stipulated time frame, adequacy and effectiveness of the monitoring mechanism; and
3. Efficacy of financial management.

Audit criteria
The sources of Audit criteria were:

1. Government of India guidelines April 2008 and 2011 on watershed management;
2. State perspective and strategic plan;
3. Detailed Project Reports;
4. General Financial and Accounting Rules and Public Works Financial and Accounting Rules;
5. Orders/guidelines/circulars issued by GoI and State Government from time to time.

Audit Scope and Methodology:
The State is divided into seven zones. Two zones, Ajmer and Jodhpur were selected for test check on the basis of maximum expenditure incurred during 2010-15. In selected zones 50 per cent of the districts i.e. two districts out of four in Ajmer zone (Ajmer and Nagaur) and three districts out of six in Jodhpur zone (Barmer, Jaisalmer and Jodhpur) were selected. In each selected district, two PIAs were further selected through random sampling using IDEA software. In each PIA, scrutiny of all of projects (maximum 10 projects) was carried out. Physical verification of 10 per cent of works carried out under the work phase in the test checked projects was also carried out jointly with departmental staff. Exit conference was conducted on 26 February 2016 with Government and responses of the Government were considered while drafting the report.

Audit Findings:

1. As per perspective and strategic plan, 58.50 lakh hectare area was to be treated under batch-I to VI during 2009-10 to 2014-15, against which 57.63 lakh hectare area was sanctioned and only 9.96 lakh hectare (17 per cent during (2009-15) was treated as of March 2015. There was delay in completion of 749 projects sanctioned during 2009-13.
2. State Government may review the strategic plan and prepare a revised plan to achieve the target of treatment of 179 lakh hectare with the proper and timely implementation of the project.
3. Cases of non-utilization of funds, excess expenditure reported to GoI, delay release of State share, cut in central share due to non-submission of consolidation evaluation report, unspent balances prior to IWMP schemes were also noticed.

Source: https://www.wgea.org/media/5582/9-pa-on-integrated-watershed-management-programme-rajasthan-report-no_4_of_2016-chapter-2.pdf

AUDIT OF SOIL CONSERVATION

Background:

Soils are the loose mineral or organic materials found on the earth's surface, usually (or averagely) made up of about 25% air, 25% water, 45% mineral and 5% organic matter. Soils are essential for life, in the sense that they provide the medium for plant growth. Unfortunately, soils are under threat in many ways, from excessive farming practices, use of chemicals during agricultural practices, water, land and air pollution, and water and wind erosion.

Soil erosion is the displacement of the upper layer of soil. This natural process is caused by the dynamic activity of erosive agents, that is, water, air (wind), plants, animals, and humans. The loss of soil from farmland may be reflected in reduced crop production potential, lower surface water quality and damaged drainage networks. Water and wind erosion are now the two primary causes of land degradation; combined, they are responsible for 84% of degraded acreage. As soil erosion removes the nutrient-rich upper soil layers that eventually end on desertification.

Soil conservation is the preventing of soil loss from erosion or reduced fertility caused by over usage, acidification, salinization or other chemical soil contamination.

Audit Objective:

Whether the risk of soil degradation is managed efficiently and effectively.

Audit Questions:

1. Whether government has developed action plan on soil conservation.
2. The target set in action plan has achieved?
3. The program launched for soil conservation has achieved its targets?

Audit Criteria:

Sources of audit criteria can include:

International conventions and agreements on soil conservation includes:

International Convention:

1. United Nations Convention on Combating Desertification
2. Convention on Biological Diversity
3. United Nations Framework Convention on Climate Change

Multilateral Agreements relevant to soil protection

1. 1972 Stockholm declaration
2. The Nairobi Declaration
3. The 1972 UNESCO Convention on the Protection of World Cultural and National Heritage
4. The European Soil Charter
5. World Conservation Strategy
6. The World Charter for Nature of 1982
7. International Code of Conduct on the Distribution and Use of Pesticides in 1985
8. Soil Protection Policy of 1992
9. Montevideo IV Programme
10. Public Policies for the Protection of Soil Resources

Audit Case Studies:

SAI Lesotho

Management of Soil Erosion by the Department Soil and Water Conservation in Lesotho

Introduction:

The Department of Soil and Water Conservation falls under the Ministry of Forestry and Land Reclamation, which was upgraded from a department in the Ministry of Agriculture and Food Security in March 2003. The decision to establish this ministry was based on the fact that soil erosion and land degradation demanded a more focused and concerned approach as they were still on the increase.

Objective:

The Office of the Auditor General undertook an audit in the Department of Soil and Water Conservation to examine the measures put in place to curb soil erosion and land degradation were ineffective, thereby come up with suggestions to remedy the problem.

Scope

The audit focused on the Department of Soil and Water Conservation and other stakeholders, which include; Ministry of Agriculture and Food Security (Departments of Crops and Field Services), Ministry of Public Works and Transport (Departments of Roads and Rural Roads), Ministry of Tourism, Environment and Culture (National Environment Secretariat – NES), Local Councils and the Public. 6 The country is divided into ten districts; however the audit was conducted in four districts that had on-going conservation works at the time of the audit.

Methodology:

1. Document review
2. Interviews
3. Physical observations

Audit Findings:

1. The audit team found out that during the period under review soil surveys had not been carried out. As a result interpretation and preparation of land capability classifications for specific land use was not done.
2. The audit team observed that information relating to conservation does not reach the target group because;
 - The radio programme was scheduled when a majority of the target group had already left their homes
 - Most areas do not have television reception.
3. The audit team established that land users do not abide by the terms stipulated in the clearance certificates. This was because the National Steering Committee (NSC) was dysfunctional. There were no spot checks done on development projects and NSC did not respond to National Environment Secretariat's memoranda.
4. The team found out that people engaged in anti-conservation land use practices, because there are no clearly defined penalties for perpetrators though the Land Husbandry Act 1969 binds the Ministry with the responsibility to regulate the use of land.
5. The audit however revealed that some conservation works were left incomplete; for instance, at Manganeng catchment, tree and grass planting was not done in other areas because arrival of seeds was delayed until the financial year and the season were over.

Recommendations:

1. The department should make communities aware of the importance of soil surveys and also that even individuals can approach the department for assistance in that regard.
2. The Information Division should schedule radio programmes in the evenings when the majority of the target group would be able to listen. Public gatherings should be held more often than the use of technical materials such as audio-visuals because public gatherings cover a large portion of the target group.
3. The department should play a leading role within the National Steering Committee to ensure that members attend all meetings and abide by the terms of the clearance certificates issued by the National Environment Secretariat
4. The department should advise the Minister to make regulations for revision of the penalty clauses against perpetrators
5. As some of the conservation activities are seasonal and do not follow the financial year, the Department of Soil and water Conservation should plan to carry forward these seasonal activities to the following financial year.

Source: <https://www.wgea.org/media/4179/2-forestry-executive-summary.pdf>

AUDIT OF RANGELAND MANAGEMENT

Background:

Rangeland is land on which the potential plant cover is composed principally of native grasses, grass-like plants, forbs or shrubs suitable for grazing. Rangelands play key role in enhancing infiltration process, leading to sustainable water flowing the down streams, and reduced soil erosion. The main reasons for deterioration of rangelands are the increase in no of livestock beyond the carrying capacity, improper land use and mismanagement. The other contributing factors are climate change and global warming. Resultantly desertification and decline in bio-diversity are common phenomenon.

Audit Objective:

Does government has rehabilitated the degraded rangelands and pastures close to their potential?

Auditable Question:

1. Do productivity and the related functions and services of the rangeland ecosystem have enhanced?
2. Whether the responsible entity has conserve and maintain rangeland biodiversity
3. Whether the responsible entity has enhance the skill and capacity of the key stakeholders for the sustainable management of the rangeland management

Audit Criteria:

United nation convention on combating desertification.

Audit Case Study:

SAI Australia Management of Pastoral Lands in Western Australia

Background:

Western Australia's (WA) rangelands cover 87% of the State. They are administered by the State Government. Around 39% of the State's rangelands (87 million hectares) is under pastoral lease. The pastoral industry contributes much to the social and economic fabric of the State, but, the industry faces many challenges, not least of which, the land on which it operates is some of the State's most fragile. Pastoral lands have been under threat for over 75 years and during that time there has been limited support to ensure the long-term productivity of the land.

Audit objective:

This audit assessed whether there is a coordinated and effective approach to protect the ecological sustainability of pastoral lands.

Audit Criteria:

Land Administration Act 1997 (LA Act)

Audit findings:

The State does not have good knowledge of lease level land condition
Lessees receive limited support to manage the land for long-term productivity
Policies and agency information management offer little to support a sustainable pastoral industry.

Source: https://www.wgea.org/media/5735/summary2017_17-pastoral.pdf

AUDIT OF SUSTAINABLE LAND MANAGEMENT (MANAGING LAND COVER AND LAND USE PRACTICES)

Background:

Land degradation is simply defined, “as a decline in ecosystem goods and services from the land”. Land degradation negatively affects the natural resources like water, soil, plants and animals. Unsustainable land use is the main causes of land degradation and ultimately leads to desertification. Some examples of wide spread unsustainable land-use techniques:

1. Extensive use of fire leading to the depletion of soil nutrients
2. The use of alien grazing animals, particularly sheep, goats and cattle, which destroy the protective vegetation and promote soil erosion
3. Agriculture on the steep slopes, with furrows orientated downhill, enhancing erosion
4. The use of non-native species for reforestation projects leading to the depletion of soil water and nutrients levels in long term perspective
5. Increasing human population density what shortens fallow periods.

The solution of this problem lays in sustainable land management practices. The United Nations defines sustainable land management (SLM) as “the use of land resources, including soils, water, animals and plants, for the production of goods to meet changing human needs, while simultaneously ensuring the long-term productive potential of these resources and the maintenance of their environmental functions”.

Audit Criteria:

United Nation Convention to combat desertification

Audit Case Studies:

SAI of Malaysia
Application of Information Technology In Environment Audit

The National Audit Department Malaysia And Malaysian Remote Sensing Agency have Signed a MOU, under the Ministry of Science, Technology for the Introduction of Remote Sensing, Technology & Geographic Information System to address gobble issue e.g. sustainable development and eradication of poverty.

Audit Objectives
To access

1. The management of the coastal Erosion Prevention Project.
2. It the River Mouth have been managed efficiently to achieve the objectives stipulated.

Scope:
Planning , implementation & monitoring of 3-projects for preventing coastal Erosion & Dredging of River Mouth for the 9th Malaysian Plan Period.

Criteria:

1. The Environment Quality Act 1974.
2. Environment Quality Order 1987.
3. DID Coastal Erosion Protection Guideline 1/1997.
4. Guideline for preparation of Coastal Engineering Hydraulic Study and Impact Evaluation, 2001.

Findings:

1. Integrated Coastal Management Plan had not been made available.
2. Erratic administration of procurement and contract.
3. Specifications were not met according in structures and construction.
4. Optional project components were not paid due attention.
5. Improper management of asset & Inventory.
6. Impact of conservation in the coastal erosion to the environment.

Recommendations:

1. Preliminaries Study covering every aspect should be conducted.
2. Monitoring should be improved for ongoing projects.
3. Records of coastal & estuarine problems must be maintained for the purpose of planning future projects.
4. Coordination between headquarter and state/region should be improved.
5. Policy should be clearer enough to not having any duplication in decision making.

Source: Country papers of the 7th seminar on Environmental Auditing.

AUDIT OF NATURAL PROTECTED AREAS:

Background:

Protected areas or conservation areas are locations which receive protection because of their recognized natural, ecological or cultural values. Natural protected areas play their role in fight against desertification in following ways:

1. Protect watersheds, water sources and wetlands
2. Maintain natural habitats and stabilise dunes to stop the advance of deserts
3. Restore habitats, including reforestation and grasslands recovery
4. Enhance grassland management practices for sustainable grazing and improved fire management
5. Maintain healthy ecosystems and pilot management practices that control and limit invasive alien species
6. Protect ecosystems with high carbon storage and rich biodiversity
7. Conserve native biodiversity

Audit Objective:

Does responsible entity have achieved its targets for conservation, preservation and restoration of natural protected areas effectively and efficiently?

Audit Questions:

1. Whether natural protected areas stabilize dunes to stop the advance of deserts?
2. Whether natural protected areas enhanced grassland management practices for sustainable grazing?

Audit Criteria:

United Nation Convention to combat desertification

Audit Case Study:

SAI of Mexico Management Assessment of Protected Natural Areas

Audit Objectives:

1. Evaluate the compliance with the objectives and targets related to the conservation, preservation and restoration of natural protected areas
2. Evaluation in order to achieve its sustainable use and exploitation
3. verify the processes in place to carry out its proper administration and verify the implementation of budgetary resources in these actions.

Audit Criteria:

1. National priorities identified in the 2001-2006
2. National Development Plan
3. Constitutional mandate.

Audit Findings:

1. In 2006, out of the 158 NPA, 68.4% (108) did not have the management program described in article 65 of the General Law of Ecological Balance and Environmental Protection, and 76 (48.1%) of annual operating programs, so in these cases was not possible to assess the compliance of the actions for conservation, protection, preservation and restoration provided for in Articles 5, Section I of the Rules of the General Law of Ecological Balance and Environmental Protection in the Field of Natural Protected Areas and 145, section V, the Internal Regulation of the Ministry of Environment and Natural Resources.
2. For the preservation of the 158 NPA, in 2006 the CONANP fulfilled 100.0% in the goal to make four conservation projects for as species listed as priority, 5.2% of the 77 species endangered or threatened. Of these 77 species, monitored 40.3% (31 species), so they turned on the programmed goal 103.3% (30 species). They also developed conservation actions and projects for 20 species identified in any of the risk categories, 26.0% of 77, which limited coverage pursuant to article 45, section II, of the General Law of Ecological Balance and Environmental Protection, to preserve endangered, threatened, endemic and rare species, as well as which are subject to special protection.
3. To protect the NPA, in 2006, under Article 5, Section I, paragraph c, of the Rules of the General Law of Ecological Balance and Environmental Protection in the Field of Natural Protected Areas, PROFEPA inspected, on average, 50.0% (12) of the 24 prioritized NPA's, covering 38.9 percentage points lower than in 2001 (88.9%), as a result of the reduction of 45.4% of inspector staffing, from 930 in 2001 to 508 in 2006. For their part, SEMAR made 14.753 routes to monitor the marine environment, in accordance with Article 30, Section XXV of the Organic Law of Federal Public Administration. In terms of restoration, CONANP did not defined targets and indicators to assess the provisions of Articles 1, first paragraph, of the General Law of Ecological Balance and Environmental Protection, and 5, Section I, paragraph a, of its regulation Area of Protected Natural Areas In order to preserve the NPA, CONANP produced 12 studies programmed to measure the alteration of ecosystems (processing rate), which showed that in 11 NPA was negative alteration (between 0.740 and 0.027), mainly by clearing and deforestation, so that the actions were insufficient to achieve sustainable use and development and preserving ecosystems, the provisions of Article 45, Sections I and III of the General Law of Ecological Balance and Environmental Protection.
4. In 2006, investment per hectare of NPA was 12.7 pesos, 3.2% more on average per year, compared to 2001 (3.4 pesos per hectare). Compared to Costa Rica, the cost per hectare was lower at 8.0% (1.1 pesos) and Spain at 77.0% (42.6 pesos). In 2006, the SEMAR and CONANP did not performed coordination activities to identify areas of competence of SEMAR that allow to efficiently and effectively fulfill its monitoring functions, the SEMAR and PROFEPA did not established coverage targets of NPA with surveillance actions, in the terms set out in Article 3, second paragraph, of the Planning Act; the CONANP did not disposed of procedure manuals to regulate commercial and tourism activities in NPA, in violation of Article 19 of the Organic Law on the Federal Public Administration; PROFEPA did not had controls to ensure collection of fines imposed, and the SEMAR lacks of records in surveillance activities.

Source: <https://www.wgea.org/audit/>

Appendices

APPENDIX 1 AUDIT DESIGN MATRIX FOR SUSTAINABLE LAND MANAGEMENT PROJECT FOR PAKISTAN

Audit Issue: Planning and translation of program into action

Audit Objective: Assess whether policies and programmes were effectively translated into action

Audit Question 01: Has Appropriate policy reforms for SLM been recommended?

Sub Question	Criteria	Source of Information
Were Consultations with stakeholders at the national, provincial and local levels on SLM policy related issues held?	National sectoral policies (Forest, Range, Agriculture & Water, Climate Change) harmonized for adoption of SLM, SFM, NRM & IWRM practices Sectoral policies; reviewed in the context of NAP & UNCCD implementation on	Planning Commission, GOP Federal Ministries: All relevant provincial Departments
Was In-house National Forest Policy review in the context of SLM completed?		Universities and Research Institution Directorate of land Reclamation & Soil Punjab Soil Survey of Pakistan
Was Provincial and national level workshops for the development of National Range Land Policy held/facilitated?		International Organizations: GM, ICIMOD, UNDP, FAO, WWF, IUCN, Swiss Inter Cooperation CABI (South Asia), IWASRI
Was Sectoral Policy reviews on (Agriculture & Water) conducted through national consultants?		
Were Sectoral policy reforms shared with the concerned Ministries?		

Audit Question 02: Has NAP mainstreamed into sectoral planning ?

Have Consultations with all stakeholders held at national & Provincial level ; Has Review of NAP and gap analysis conducted through national consultation?	Gap analysis of NAP	Planning Commission, GOP Federal Ministries: All relevant provincial Departments
Whether NAP alignment with UNCCD 10-Year strategic Plan launched?	NAP– mainstreamed into sectoral policies, planning and budgetary processes.	Universities and Research Institution Directorate of land Reclamation & Soil Punjab Soil Survey of Pakistan
Has Global Mechanism being involved to develop Integrated Financing Strategy (IFS) for the aligned NAP.		International Organizations: GM, ICIMOD, UNDP, FAO, , WWF, IUCN, Swiss Inter Cooperation CABI (South Asia), IWASRI

Sub Question	Criteria	Source of Information
Audit Question 3: Whether National Criteria & Indicators (C & I) Developed for SLM		
Has Review of literature on C & I completed? Whether Awareness and– sensitization of partner organizations and line agencies on need for C & I development created ?	C & I for SLM developed & adopted	Federal Ministries including Planning Commission Provincial Planning & Development Departments. Research Institutions International NGOs Private Sector Academia Community Organizations
Has a Background paper– for C & I prepared and shared with stakeholders;		

Audit Question 5: Whether National Desertification Control Fund (NDCF) established

Have Consultations with stakeholders including CBOs on the feasibility of establishing of NDCF/local level funds?	Local level funds established	
Ascertain Development of– operational guidelines for the establishment of local level funds.		
Whether Preparation of– contract agreement for local level funds made?		

Audit Title: Capacity Building

Audit Objective: To ascertain whether skills has enhanced to scale up SLM through an institutionalized, multi-tiered capacity-building programme?

Audit Question 01: Institutional capacity at National, Provincial and Local levels strengthened

Sub Question	Criteria	Source of Information
Whether Training Need Assessment has Conducted?	Capacity– gaps of provincial and local agencies identified and training plans developed. Community represent actives trained and certified to facilitate SLM interventions	All local line Deptts like Forest Deptt, Agriculture Deptts provided inputs during implementation of Pilot Projects National– Research and Development Institutions extended support by providing Resource Persons during organization of different Workshops like PARC, WWF and BARI etc
Whether National level Workshops has organized?		
Whether workshop at Provincial level has organized?		

Audit Question 02: Have apex bodies for coordination of desertification control measures formed?

Whether NCCD revived and renotified after consultation process?	National Coordination Committee on Desertification (NCCD) revived to implement UNCCD and NAP Provincial– Coordination Committees on Desertification (PCCDs) established	All members from Ministries, Deptts, NGOs and Private sector, participated during regular meetings of these coordination forums
Whether PCCDs has established in provinces conducting its regular meetings?		

Audit Question 3: Orientation of research institutes towards targeted SLM activities

Have Research Projects conceived in collaboration with universities?	Targeted– research studies conducted and findings implemented Research findings by the farmers/pastoral communities developed	All Research Institutes working on degraded land Project
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Audit Question 4: Public – Private partnership promoted

Any Dialogues/collaboration with Private Companies for investment?	Willingness of private sector’s participation in dryland management assessed. Public private partner investment plans designed and implemented	Investment Partners
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Sub Question	Criteria	Source of Information
Audit Question 4: Whether knowledge generated for sustainable land management?		
Have system of Drought/Floods Early Warning in Pakistan strengthened?	Early warning system and mechanism for monitoring drought supported Number- of climate change impact studies conducted	Pakistan Metrological department NDMA and PDMAs Early Warnings BlackBox- Sounds private company

Audit Title: Mainstreaming SLM into Land Use Planning Process

Audit Objective: To assess the Mainstreaming SLM into Land Use Planning Process

Audit Question 01: Whether National & local LUPs developed/ harmonized to SLM principles

Sub Question	Criteria	Source of Information
Have Guidelines for preparation of National / provincial and Village land use plans drafted and shared with the then MoE?	SLM Guidelines integrated into national LUPs / National land use planning process harmonized towards SLM practices by developing guidelines at grassroots and national / provincial levels	Pakistan Upper Atmospheric Research Commission (SUPARCO); -National Agriculture Research Centre (NARC); -Survey of Pakistan (SoP); -Soil Survey of Pakistan (SSP); - Pakistan Meteorological Department (PMD); -Pakistan Wetlands Program; -
Whether National Land Use Atlas prepared by NLUP project of then MoE was studied / reviewed to ascertain that SLM is integrated into this atlas?	Grassroots /Village Land Use Plans (VLUPs) at 9 demonstration sites	
Have Guidelines for Village LU planning for SLM translated into Urdu ?		

Audit Question 02: Whether SLM Information System Based on GIS Database Developed

Whether Baseline database has developed?	Extent of desertification at feasibility study sites mapped;	Pakistan Upper Atmospheric Research Commission (SUPARCO); -National Agriculture Research Centre (NARC); -Survey of Pakistan (SoP); -Soil Survey of Pakistan (SSP); - Pakistan Meteorological Department (PMD); -Pakistan Wetlands Program; -
Have Thematic and land-cover maps prepared?	Existing data accumulated and incorporated in SLM Information system;	
Whether Community activists and IPs were trained on use of GPS and ground truthing of satellite imageries for participatory GIS mapping?	Field survey conducted to fill gaps in the GIS database/SLM Information System	

Audit Question 3: Whether periodic changes at demonstration sites towards sustainability of SLM practices monitored & assessed

Have Performance indicators identified ?	Performance indicators identified & monitored	
Whether Performance of pilot projects against indicators being monitored on quarterly basis?		

Audit Title: Monitoring and evaluation

Audit Objective: Analyze whether the monitoring system envisaged in the programme adequate and effective in realization of objectives

Audit Question 01: Were all the committees prescribed under guidelines of programme formed in time

Sub Question	Criteria	Source of Information
Was the frequency of the meetings of various committees fixed?	Frequency of Meeting Finalized	Project
Were meetings of all the committees held regularly and on schedule?	Schedules and Minutes of Meeting	
Was follow up action taken on the recommendations Of various committees?		

Sub Question	Criteria	Source of Information
Audit Question 2: Was periodic review of progress undertaken during implementation stage at district, state and national level?		
Were suitable standard format evolved to develop a uniform system of monitoring of physical and financial progress of project?	Progress Evaluation Reports	Project
Was action taken on report of Mid-term review at various levels of implementation		
Audit Question 3: Did the Ministries concerned conduct surprise visits of project sites to find irregularities?		
Audit Question 4: Were the remedial measures taken to correct the irregularities?		
Audit Question 5: Whether the system of concurrent Evaluation was working efficiently and follow up action taken on the reports of concurrent evaluation?		
Audit Question 6: Did various agencies involved in the programme interact periodically and regularly?		
Audit Question 7: Was Soil testing laboratories and the practice of maintaining Soil Health Cards at either the 'farm level' or at an 'area level' made available and effectively functional ?		

APPENDIX 2 UNITED NATION CONVENTION TO COMBAT DESERTIFICATION

United Nation Convention to Combating Desertification		
Other Names	UNCCD	The Convention's purpose is to fight desertification and mitigate drought effects in nations with serious drought and/or desertification issues, particularly in Africa, through effective action at all levels, supported by international cooperation and partnership arrangements, in the framework of an integrated approach, and contributing to the achievement of sustainable development in affected areas.
Place and Date of Signature		
Date of Entry into force	24.06.1998	
Number of Parties (as of Sept 2018)	197	
Web Link for the Secretariat	http://www.unccd.int	
Secretariat contact	secretariat@unccd.int	

Desertification came on the radar of UN in 1974 when it was recognized as a global problem. However, the area remained in low priority by funding agencies and lacked in providing funding and technical solutions to countries affected by desertification. A framework was needed that could mobilize resources, engage local populations and focus affected countries strategies. Earth Summit at Rio de Janeiro, Brazil proved a game changer and idea for a convention was supported unanimously. Despite past disappointments in global efforts to address the issue, environmentalists had ample reason for optimism.

United Nations took up the issue of land degradation and desertification around the globe through United Nations Convention to Combat Desertification (UNCCD), 1996, which emphasizes effective environmental governance at national, regional & international levels with the following aspects:

1. Binding under international law
2. Aiming systematic utilization of existing experience
3. Stipulating all the national and Regional action programs for its implementation
4. Promoting participation of affected population & all national stakeholders
5. Calling for partnership agreements at national & international level and to create appropriate coordination fabric
6. Advocating the integration of Action program into National Investment programs, strategies and steps for development including Poverty Reduction Strategy Papers (PRSPs)
7. As well as effective utilization of funds and mobilization of innovative financing mechanism
8. Strategy making for efficient –framework of sustainable natural resource management.

After the first decade of existence of UNCCD, it was difficult to determine whether the rate of desertification in the world had been actually decreasing especially in absence of benchmarks and indicators. To overcome this handicap, UNCCD focused on more holistic perspective that attempted to address the complex dynamics of desertification. The view is evident in preamble of the Convention which underscores nexuses between desertification and drought affecting sustainable development through their interrelationships with important social problems such as poverty, poor health and nutrition, lack of food security and those arising from migration, displacement of persons and demographic.

In a decade from 2010 onwards, there have been a number of global/regional targets and initiatives to stop and reverse land degradation and restore degraded land. Some of them are:

- **Convention on Biodiversity's Aichi biodiversity¹⁸** targets aims at restoration of at least 15% of degraded ecosystem
- **The Bonn Challenge¹⁹** and its regional initiatives to restore more than 150 million hectares
- **2030 Agenda for Sustainable Goals (SDGs)**

The 17- Sustainable Development Goals (SDGs), preceded by Millennium Development Goals (MDGs) of United Nations, include other emerging areas which ultimately cross each other as cause and consequence of desertification, i.e., elimination of Poverty and hunger with good health and wellbeing as well as quality education, clean water, sanitation, affordable energy, infrastructure and economic growth, sustainable cities, climate action with land above and below land with healthy environment and partnership for goals are of utmost importance.

Keeping in view the inter-linkages among the SDGs as a cause or consequence of desertification, UNCCD in 2015 joined hands for "Sustainable Development 2030" with its key partners like Food and agriculture of the United Nations (FAO), United Nations Framework Convention on Climate Change (UNFCCC), Convention on Biological Diversity (CBD), United Nations environment Program (UNEP) and the United Nations Statistics Division (UNSD).

UNCCD is only convention stemming from a direct recommendation of the Rio Conference's Agenda 21, was adopted in Paris, France on 17 June 1994 and entered into force in December 1996. It is the only internationally legally binding framework set up to address the problem of desertification. The Convention is based on the principles of participation, partnership and decentralization—the backbone of Good Governance and Sustainable Development. It has 196 parties, making it near universal in reach.

The Conference of the Parties

The Conference of the Parties (COP) oversees the implementation of the Convention. It is established by the Convention as the supreme decision-making body, and it comprises all ratifying governments.

Committee on Science and Technology (CST):

The UN Convention to Combat Desertification has established a Committee on Science and Technology (CST). The CST was established under Article 24 of the Convention as a **subsidiary body of the COP**, and its mandate and terms of reference were defined and adopted during the first session of the Conference of the Parties in 1997. It is **composed of government representatives** competent in the fields of expertise relevant to combating desertification and mitigating the effects of drought. The committee identifies priorities for research, and recommends ways of strengthening cooperation among researchers. It is multi-disciplinary and open to the participation of all Parties. It meets in conjunction with the ordinary sessions of the COP.

Group of Experts

Under the authority of the CST, a Group of Experts was established by the COP with a specific work programme, to assist in improving the efficiency and effectiveness of the CST. This Group of Experts working under the authority of the CST, provides advice on the areas of drought and desertification. The Group of Experts plays an important institutional role, providing the CST with information on the current knowledge, the extent and the impact, the possible scenarios and the policy implications on various themes assigned in its work programme. The results of the work performed by the GoE are widely recognized and include dissemination of its results on ongoing activities (benchmarks and indicators, traditional knowledge, early warning systems).

The Group of Experts develops and makes available to all interested people information on appropriate mechanisms for scientific and technological cooperation and articulates research projects, which promote awareness about desertification and drought between countries and stakeholders at the international, regional and national level.

The Group of Experts seeks to build on and use existing work and evidence to produce pertinent synthesis and outputs for the use of the Parties to the Convention and for the broader dissemination to the scientific community. The programme of work and its mandate is pluri-annual in nature, for a maximum of four years.

18 CBD's Strategic Plan (2011-2020) & Aichi targets

19 The Bonn Challenge is a global effort to bring 150 million hectares of the world's deforested and degraded land into restoration by 2020, and 350 million hectares by 2030. It was launched in 2011 by the Government of Germany and IUCN, and later endorsed and extended by the New York Declaration on Forests at the 2014 UN Climate Summit.

New World Soil Charter

Coinciding with 2015 the international year of soils, member countries during the 39th fao conference unanimously endorsed the new world soil charter as a vehicle to promote and institutionalize sustainable soil management at all levels. When doing so, members also welcomed and appreciated the work done by the global soil partnership and requested to move into its full implementation including that of the world soil charter.

Report: Status of the World's Soil Resources

Year of publication: 2015

Publisher: FAO

Pages: #94 p.

Isbn: 978-92-5-108960-6

Job number: i5126;

Author: pennock, d.;mckenzie, n.;montanarella, l.;land and water division;

Agrovoc: agricultural soils; climate change; biodiversity; soil erosion models;

Abstract:

This document presents a summary of the first *status of the world's soil resources* report, the goal of which is to make clear the essential connections between human well-being and the soil. The report provides a benchmark against which our collective progress to conserve this essential resource can be measured. The report synthesizes the work of some 200 soil scientists from 60 countries. It 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. The specific threats considered in the report are soil erosion, compaction, acidification, contamination, sealing, salinization, waterlogging, nutrient imbalance (e.g. Both nutrient deficiency and nutrient excess), and losses of soil organic carbon (soc) and of biodiversity.

The report focuses on the 10 main threats to soil functions: soil erosion, soil organic carbon loss, nutrient imbalance, soil acidification, soil contamination, waterlogging, soil compaction, soil sealing, salinization and loss of soil biodiversity.

It notes how there is a general consensus on soil-related strategies that can, on the one hand, increase the supply of food, while on the other, minimize harmful environmental impacts.

The solution proposed is one that centres on sustainable soil management and which requires the participation of a broad level of stakeholders ranging from governments to small-holder farmers.

Erosion, for example, can be curbed by reducing or eliminating tillage - digging, stirring, and overturning of soil - and using crop residues to protect the soil surface from the effects of rain and winds. Similarly, soils suffering from nutrient deficits can be restored and yields increased by returning crop residues and other organic material to the soil, employing crop rotation with nitrogen-fixing crops, and making judicious use of organic and mineral fertilizers.

The report identifies **four priorities for action:**

- Minimize further degradation of soils and restore the productivity of soils that are already degraded in regions where people are most vulnerable;
- Stabilize global stores of soil organic matter, including both soil organic carbon and soil organisms;
- Stabilize or reduce global use of nitrogen and phosphorus fertilizer, while increasing fertilizer use in regions of nutrient deficiency; and,
- Improve our knowledge about the state and trend of soil conditions.

Such actions need to be supported by targeted policies, including:

- Support for the development of soil information systems to monitor and forecast soil change;
- Increasing education and awareness on soil issues, by integrating this into formal education and across the curriculum - from geology to geography, from biology to economics.
- Investing in research development and extension, to develop test, disseminate sustainable soil management technologies and practices.
- Introducing appropriate and effective regulation and incentives. This could include taxes that discourage harmful practices such as excessive use of fertilizer, herbicides and pesticides. Zoning systems can be used to protect the best agricultural soil from urban sprawl. Subsidies could be used to encourage people to purchase tools and other inputs that have a less harmful impact on soils, while certification of sustainable crop and livestock practices can make produce more commercially attractive at higher prices.
- Supporting achievement of local, regional and international food security by considering countries' soil resources and their capacities to manage them sustainably.

APPENDIX 3 STATUS OF THE WORLD'S SOIL RESOURCES²⁰

Area of Audits: Forest Management	
Year	Title
2017	Protection Forest Management at the Österreichische Bundesforste AG
2017	Wildland Fire Risk Reduction: Multiple Factors Affect Federal-Nonfederal Collaboration, but Action Could Be Taken to Better Measure Progress (GAO-17-357)
2017	Effectiveness of measures, activities and projects for protection of the forests in the Republic of Macedonia
2017	Expert-analytical activity "Analysis of the implementation (in the period 2015-2017) of measures on forest fire protection, which are designated in the state program "Development of Forestry 2013-2020"
2017	Audit on the completeness, promptness and efficiency of federal budget expenditures, allocated (in the period 2015-2017) to forest fire protection in the framework of the state program "Development of forestry" for the period 2013-2020
2016	The Performance Evaluation Results of the Forest and Wetlands Protection - Ministry of Agriculture
2016	The control of forest regeneration work
2016	Forest Management and Conservation
2016	Implementation of the Programme of funding of General Forestry Needs
2016	CO ₂ compensation in Switzerland
2016	Audit on the reasonableness of policies and regulations in forest resources
2015	Environmental Aspects Audit in coordination with superior Supervising Institutions of Latin America, to the management of biodiversity, focused on the national protected areas, under the supervision of related institutions and the Ministry of Environment
2015	Serial audit on the asset management activities of state-owned forestry companies
2014-2015	PA on Working of Maharashtra Forest Department
2014	Forestry, land use planning and its impact to climate change
2014	Report of the Comptroller and Auditor General of India Audit of Forests, Ecology, Environment & Wildlife Department for the year ended March 2013, Government of Nagaland (Report No. 2 of 2014)
2014	Audit on the forest fire prevention measures taken by governmental authorities of the Republic of Bulgaria.
2013	Irregular appointment of Technical Managers at the forest and wildlife technical administrations in Tambopata
2013	Performance Audit on Protection of Forests and Wildlife of Rajasthan
2013	Performance Audit on Compensatory Afforestation in India
2013	Leasing of Government Land, GRF Land and Mines
2012	Management of forest harvesting by the Ministry of Natural Resources and Tourism
2012	Managing Forest

²⁰ <http://www.fao.org/3/a-mn442e.pdf>

Area of Audits: Forest Management	
Year	Title
2012	Parallel audit of the Accounts Chamber of the Russian Federation and the Office of Auditor General of Mongolia of efficiency of state regulation in area of protection of the environment (1994/1995 bilateral agreements between the Russian Federation and Mongolia)
2012	Control over the conservation and use of forest and wildlife resources
2012	The Office of the Auditor General(s) investigation of sustainable management of Norwegian forest resources

Area of Audits: Land Development	
2017	Management of Pastoral Lands in Western Australia
2017	Managing Victoria's Planning System for Land Use and Development
2017	Greening: a more complex income support scheme, not yet environmentally effective
2017	Wildland Fire Risk Reduction: Multiple Factors Affect Federal-Nonfederal Collaboration, but Action Could Be Taken to Better Measure Progress (GAO-17-357)
2017	ECOSYSTEM PRESERVATION OF PRESPA NATIONAL PARK
2016	Funds provided for the improvement of nature and landscape
2016	Management of mineral resources
2015	NON-URBAN SOIL AND LAND GOVERNANCE
2014-2015	PA on Conservation of Wetlands
2014	Compensation for damage to nature areas. Follow up audit of the protection of nature areas
2014	Sustainable use of agricultural land
2014	Forestry, land use planning and its impact to climate change
2014	Chapter 6: The Land Aggregation Scheme
2014	Forestry, land use planning and its impact to climate change
2014	Coastal management in Cyprus
2012	Implementation of legal obligations in landscape parks
2012	Management of land use planning and disaster risk
2012	Management of land use planning and disaster risk
2011	Forestry audit

APPENDIX 4 LIST OF RELATED AUDITS²¹

National Action Plans for UNCCD

Sr. No.	Name of Region	Name of Sub Regions	Countries	Nation Action Programme (in which Year)
	Africa	Northern Africa	Algeria	Yes 2004
			Egypt	Yes 2005
			Libya	No
			Mauritania	Yes 2002
			Morocco	Yes 2002
			Sudan	Yes 2002
			Tunisia	Yes 2000
		Southern Africa	Angola	No
			Botswana	Yes 2006
			Lesotho	Yes 1999
			Madagascar	Yes 2001
			Malawi	Yes 2001
			Mozambique	Yes 2002
			Mauritius	No
			Namibia	Yes 1994
			Seychelles	No
			South Africa	Yes 2004
			South Sudan	No
			Swaziland	Yes 2000
			Zambia	Yes 2000
			Zimbabwe	Yes 2000

²¹ <https://www.environmental-auditing.org/>

Sr. No.	Name of Region	Name of Sub Regions	Countries	Nation Action Programme (in which Year)
		Western Africa	Benin	Yes 2000
			Burkina Faso	Yes 2000
			Cape Verde	Yes 2000
			Côte d'Ivoire	No
			Gambia	Yes 2000
			Liberia	Yes 2013
			Mali	Yes 2000
			Niger	Yes 2000
			Nigeria	Yes 2001
			Senegal	Yes 2000
			Sierra Leone	No
			Togo	Yes 2002
		Eastern Africa	Comoros	Yes 2013
			Djibouti	Yes 2000
			Eritrea	Yes 2002
			Ethiopia	Yes 2000
			Ghana	Yes 2002
			Guinea	Yes 2006
			Guinea-Bissau	No
			Kenya	Yes 2002
			Somalia	No
			Uganda	Yes 2000
			Tanzania, United Republic of	Yes 2000

Sr. No.	Name of Region	Name of Sub Regions	Countries	Nation Action Programme (in which Year)
		Central Africa	Burundi	Yes 2011
			Cameroon	Yes 2006
			Central African Republic	No
			Chad	Yes 2000
			Congo, Republic of the	Yes 2006
			Congo, Democratic Republic of the	Yes 2006
			Equatorial Guinea	Yes 2006
			Gabon	Yes 2007
			Rwanda	No
			Sao Tome and Principe	No
2	Asia	South Asia	Afghanistan	No
			Bangladesh	No
			Bhutan	Yes 2010
			India	Yes 2001
			Iran, Islamic Republic of	Yes 2004
			Maldives	No
			Nepal	Yes 2004
			Pakistan	Yes 2002
			Sri Lanka	Yes 2002
		East Asia	China	Yes 2000
			Mongolia	Yes 2000

Sr. No.	Name of Region	Name of Sub Regions	Countries	Nation Action Programme (in which Year)
		West Asia	Bahrain	No
			Iraq	No
			Jordan	Yes 2015
			Kuwait	No
			Lebanon	Yes 2003
			Oman	Yes 2005
			Qatar	No
			Saudi Arabia	Yes 2005
			Syrian Arab Republic	Yes 2002
			United Arab Emirates	Yes 2003
			Yemen	Yes 2000
		Central Asia	Kazakhstan	Yes 2001
			Kyrgyzstan	Yes 2014
			Tajikistan	Yes 2001
			Turkmenistan	Yes 1997
			Uzbekistan	Yes 1999
		South East Asia	Cambodia	No
			Indonesia	Yes 2002
			Lao People's Democratic Republic	Yes 2000
			Malaysia	No
			Myanmar	Yes 2005
			Philippines	Yes 2004
			Singapore	No
			Thailand	Yes 2004
			Timor-Leste	No
			Viet Nam	Yes 2002

Sr. No.	Name of Region	Name of Sub Regions	Countries	Nation Action Programme (in which Year)
		Pacific Asia	Cook Islands	No
			Fiji	Yes 2007
			Kiribati	No
			Marshall Islands	No
			Micronesia, Federated States of	No
			Nauru	No
			Niue	Yes 2004
			Palau	Yes 2005
			Papua New Guinea	No
			Samoa	Yes 2015
			Solomon Islands	No
			Tuvalu	Yes 2006
			Tonga	No
			Vanuatu	No
		Affected and Developed Country Party	Australia	No
3.	Latin America and Caribbean (LAC)	Andean	Colombia	Yes 2004
			Ecuador	Yes 2004
			Peru	Yes 1996
		Mesoamerica	Belize	No
			Costa Rica	Yes 2004
			El Salvador	Yes 2003
			Guatemala	Yes 2001
			Honduras	Yes 2005
			Nicaragua	Yes 2004
			Panama	Yes 2004

Sr. No.	Name of Region	Name of Sub Regions	Countries	Nation Action Programme (in which Year)
		South Cone	Argentina	Yes 1997
			Bolivia (Plurinational State of)	Yes 1997
			Brazil	Yes 2004
			Chile	Yes 2004
			Paraguay	Yes 2003
			Uruguay	No
			Venezuela, Bolivarian Republic of	Yes 2004
		Caribbean	Antigua and Barbuda	Yes 2005
			Bahamas	Yes 2006
			Barbados	Yes 2001
			Cuba	Yes 2003
			Dominica	Yes 2004
			Dominican Republic	Yes 2012
			Grenada	Yes 2006
			Guyana	Yes 2006
			Haiti	Yes 2015
			Jamaica	Yes 2002
			Saint Kitts and Nevis	Yes 2007
			Saint Lucia	No
			Saint Vincent and the Grenadines	No
			Suriname	No
			Trinidad and Tobago	No
		Affected and Developed Country Party	Mexico	No

Sr. No.	Name of Region	Name of Sub Regions	Countries	Nation Action Programme (in which Year)
4	Northern Mediterranean	Affected and Developed Country Party	Albania	No
			Croatia	No
			Cyprus	No
			Greece	Yes 2001
			Hungary	No
			Israel	No
			Italy	Yes 2000
			Malta	No
			Portugal	Yes 1999
			Slovenia	No
			Spain	Yes 2008
Turkey	Yes 2006			
5	Central and Eastern Europe	Central and Eastern Europe	Armenia	Yes 2002
			Azerbaijan	No
			Belarus	Yes 2015
			Bosnia and Herzegovina	No
			Georgia	Yes 2003
			Montenegro	No
			Russian Federation	No
			Serbia	No
			Macedonia, the former Yugoslav Republic of	No
			Ukraine	No
			Affected and Developed Country Party	Bulgaria
		Latvia		No
		Moldova; Republic of		Yes 2000
		Romania		Yes 2000
		Slovakia		No
		Andorra		
		Austria		
		Belgium		

Sr. No.	Name of Region	Name of Sub Regions	Countries	Nation Action Programme (in which Year)
			Brunei Darussalam	
			Canada	
			Czechia	
			Denmark	
			Estonia	
			European Union	
			Finland	
			France	
			Germany	
			Iceland	
			Ireland	
			Japan	
			Liechtenstein	
			Lithuania	
			Luxembourg	
			Monaco	
			Netherlands	
			New Zealand	
			Norway	
			Poland	
			Korea, Republic of	
			San Marino	
			Sweden	
			Switzerland	
			United Kingdom of Great Britain and Northern Ireland	
			United States of America	

APPENDIX 5: SUMMARY OF PREVIOUS WGEA WORK ON LAND USE²²

The work elaborates the importance of land and its use to keep a balance between different human activities. The research paper specifies that the current land planning and land management policies and models are based on overexploitation and demands for a shift from unchecked land use to sustainable land management. The failure to maintain the balance is resulting into deforestation and soil degradation at an alarming rate, which if goes unchecked, may lead to impact the economic well-being of the globe.

It discusses the environmental issues in land use which are related to combination of many complex natural and human induced phenomena. These issues are mainly related to deforestation, intensification and mechanization of agricultural practices, excessive cultivation, disturbance of biodiversity, desertification and climatic pollution and their impact is so intense that the natural and semi natural ecosystems are badly disturbed and devastated.

The document also emphasizes the importance of various responses governments pose to address the environment issues in land use. Governments regulate the exploitation of resources and they control land use. A variety of public policy tools are used to implement these actions. Public policy tools include international agreements, programs, laws and public education. In addition, governments manage land use with more specific instruments. These include regulatory instruments (such as legislation, regulations, permits, licenses, bylaws, and ordinances), and economic instruments such as subsidies, incentives, taxes or grants.

The last chapter of the WGEA work on Land Use and Land Management Practices give details of the following four audit topics with relevant case studies by different SAIs. These audits highlight the role of SAIs in auditing their government's responses to the environmental issues in land use/land management.

- Government policy on land use and land management
- Effectiveness of planning tools for land use
- Sustainable use of Land resources
- Protection, regulation and rehabilitation of land resources.

²² Land Use and Land Management Practices in Environmental Perspective by INTOSAI WGEA

Glossary

Aridity Index	An aridity index (AI) is a numerical indicator of the degree of dryness of the climate at a given location.
Carbon sequestration	The long-term storage of carbon in plants, soils, geologic formations, and the ocean
Carbon stock	The quantity of carbon in a pool.
Deforestation	Removal of a forest or stand of trees where the land is thereafter converted to a non-forest use.
Desertification	Land degradation in arid, semi arid and dry sub-humid regions resulting from various factors, including climatic variations and human activities.
Dry lands	Lands with an Aridity Index of less than 0.65.
Drought	A drought is a period of below-average precipitation in a given region, resulting in prolonged shortages in the water supply, whether atmospheric, surface water or ground water.
Infiltration	The process through which water enters the soil
Land	Includes soil and local water resources, land surface and vegetation or crops
Land cover	The observed physical cover on the earth's surface
Land degradation	Loss of biological and economic productivity of dry lands.
Land productivity	Refers to the total above-ground net primary productivity.
Land use	Is characterized by the arrangements, activities and inputs by people to produce, change or maintain a certain land cover type.
Minerals	Come from rocks below or nearby
Organic matters	Remain of plants and animals that use the soil
Soil erosion	Displacement of the upper part of the soil.
Watershed	The area of land where the rain water is usually collected

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