



## LETTER FROM THE EXECUTIVE BOARD

Dear Delegates,

It gives us incredible delight to invite you all to the academic simulation of the United Nations Environment Programme at **VHMUN 2022**. We trust this experience improves your public speaking abilities and that you find out about a squeezing world issue that convolutes the existence of numerous individuals in our nation just as abroad. Please consider that the following guide, as the name suggests, is merely to provide you with the background of the agenda and cannot serve as a credible source of information. Your real research lies beyond this guide, and we hope to see some strong content and debate come our way. The agenda at hand is vast and complex and a successful discussion on it would entail the collective participation of all of you. It shall be your prerogative to decide the direction in which you want to take this committee. The background guide is designed to help everyone to understand the basic things about the agenda, and we strongly recommend that you research various things on your own. We also suggest understanding how various rights get affected (legally). Do not feel taken aback on the research, foreign policy and other details of the allotted country. Prior to coming for the meeting, it is vital to break the agenda into more modest subtopics and pose inquiries to yourself about the plan. Making chits and directed gathering points previously would give you an edge in modestly bigger advisory committees like the UNEP. It is also crucial to enhance your leadership skills and lobbying capacity since we would give equal importance to overall participation in the committee. We would be using the UNA-USA rules of procedure to facilitate this simulation. ( <https://unausa.org/model-un/> )

Take the initiative to research properly. PLEASE DO READ THE GUIDE. While it is a clear agenda, it is still open to interpretation and there shall be no direction of debate that shall be provided by the Executive Board. Delegates are required to direct the council at all stages, unless stagnation occurs. The agenda of an MUN is a beautiful experience and is not as difficult as it may seem. We hope to see a great level of effort and enthusiasm from you all, so that we all can take back a great experience.

Regards

Executive Board

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# Beginner's Guide to Model UN

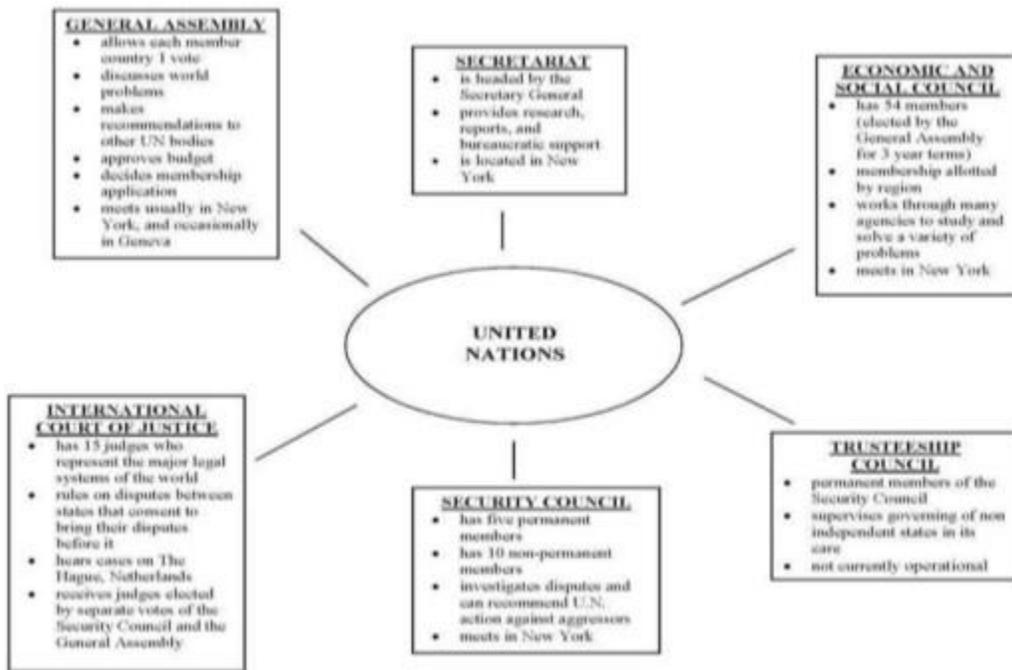
## Question 1: What is the United Nations?

The United Nations is an international organization founded in 1945 to maintain international peace and security, developing friendly relations among nations and promoting social progress, better living standards and human rights by 51 countries. The United Nations has 6 principle organs.

### The UN has 4 main purposes

- To keep peace throughout the world;
- To develop friendly relations among nations;
- To help nations work together to improve the lives of poor people, to conquer hunger, disease and illiteracy, and to encourage respect for each other's rights and freedoms;
- To be a centre for harmonizing the actions of nations to achieve these goals

### PRINCIPLE ORGANS OF UNITED NATIONS



## **Question 2: What is Model United Nations?**

Model United Nations is a simulation of the actual United Nations which is done to enhance knowledge about pressing International issues. It is called Model United Nations not mock United Nations because it does not work as an exact replica of the United Nations, it is just an attempt to understand the working of the United Nations by practicing some of its working mechanisms. Every person who participates is given a country to represent and are called Delegates of their respective committees. There are some rules that we follow in MUNs to facilitate the debate called rules of procedure. The procedure that is closest to what is followed in the actual UN is UN4MUN.

## **Question 3: What is considered to be valid evidence in Model United Nations?**

### **Evidence or proof that is acceptable from sources**

#### 1. News Sources:

- a. REUTERS – Any Reuters article which clearly makes mention of the factor is in contradiction of the fact being stated by a delegate in council. <http://www.reuters.com/>
- b. State-operated News Agencies – These reports can be used in the support of or against the State that owns the News Agency. These reports, if credible or substantial enough, can be used in support of or against any Country as such but in that situation, they can be denied by any other country in the council. Some examples are,
  - i. RIANovosti (Russia) <http://en.rian.ru/>
  - ii. IRNA(Iran) <http://www.irna.ir/ENIndex.htm> iii.
  - BBC (United Kingdom) <http://www.bbc.co.uk/>
  - iv. Xinhua NewsAgency and CCTV (P.R. China) <http://cctvnews.cntv.cn/>

2. Government Reports: These reports can be used in a similar way as the State Operated NewsAgencies reports and can, in all circumstances, be denied by another country.

- a. Government Websites like the State Department of the United States of America ( <http://www.state.gov/index.htm> ) or the Ministry of Defense of the Russian Federation ( <http://www.eng.mil.ru/en/index.htm> )
- b. Ministry of Foreign Affairs of various nations like India (<http://www.mea.gov.in/>),  
People’s Republic of China (<http://www.fmprc.gov.cn/eng/> ),  
France (<http://www.diplomatie.gouv.fr/en/> ),  
Russian Federation ([http://www.mid.ru/brp\\_4.nsf/main\\_eng](http://www.mid.ru/brp_4.nsf/main_eng) )

c. Permanent Representatives to the United Nations Reports <http://www.un.org/en/members/> (Click on any country to get the website of the Office of its Permanent Representative)

d. Multilateral Organizations like the NATO (<http://www.nato.int/cps/en/natolive/index.htm> ), ASEAN (<http://www.aseansec.org/> ), OPEC ([http://www.opec.org/opec\\_web/en/](http://www.opec.org/opec_web/en/) ), etc.

3. UN Reports: All UN Reports are considered credible information or evidence for the Executive Board of the Security Council.

a. UN Bodies: Like the SC (<http://www.un.org/Docs/sc/>), GA (<http://www.un.org/en/ga/>), HRC (<http://www.ohchr.org/EN/HRBodies/HRC/Pages/HRCIndex.aspx>) etc.

b. UNAffiliated bodies like the International Atomic Energy Agency 5 (<http://www.iaea.org/>), World Bank (<http://www.worldbank.org/>), International Monetary Fund (<http://www.imf.org/external/index.htm>), International Committee of the Red Cross (<http://www.icrc.org/eng/index.jsp>), etc.

c. Treaty Based Bodies like the Antarctic Treaty System (<http://www.ats.aq/e/ats.htm>), the International Criminal Court (<http://www.iccpi.int/Menus/ICC>)

**IMPORTANT NOTE: THIS BACKGROUND GUIDE ISN'T A VALID SOURCE FOR PROOFS. IT IS JUST FOR REFERENCE, DON'T RESTRICT YOUR RESEARCH TO SAME.**

**Question 4: How to prepare for the Model United Nations?**

### **General Research and Preparation guidelines**

There are three consistently significant parts of representative planning. They are: useful; meaningful; and positional planning. Practical readiness outfits the representatives with essential apparatuses, including a comprehension of the guidelines important to act in board of trustees. The meaningful component gives preparation of explicit data on the subject regions. At long last, positional planning requires the understudies to embrace viewpoints that are not their own. In light of this, the EB gives three instruments to help you: this Guide to Delegate Preparation, Background Guides, and position papers. Together, these will guarantee you will be prepared for the gathering. Past perusing and understanding the material we have given, the more pragmatic experience you can gain through banter, goal composing, making introductions, and so forth, the more ready you will be.

### **Meaningful Preparation**

The Background Guides are a consequence of broad exploration and exertion with respect to the Executive Board and are the establishment of considerable groundwork for every advisory group. We recommend that you read them, talk about them, and read them once more. On the off chance that an agent has not perused and ingested the data in the Background Guide, the person won't contribute adequately to the board. An ambitious

beginning on the Background Guides will empower you to completely comprehend the subjects and start to tissue out your own thoughts. Advise yourself that you should go about as policymakers, dissecting and shaping the data you have gotten into arrangements and goals. Conversations with different representatives will likewise assist you with fostering your thoughts. While the Background Guide will give a large portion of your meaningful readiness, autonomous exploration is valuable, fulfilling and important for a fruitful gathering.

### **Positional Preparation**

We expect representatives to receive the situation of a particular country all through the UN reproduction. This is a vital component of the "global" experience of a model UN as it powers representatives to analyze the points of view, issues, and arrangements of one more country at an exceptionally major level. It is additionally quite possibly the most troublesome parts of MUN on the grounds that understudies should go up against natural inclinations of their own public viewpoints and authentic data. The position papers are the focal point of positional planning before the meeting. Albeit generally short, we request that you invest energy and exertion on investigating and keeping in touch with them.

Materials arranged by the EB are not intended to fill in for your individual exploration. All things being equal, they ought to give a beginning stage, motivating you to ask yourself inquiries about the current issues. The best-arranged agents are those that accept the gave materials as the start of their exploration and dig further into the theme regions. Past these materials are a large group of data administrations, starting with United Nations sources. UN's assets regularly have ordered measurements, outlines, and charts which you may discover supportive in understanding the issues. Most UN report communities convey records of UN gatherings; maybe the most ideal approach to comprehend your nation's position is to see it iterated by its diplomat.

### **Explicit assets to research include:**

•**Yearbook of the United Nations**: The Yearbook is a decent beginning stage for your examination. The Yearbook will furnish you with general data on what has been done on your theme during a specific year. It likewise gives exceptionally accommodating references to past articles and goals.

•**United Nations Chronicle**: This magazine gives you general data on the procedures of the UN. Watch out for exceptional reports on your theme region, which will advise you about the point and countries' situations on it.

•**UN Document Index:** This record for all UN reports comes in three distinct renditions: UNDI (1950-1973), UNDEX (1970-1978), and UNODC (1979-present). Contingent upon which of the three you are utilizing, you will track down a subject record, a nation file, and an alphanumeric rundown of all reports distributed (this is helpful in light of the fact that each panel has its own novel alphanumeric prefix and accordingly you can track down every one of the records put out by a board of trustees during a specific year paying little heed to the particular theme.

•**UN Resolutions:** This arrangement is both significant and extremely simple to utilize. The record is aggregate from 1946, which implies that you need just check the most current list to track down every one of the goals on your point that the UN has at any point passed.

•**Other UN Sources:** Depending on the subject, there may be extra pertinent UN sources. Check for books and exceptional reports put out by the WHO. Past United Nations sources, notwithstanding, are general wellsprings of data. Explore your school and nearby libraries. Look at diaries, periodicals, and papers for more current sources. Remember to ask the curators for help.

•**Books:** Up-to-date books are probably going to give you a profundity and exactness that is hopeless from UN sources or periodicals. Try to check library postings for bound materials. Book research, in any case, can take a decent arrangement of time, so use prudence when choosing books.

•**Periodicals:** Periodicals are valuable for straightforward, current data on points (the Reader's Guide to Periodical Literature and InfoTrack fill in as a record for these materials). Try not to anticipate that they should supply you with the profundity of data you will require for the Conference.

•**People:** A regularly ignored source; individuals can help you extraordinarily in your exploration. A few groups to remember are: bookkeepers, individual agents, personnel counselors, and your board of trustees' Director, Moderator, and Assistant Directors. Not exclusively can these individuals help you discover what you are searching for, yet they may likewise suggest new sources that you had not thought of. Try not to spare a moment to call or email your advisory group Director.

•**Embassies and Consular Offices:** Contact the government office or consular office of the country that you are addressing. These spots are happy to help you in your exploration via mailing factual information and other unclassified data.

## United Nations Environment Program

### Introduction

Since its inception in 1972, the United Nations Environment Programme (UNEP) has been the global authority that sets the environmental agenda, promotes the coherent implementation of the environmental dimension of sustainable development within the United Nations system and serves as an authoritative advocate for the global environment.

UNEP's mission is to provide leadership and encourage partnership in caring for the environment by inspiring, informing, and enabling nations and peoples to improve their quality of life without compromising that of future generations.

UNEP works on delivering transformational change for people and nature by drilling down on the root causes of the three planetary crises of climate change, nature and biodiversity loss, and pollution and waste. UNEP employs seven interlinked sub programmes for action: Climate Action, Chemicals and Pollutions Action, Nature Action, Science Policy, Environmental Governance, Finance and Economic Transformations and Digital Transformations.

Through its campaigns, particularly World Environment Day, UNEP raises awareness and advocates for effective environmental action.

Headquartered in Nairobi, Kenya, UNEP works through its divisions as well as regional, liaison and out-posted offices and a growing network of collaborating centres of excellence.

UNEP works closely with its 193 Member States and representatives from civil society, businesses, and other major groups and stakeholders to address environmental challenges through the UN Environment Assembly, the world's highest-level decision-making body on the environment.

The organization hosts the secretariats of many critical multilateral environmental agreements and research bodies.

The Executive Director and Senior Management Team lead the implementation of UNEP's Medium-Term Strategy (MTS). The four-year MTS articulates UNEP's role in delivering the promises of the 2030

Agenda for Sustainable Development and the United Nations Conference on Sustainable Development (Rio+20) as well as its outcome document, “The Future We Want.”

UNEP supports Member States to ensure that environmental sustainability is reflected in development and investment planning and provides countries with the necessary tools and technologies to protect and restore the environment. Its work is made possible by partners that fund and champion the mission. UNEP depends on voluntary contributions for 95 percent of its income.

Source-

<https://www.unep.org/about-un-environment>

## History

The creation of UNEP was recommended at the United Nations Conference on Human Environment in Stockholm, Sweden in June 1972. Six months later, in December 1972, the GA adopted resolution 2997 (XXVII) which established UNEP as the official body concerned with environmental issues of the UN. Since that time, UNEP has played a significant role in coordinating environmental policy for various UN agencies. UNEP played a very pivotal role in the planning and execution of the UN Conference on Environment and Development (UNCED) in 1992. UNCED was the conference that led to the adoption of Agenda 21 and the Rio Declaration on Environment and Development (1992). Chapter 38 of Agenda 21 calls for the creation of an inter-agency task force that would research the best ways to identify and address environmental issues. This led to the creation of the Inter-Agency Committee on Sustainable Development (IACSD), of which UNEP is a key member. IACSD has a system of task managers, each in charge of specific thematic areas with UNEP being the task manager concerned with the areas of the atmosphere, toxic chemical, hazardous waste, desertification and drought, and biodiversity. UNEP also takes an active role in other thematic areas of the organization, using their environmental expertise to ensure that no areas of concern go unnoticed.

Source-<https://www.un.org/en/conferences/environment/stockholm1972>

## Mandate of the UNEP

Upon the adoption of resolution 2997 (XXVII), UNEP was mandated to promote international and regional environmental cooperation; help in establishing environmental policy; highlight global and regional problems; facilitate the transfer of scientific knowledge; assist developing Member States in environmental matters, review reports of the Executive Director; and approve the annual program on the allocation of UNEP’s main source of funding, the Environment Fund. Since 1972, UNEP’s mandate has been amended and modified numerous times, including its most recent update in 2022.

The first amendment to UNEP’s mandate came in 1992, via Agenda 21, which led to UNEP’s involvement with IACSD. Five years later, in 1995, the GA held a special session to review the

implementation of Agenda 21 and amended UNEP's mandate by stating "UNEP is to be the leading global environmental authority that sets the global environmental agenda." In 1997, the Secretary-General requested the GA create a Task Force to review and propose reforms for UN activities concerning the environment and human settlements. In October of 1998, per the guidance of the Task Force, the GA put forth a set of recommendations that would further amend UNEP's mandate. As a result, the Executive Director of UNEP was placed in charge of a new committee called the Environmental Management Group (EMG). The key purpose of EMG is to coordinate and facilitate access to relevant information and findings concerning the environment and human settlements, in order to ensure the most efficient and cost effective allocation of resources and information.

The mandate was further amended upon UNEP's adoption of the Nairobi Declaration (1997) This amendment was one of the most significant in UNEP's history, because it created a new "core mandate" for the organization. The core mandate did not replace the original mandate, but it did shift the focus of UNEP to ensure a more modern and technologically friendly approach is taken to environmental issues. It made UNEP responsible for: using the best available scientific methods and evidence to analyze global environmental trends; utilizing early warning systems; furthering the development of international environmental law and policy; monitoring and fostering Member State compliance with existing international environmental norms; strengthening its role in coordinating UN environmental activities; serving as a link between the scientific community and the UN when environmental policy is concerned; and providing key policy advice for UN bodies, governments, and other institutions.

UNEP's mandate was most recently modified in 2002, through the Johannesburg Declaration on Sustainable Development. The Johannesburg Declaration calls on UNEP to strengthen their ties and cooperation with the World Trade Organization (WTO), the United Nations Development Programme (UNDP), and all relevant Non- Governmental Organizations (NGOs) to ensure efficiency of programs, initiatives, and resources in all areas.

After the UN Conference on Sustainable Development (Rio+20) in 2012, UNEP's Governing Council was expanded to include all Member States. This was done to strengthen UNEP and to ensure its place as the global leader on the environment. UNEP's first universal session was held in February 2013, where the decision was made to change the Governing Council to the United Nations Environmental Assembly of UNEP (UNEA). The UNEA has its own mandate that allows the UNEA to make major strategic decisions for UNEP, provide political guidance (especially for Member State specific programs), and to promote strong scientifically based policies.

UNEP's mandate strongly calls for the efficiency and accuracy of information sharing in order to ensure that environmental policy is scientifically and technologically accurate. The mandate also emphasizes the need for strong ties between UNEP and other world organizations, such as the WTO and UNDP, to ensure that various projects, programs, and initiatives are environmentally friendly in their execution. Overall, UNEP's mandate permits UNEP to be the voice of the environment of the UN system, meaning that UNEP oversees the development and execution of any official environmental policies developed within the UN system. In addition, UNEP's mandate requires UNEP to monitor the programs of other UN entities to ensure they too are executed in an environmentally sound manner.

Source-

<http://www.un-documents.net/a27r2997.htm>

<http://www.un-documents.net/jburgdec.htm>

[https://www.un.org/esa/sustdev/documents/WSSD\\_POI\\_PD/English/WSSD\\_PlanImpl.pdf](https://www.un.org/esa/sustdev/documents/WSSD_POI_PD/English/WSSD_PlanImpl.pdf)

<https://digitallibrary.un.org/record/753609?ln=en>

<https://era.library.ualberta.ca/items/4545ec18-a387-4272-a071-0a1c9159d8ce>

## Governance, Structure, and Membership

Headquartered in Nairobi, Kenya, UN Environment Programme is led by a Senior Management Team that's chaired by our Executive Director.

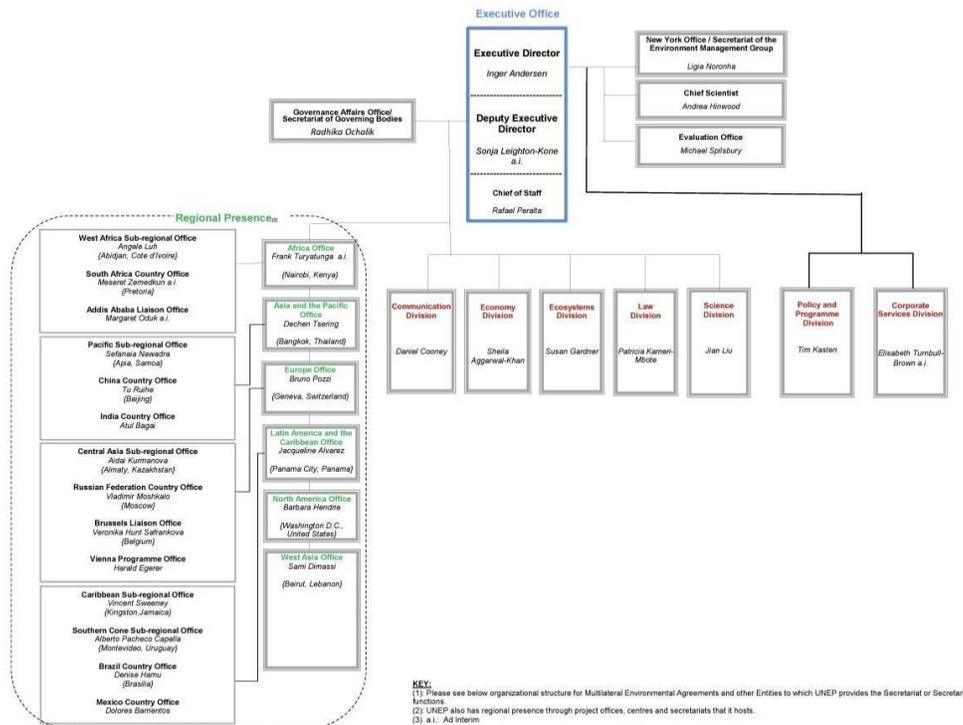
The UNEP works through divisions, regional, liaison and out-posted offices, plus a growing network of collaborating centres of excellence. UNEP also hosts several environmental conventions, secretariats and inter-agency coordinating bodies.

Under-Secretary-General of the United Nations and Executive Director of the UN Environment Programme - Inger Andersen



### United Nations Environment Programme<sup>(1)</sup>

28 March 2022



UNEP's structure is ordered as: the United Nations Environmental Assembly of UNEP (UNEA), the Secretariat, the Environment Fund, and the Committee of Permanent Representatives.

At its inception, a Governing Council of 58 members governed UNEP, but in 2013 the UNEA took its place. UNEA meets biennially in order to set the global environmental agenda and to discuss policy about emerging challenges. The UNEP Secretariat is also responsible for UNEA and consists of a rotating President, three Vice- Presidents, and a Rapporteur who oversee all of UNEP's activities. The Environment Fund is UNEP's main source of funding. Member State's financial contributions are based upon the Voluntary Indicative Scale of Contributions (VISIC), which means Member States are not required to donate money to UNEP, though they are highly encouraged to donate. If they choose to donate, the amount is determined according to their Gross Domestic Product (GDP). UNEP's Committee of Permanent Representatives consists of all Permanent Missions to the UN, and their purpose is to give advice to the UNEA and to create subsidiary organs that may be necessary to complete UNEP's functions. The Committee of Permanent Representatives is overseen by an Executive Bureau. The Executive Bureau consists of a five Member State panel, which oversees all of the Committee's actions.<sup>44</sup> Executive Bureau members are elected for two-year terms, and the UN principles of equitable geographic distribution apply.

UNEP has six regional offices throughout the world that undertake UNEP's projects on a regional, sub-regional, and local level. Each office holds yearly Regional Consultation Meetings, where representatives from various civil society organizations are invited to engage in an environmental policy dialog. The regional offices bring any concerns or ideas from these meetings to the next UNEA meeting for wider UNEP discussion and possible implementation. The role of the regional offices was increased and enhanced to include the Regional Consultation Meetings and other projects in 2003, when the Governing Council approved Decision 22/14. This Decision called for UNEP's regional offices to strengthen their partnerships with other UN agencies in their region, create financial institutions to fund environmental causes, and establish and/or enhance partnerships with relevant local groups in order to strengthen UNEP's mission in each region.

Source-

<https://www.unep.org/50-years/about-unep50>

## Functions, and Powers of the UNEP

UNEP ensures the implementation of their mandate by promoting international cooperation on existing environmental policies and guiding the creation of new environmental policies. They also monitor the state of the global environment, on both an international and regional scale, and share the gathered information with interested parties. Another major way UNEP implements their mandate is by using environmental awareness to help governments, the private sector, and civil society work to address environmental threats. UNEP contributes significantly in developing regional plans for environmental sustainability, helping Member States who are facing sizable challenges to create and implement environmental policy, and providing individual Member States with support in environmental

capacity-building. On a more global scale, UNEP works to develop international environmental law and ensure the proper use of environmental information and instruments. UNEP is also currently working with various UN activities to ensure their implementation is environmentally sound.

UNEP has the ability to create task forces and subsidiaries in order to implement the environmental policy they develop. However, any resolution concerning environmental policy that UNEP passes, or any proposed body to be created, must first be submitted to either the GA or the Economic and Social Council (ECOSOC) for approval. If the GA or ECOSOC approves of UNEP's proposals, they become official policy of the UN, and UNEP can move forward with their implementation.

An example of UNEP's function in action is their partnership with the Global Environment Facility (GEF). The GEF is an organization that uses international cooperation to address environmental issues and has been an official partner of the UN since 1991. UNEP is their project implementation agency, along with the World Bank and UNDP, which means they are the chief actors in the coordination and supervision of GEF projects in various Member States, especially developing nations. UNEP also helps drive the policy creation of the organization and staffs the GEF's Scientific and Technical Advisory Panel. GEF's areas of focus have specifically been aligned with UNEP's mandate and key thematic areas in order to ensure greater cooperation in order to enhance the impact of environmental programs. This is an implementation of UNEP's mandate in a variety of ways. First, it helps coordinate and increase the ties between UNEP, the WTO, and UNDP. Second, it ensures that the implementation of the GEF's programs are environmentally friendly, and finally, it helps UNEP stay up to date with the latest scientific advancements in the field of the environment.

#### *Conventions and regional plans*

UNEP has eight major conventions that are each overseen by separate Secretariats: the *Convention of Biological Diversity*, the *Convention on International Trade of Endangered Species of Wild Flora and Fauna*, the *Convention on Migratory Species of Wild Animals*, the *Convention on Persistent Organic Pollutants*, the *Convention of Climate Change*, the *Convention on Desertification*, the *Regional Seas Convention*, and the *Rotterdam Convention on Informed Consent*. The role of these Secretariats is to monitor, report on, and implement programs in the area that its internationally agreed-upon convention specifies. For example, the Secretariat for the *Convention of International Trade of Endangered Species of Wild Flora and Fauna* is responsible for monitoring and stopping any black market trade of endangered plants or animals, and to help ensure that legal trade in these species is safe and does not threaten their existence.

## About the Agenda

Land degradation in arid, semi-arid and dry sub-humid regions, resulting from various factors, including climatic variations and human activities, is called desertification (Anonymous, 1992). It is a slow process of land degradation that exacerbates the quality of land, leading to decline in its productivity and thus impacting the livelihood of the people depending on The Arid, semi-arid and sub-humid regions together form the “drylands.” However, the term “drylands” excludes the hyper-arid regions such as the Atakama and Sahara Deserts, where very low rainfall and very high rates of evapotranspiration restrict plant growth to a minimum and preclude other than transient or extremely sparse and localized occupation (Williams and Balling Jr., 1996). Land degradation is a complex term, conveying different meanings to different people, although it is usually believed that it leads to decline in the productivity of land. The term land includes land and local water resources, the land surface and its natural vegetation. Two basic questions are involved in the interpretation of the term land degradation: (i) the rates of processes that translocate the sediments/solutes and, hence, degrade a particular land, and (ii) the impact of such translocations on productive capacities of the land. The first is usually the domain of scientists, while the second is the domain of the land users.

The term “desertification” was first used by Lavauden (1927) to describe severely overgrazed lands in Tunisia (Dregne, 2000), and was then used by Aubreville (1949) to show excessive soil erosion due to deforestation in French West Africa. Subsequently, alarmed by a long drought in sub-Saharan Africa during the early 1970s, the United Nations Conference on Desertification (UNCOD) at Nairobi, defined the term as a diminution of the biological potential of land in any ecosystem (UNCOD, 1977). The definition was revised again during the 1992 United Nations Conference on Environment and Development (UNCED) as “land degradation in arid, semi-arid, and dry sub-humid areas, resulting from various factors, including climatic variation as well as human activities” (Anonymous, 1992). This definition is now being followed by the UN Convention Combat Desertification (Anonymous, 1995). The desertification gets manifested as accelerated soil erosion by wind and water, increasing salinization of soils and near-surface ground water, a reduction in species diversity and plant biomass, and a reduction in the overall productivity of dryland ecosystems.

### **CURRENT SCENARIO**

According to the UNEP (United Nations Environment Program) (1997), about 5172 million ha (Mha) area of the world (or 39.7% of the world’s land area) is under the drylands, and is susceptible to desertification. This excludes 978 million ha area of the hyper-arid zone (7.5%).

Out of the total dryland area, arid lands (excluding hyper-arid areas) cover 26% area, semi-arid 38% and dry sub-humid 21%. It has been estimated that about 1035 Mha (or 20% of the total area) is affected by desertification (17% slight to moderately affected; 3% strongly affected), while 467 Mha is estimated to be susceptible to water erosion, and 432 Mha is assessed to be under wind erosion (Thomas, 1995).

Deserts are almost synonymous with the hyper-arid and arid areas, and form part of the “drylands.” The deserts are confined mostly to the five major belts :

The Sonoran desert of northwestern Mexico, and its continuation in the desert

The Atacama desert, a thin coastal strip running west of Andes from Southern

Arabian desert, the desert of Iran and the erstwhile USSR, the Thar desert of India, and the Taklamakan and Gobi deserts of China and Mongolia;

The Kalahari and its surrounding arid lands in southern Africa, and

Most of the continent of Australia.

Besides, isolated pockets of arid lands such as Guajira peninsula of Columbia, southwestern Madagascar, and part of northwestern Brazil are encountered. In Asia, out of the 19.49 million km<sup>2</sup> area under drylands, an estimated 10.75 million km<sup>2</sup> (excluding the hyper-arid areas) is susceptible to desertification (UNEP, 1997). In India, approximately 50.8 Mha land area (15.8% of the country’s geographical area) is estimated to be arid, 123.4 Mha (37.6%) semi-arid and 54.1 Mha (16.5%) dry sub-humid regions (Ministry of Environment and Forests, 2001). In other words, dry lands cover about 228 Mha area (69% of the total geographical area of the country).

#### Transforming Land Management Globally

“Combating desertification/land degradation and drought for poverty reduction and sustainable development: the contribution of science, technology, traditional knowledge and practices”

#### Preliminary conclusions

Paragraph 33 of the 2030 Agenda for Sustainable Development focuses on the linkage between sustainable management of the planet’s natural resources and social and economic development as well as on “strengthen cooperation on desertification, dust storms, land degradation and drought and promote resilience and disaster risk reduction”.

Sustainable Development Goal 15 of the 2030 Agenda aims to “protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss”.

The economic and social significance of a good land management, including soil and its contribution to economic growth and social progress is recognized in paragraph 205 of the Future We Want. In this context, Member States express their concern on the challenges posed to sustainable development by desertification, land degradation and drought, especially for Africa, LDCs and LLDCs. At the same time, Member States highlight the need to take action at national, regional and international level to reverse land degradation, catalyse financial resources, from both private and public donors and implement both the United Nations Convention to Combat Desertification (UNCCD) and its 10- Year Strategic Plan and Framework (2008-2018).

Furthermore, in paragraphs 207 and 208 of the Future We Want, Member States encourage and recognize the importance of partnerships and initiatives for the safeguarding of land resources, further development and implementation of scientifically based, sound and socially inclusive methods and indicators for monitoring and assessing the extent of desertification, land degradation and drought. The relevance of efforts underway to promote scientific research and strengthen the scientific base of activities to address desertification and drought under the UNCCD is also addressed.

Combating desertification and drought were discussed by the Commission on Sustainable Development in several sessions. In the framework of the Commission's multi-year work programme, CSD 16-17 focused, respectively in 2008 and 2009, on desertification and drought along with the interrelated issues of Land, Agriculture, Rural development and Africa.

In accordance with its multi-year programme of work, CSD-8 in 2000 reviewed integrated planning and management of land resources as its sectoral theme. In its decision 8/3 on integrated planning and management of land resources, the Commission on Sustainable Development noted the importance of addressing sustainable development through a holistic approach, such as ecosystem management, in order to meet the priority challenges of desertification and drought, sustainable mountain development, prevention and mitigation of land degradation, coastal zones, deforestation, climate change, rural and urban land use, urban growth and conservation of biological diversity.

The sectoral cluster of land, desertification, forests and biodiversity, as well as mountains (chapters 10-13 and 15 of Agenda 21) were considered by CSD-3 in 1995 and again at the five-year review in 1997.

The UN Conference on Environment and Development (UNCED) called upon the United Nations General Assembly to establish an Intergovernmental Negotiating Committee (INC) to prepare, by June 1994, an international convention to combat desertification in those countries experiencing serious drought and/or desertification, particularly in Africa. The Convention was adopted in Paris on 17 June 1994 and opened for signature there on 14-15 October 1994. It entered into force on 26 December 1996.

Deserts are among the "fragile ecosystems" addressed by Agenda 21, and "combating desertification and drought" is the subject of Chapter 12. Desertification includes land degradation in arid, semi-arid and dry sub humid areas resulting from various factors, including climatic variations and human activities. Desertification affects as much as one-sixth of the world's population, seventy percent of all drylands, and one-quarter of the total land area of the world. It results in widespread poverty as well as in the degradation of billion hectares of rangeland and cropland.

Integrated planning and management of land resources is the subject of chapter 10 of Agenda 21, which deals with the cross-sectoral aspects of decision-making for the sustainable use and development of natural resources, including the soils, minerals, water and biota that land comprises. This broad integrative view of land resources, which are essential for life-support systems and the productive capacity of the environment, is the basis of Agenda 21's and the Commission on Sustainable Development's consideration of land issues.

Expanding human requirements and economic activities are placing ever increasing pressures on land resources, creating competition and conflicts and resulting in suboptimal use of resources. By examining all uses of land in an integrated manner, it makes it possible to minimize conflicts, to make the most efficient trade-offs and to link social and economic development with environmental protection and enhancement, thus helping to achieve the objectives of sustainable development. (Agenda 21, para 10.1)

According to UNESCO, one-third of world's land surface is threatened by desertification, and across the world, it affects the livelihood of millions of people who depend on the benefits of ecosystems that drylands provide. The UN, which has been fighting desertification since 1994, defines it as the process of land degradation in arid, semi-arid and dry sub-humid areas as a result of various climatic and human factors. With climate change, these factors have only multiplied and it is now considered one of the world's major environmental problems. Human activities, including deforestation and the overexploitation of aquifers, accelerate desertification. The effects of climate change, which is also driven by humans, and the destruction it causes in the form of extreme weather phenomena such as droughts, hurricanes, fires, etc. must be added to this.

According to the UN, more than 24 billion tonnes of fertile soil disappear every year. In fact, today two-thirds of the Earth is undergoing a process of desertification and, if no action is taken, 1.5 million km<sup>2</sup> of agricultural land, an area equivalent to the entire arable land of India, which is essential for maintaining biodiversity and feeding the population, will be lost by 2050.

6,000 years ago, the Sahara Desert, now the largest desert in the world, was grassland covered with vegetation. The oscillations of the Earth's axis turned this area of the planet from an orchard to a sandy area where almost nothing can grow. In that case, we speak of a process of natural desertification which is in contrast to what is happening currently: large areas of the planet are being desertified at an accelerated rate as a result of human activity and climate change.

*Desertification and desertisation: differences*

Although they are often used interchangeably, the difference lies in the human influence on the process. In desertisation, the causes of deterioration are strictly natural, as in the case of the Sahara mentioned above, but in desertification, although natural causes also play a role, human activities are a determining factor.

### CAUSES OF DESERTIFICATION

The main human activities driving desertification are:

1. Deforestation, causes of which go beyond tree felling, which increases the risk of fires, among others.
2. Poor agricultural practices, from not rotating crops to unprotected soils or chemical fertiliser and pesticide use, etc.
3. Overexploitation of natural resources as a consequence, for example, of irresponsible management of vegetation or water.
4. Bad livestock practices, such as overgrazing, which severely erode the land and prevent the regeneration of vegetation.

### CONSEQUENCES OF DESERTIFICATION

Drylands cover about half of the earth's ice-free land surface and many of them belong to the world's poorest countries, which exacerbates the consequences:

1. Loss of biodiversity by worsening the living conditions of many species.
2. Food insecurity due to crop failure or reduced yields.
3. The loss of vegetation cover and therefore of food for livestock and humans.
4. Increased risk of zoonotic diseases, such as COVID-19.
5. Loss of forest cover, with a corresponding shortage of wood resources.
6. The decrease in drinking water reserves due to the loss of aquifers.

According to the United Nations Convention to Combat Desertification, the lives of 250 million people are already affected by desertification and up to 135 million could be displaced (climate migrations) by desertification by 2045, making it one of the most serious environmental problems facing humanity. Slightly less than half of Earth's ice-free land surface—approximately 52 million square km (about 20 million square miles)—is drylands, and these drylands cover some of the world's poorest countries. The United Nations Environment Programme (UNEP) notes that desertification has affected 36 million square km (14 million square miles) of land and is a major international concern. According to the United Nations Convention to Combat Desertification, the lives of 250 million people are affected by desertification, and as many as 135 million people may be displaced by desertification by 2045, making it one of the most severe environmental challenges facing humanity. Since dryland environments are used for a variety of human purposes (such as agriculture, animal grazing, and fuelwood collection), the various activities undertaken in them can exacerbate the problem of desertification and bring

about lasting changes to dryland ecosystems. In 1977, at the United Nations Conference on Desertification (UNCOD) in Nairobi, Kenya, representatives and delegates first contemplated the worldwide effects of desertification. The conference explored the causes and contributing factors and also possible local and regional solutions to the phenomenon. In addition, the delegates considered the varied consequences of desertification, such as crop failures or decreased yields in rain-fed farmland, the loss of perennial plant cover and thus loss of forage for livestock, reduced woody biomass and thus scarcity of fuelwood and building materials, a decrease in potable water stocks from reductions in surface water and groundwater flow, increased sand dune intrusion onto croplands and settlements, increased flooding due to rising sedimentation in rivers and lakes, and amplified air and water pollution from dust and sedimentation.

#### Four areas affected by desertification

To better understand how climatic changes and human activities contribute to the process of desertification, the consequences can be grouped into four broad areas:

1. Irrigated croplands, whose soils are often degraded by the accumulation of salts.
2. Rain-fed croplands, which experience unreliable rainfall and wind-driven soil erosion.
3. Grazing lands, which are harmed by overgrazing, soil compaction, and erosion.
4. Dry woodlands, which are plagued by the overconsumption of fuelwood.

#### Irrigated croplands

Nearly 2,750,000 square km (about 1,062,000 square miles) of croplands are irrigated. Over 60 percent of these irrigated areas occur in drylands. Certainly, some dryland areas have been irrigated for millennia, but other areas are more fragile. Of the irrigated dryland, 30 percent (an area roughly the size of Japan) is moderately to severely degraded, and this percentage is increasing.

The main cause of declining biological productivity in irrigated croplands is the accumulation of salts in the soil. There is an important difference between rainwater and the water used for dryland irrigation. Rainwater results from the condensation of water evaporated by sunlight. Essentially, rainwater is distilled seawater or lake water. In contrast, water used for irrigation is the result of runoff from precipitation. Runoff percolates through the soil, dissolving and collecting much of the salts it encounters, before finding its way into rivers or aquifers. When used to irrigate crops, runoff evaporates and leaves behind much of the salts that it collected. Irrigated crops need an average of 80 cm (about 30 inches) of water annually. These salts can build up in the soil unless additional water is used to flush them out. This process can rapidly transform productive land into relatively barren salt flats scattered with halophytes (plants adapted to high levels of salt in the soil). Most salt-degraded cropland occurs in Asia and southwestern North America, which account for 75 and 15 percent of the worldwide total, respectively. In Asia, Iraq has lost over 70 percent of its irrigated land to salt accumulation. In Russia, much of the irrigated land located where the Volga River runs into the Caspian Sea may

last only until the middle of the 21st century before the build-up of salts makes it virtually unusable. Such losses are not restricted to developing countries. In the United States, salt accumulation has lowered crop yields across more than 50,000 square km (19,000 square miles), an area that is about a quarter of the country's irrigated land.

### Rain-fed croplands

Drylands also support rain-fed crops. Before cultivation, such areas were often vast grasslands. They now cover about 5 million square km (about 2 million square miles) and account for roughly one-third of all croplands worldwide. They receive less than 60 cm (about 24 inches) of rain each year, and thus they are at the margin of what farmers can use for crops without at least some irrigation. Rainfall can vary considerably from one year to the next, so those lands may experience droughts that often lead to crop failure. Globally, more than 2,000,000 square km (about 770,000 square miles) of rain-fed croplands are moderately to severely degraded, and each year about 1 percent of those lands is abandoned.

The crops grown on drylands are annuals; each year they emerge from seed, mature, and die. Grains such as wheat and corn (maize) are annuals that account for roughly 85 percent of global food production. After these grains are harvested, the lands are left uncovered until the next planting season. During this time, the soil is vulnerable to erosion by wind and rain. Wind can whip up the unprotected topsoil to create severe dust storms. Such dust storms often transport the soils, along with the nutrients they contain, over long distances. Rainfall is scarce in drylands, but when it does come it can be torrential. Heavy downpours often wash away the soils on bare ground or deplete them of their nutrients. In contrast, native grasslands contain a mix of mainly perennial species that inhibit erosion. Perennials live from year to year, have deeper roots to bind the soil, and do not leave the soils exposed for months on end.

### Grazing lands

Desertification also occurs in rangelands. Typically, the damage in those environments can be separated into damage to soil and damage to vegetation. The former is more important than the latter; however, large areas experience both. The process of soil damage and loss often begins with the activities of grazing animals. Grazing livestock sometimes consume plants down to the ground. This activity weakens the individual plant; with a reduction in tissues capable of photosynthesis, its growth is greatly inhibited. In addition, livestock herds may trample and kill vegetation by walking to and from permanent water sources. Trampling destroys plant roots that bind the soil together. When rains come to those grazing lands, rivulets often form along the walking paths and wash away unprotected topsoil. Also, the repeated movement of herds over one section of the landscape can compact the soil, hindering the development of plant roots.

Livestock can substantially alter plant communities. It may be obvious that these animals reduce plant populations through their grazing activities, but livestock can also change the composition of the plant community by consuming some species and leaving others alone. The grazing pressure placed on grasses and other edible species gives a competitive advantage to cacti and other inedible species. For example, in the southwestern United

States, honey mesquite (*Prosopis glandulosa*) is a native shrub, but it can increase its range considerably when cattle overgraze grasslands. The resulting plant community supports few livestock and is a persistent one—that is, the extensive thickets of mesquite often prevent grasses from recolonizing their former range.

### Dry woodlands

The fourth area of desertification is dry woodlands, which are greatly affected by the overconsumption of firewood. Across large areas of Asia and Africa, the principal raw material for cooking and heating is wood. Firewood in these areas is often converted to charcoal in earthen kilns before it is used, because charcoal gives off less smoke than wood. The conversion process is often inefficient, however, with about 75 percent of the wood's heating potential lost. In Africa and Asia, a very rough estimate of the per capita consumption of firewood is about half a ton per year. Across large areas of dryland where total plant production is roughly two tons per hectare per year, a family of four would have to clear a hectare of land or more per year. Very often, such deforested areas are not replanted. As human population densities increase, one can imagine that they might consume more wood than the land could support and create a “fuelwood crisis.”

## **Pre- Existing International frameworks**

### 1) UNCCD

The UNCCD is the only legally binding framework set up to address desertification and the effects of drought. There are 197 Parties to the Convention, including 196 country Parties and the European Union. The Convention – based on the principles of participation, partnership and decentralization – is a multilateral commitment to mitigate the impact of land degradation, and protect our land so it can provide food, water, shelter and economic opportunity to all people.

It aims to combat land degradation and desertification by focusing on sustainable land management within “affected country Parties”. Those countries in arid, semi-arid and dry sub-humid areas (collectively known as drylands) are definitely included under the scope of the Convention, and debates between the Parties are currently underway to determine the wider applicability of the Convention to all lands which face the risk of or suffer from land degradation. The Convention also includes provisions for financing support from developed countries which are not affected Parties. The affected country Parties create National Action Programmes (NAPs) in order to identify drivers of desertification and develop measures to combat this

<https://www.unccd.int/convention/global-mechanism>

## 2) Sustainable Development Goals

Paragraph 33 of the 2030 Agenda for Sustainable Development focuses on the linkage between sustainable management of the planet's natural resources and social and economic development as well as on “strengthen cooperation on desertification, dust storms, land degradation and drought and promote resilience and disaster risk reduction”.

Sustainable Development Goal 15 of the 2030 Agenda aims to “protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss”.

Integrated planning and management of land resources is the subject of chapter 10 of Agenda 21, which deals with the cross-sectoral aspects of decision-making for the sustainable use and development of natural resources, including the soils, minerals, water and biota that land comprises.

<https://sustainabledevelopment.un.org/topics/desertificationlanddegradationanddrought#:~:text=SDG%2015%20aims%20at%20protecting,degradation%20and%20halt%20biodiversity%20loss.>

## 3) UNFCCC

The UNFCCC, signed in 1992 at the United Nations Conference on Environment and Development, constitutes the foundational climate agreement that has provided the platform for most subsequent international climate agreements.

The international mechanism for addressing climate change is the United Nations Framework Convention on Climate Change (UNFCCC). This convention has been ratified by a broad cross-section of both developed and developing countries, including the United States. The goal of the convention is to “prevent dangerous human interference in the climate system.” Achieving this goal is controversial despite the broad international consensus behind the convention.

#### 4) Kyoto Protocol

The Kyoto Protocol focuses on climate change when outlining provisions regarding sinks and reservoirs that are relevant to land degradation. Article 2 describes the Annex I Parties' mandate to adopt national policies and measures for protection and enhancement of sinks and reservoirs, promotion of sustainable forest management practices, and "promotion of sustainable forms of agriculture in light of climate change considerations". This would contribute to prevention and remediation of land degradation in terms of soil erosion and potentially salinisation. Article 6 on the Joint Implementation mechanism could include projects that enhance removals by sinks, which could encompass projects which remediate degraded land. Additionally, the projects could reduce emissions from sources, so those could include prevention of land degradation since land can function as a source of emissions as well.

#### Conclusion

The international agreements discussed in this section contain different types of measures and varying levels of focus on the prevention, remediation, and planning against land degradation. Overall, there is an emphasis in all three conventions on the prevention of impacts on ecosystems, land, sinks and reservoirs (different terms are used in the conventions) within the focus of that particular convention – climate change, biodiversity degradation, or desertification/land degradation. Environmental impact assessments, which operate as a procedural check on governmental action which could have significant environmental impacts, are mentioned under both the UNFCCC and CBD. The inclusion of this prevention mechanism would be relevant under the UNCCD as well so that Parties provide a procedural check to assess and prevent land degradation from being caused or furthered by government-sponsored policies, programmes, or projects, which Parties may choose to extend to private actions as well, before it occurs. Each convention requires a large amount of planning through national strategies, plans, programmes, national measures, legislation, etc. to contribute to prevention of degradation of land, ecosystems, sinks and reservoirs. Nonetheless, land use planning or protection could be more effectively utilised, coordinated, and comprehensive to prevent and remediate/offset land degradation. Protected area designation is only included under the CBD, so this could be expanded to more broadly cover land degradation beyond simply the biodiversity focus. Project-based mechanisms and emissions trading schemes include land degradation prevention and remediation actions only to a limited degree, so broadening the scope of actions accepted under the mechanisms would potentially increase the uptake and demand for this type of activity (e.g., more types of LULUCF projects accepted under the CDM than just afforestation and reforestation). Finally, there are some specific instances where remediation is mentioned, but in general this is a weak point within the international agreements that were analysed. While

preventative measures are important, there is also a need for remediation to counter-balance any degradation that happens regardless of the preventive actions.

## Case Studies

Land degradation affects countries of all income levels and at all levels of human development. Some of the most degraded areas in the world, such as Western Europe and parts of Australia, are also the high GDP countries. However, the negative impacts of land degradation on human well-being are likely to be more pronounced in locations where degradation overlaps with poverty, low institutional capacity and weak social safety nets. In this map, countries are coloured according to their Human Development Index (HDI) score,<sup>20</sup> while loss of soil organic carbon relative to estimated original condition (one indicator of land degradation) is illustrated by the lightness or darkness of each pixel.

### 1) Desertification in the Oglat Aferieba region, Tunisia

In Tunisia, the desert proper begins south of the 100 mm average annual isohyet: there are both stony regs with extremely sparse vegetation and the dunes of the Great Eastern Erg which cover an area of approximately 25000 km<sup>2</sup>. The area taken up by chotts-vast, saline depressions devoid of vegetation-amounts to 5575 km<sup>2</sup>. Little will be said in this paper on the problems specific to these zones, where the desert is not due solely to human influence which is slight-and where the existing ecosystems are likely to evolve only very slowly. Taken as a whole, there is marked variation in precipitation, and the degree of variation is inversely related to the amount of rainfall. Thus, in the area which lies between the 100 and 200 mm isohyets, the maximum annual rainfall recorded is approximately ten to twelve times greater than the minimum recorded, whereas in the area lying between the 200 and 350mm isohyets it is only four to eight times greater. In general, this rain falls mainly in the winter months but can also occur in winter and spring.

Rapp (1974) summed up the techniques used by different authors to detect long-term climatic changes north and south of the Sahara, including evidence from meteorology and hydrology, archaeology and history, geomorphology, history of the vegetation and of the fauna, dendrochronology and palynology. During the past 20000 years the climate of the Saharan regions has probably changed several times, passing through wetter periods-called pluvial

periods-and drier or interpluvial periods. No change of this kind has been recorded during the past 2000 years, but there seem to have been frequent minor fluctuations. No sign of any trend towards a drier or wetter climate since the beginning of the century can be detected.

Harmful human practices in this arid climate include the marginal cultivation of cereals, overgrazing, the destruction of woody plant species by burning them as fuel and salinization of the soil as a result of faulty irrigation techniques.. United Nations has attempted, by studying the phenomena in the zone itself, to separate mere reversible 'degradation' from more or less permanent 'desertification', defined as an irreversible reduction in the productivity level of an ecosystem.

## 2) Desertification in the region of Coquimbo, Chile

The climate is predominantly of the arid-mediterranean type, with rains in the winter and drought during the wanner months. This mediterranean climate is controlled by the south-east Pacific anticyclone and by the cold Humboldt current. The topography consists of many rugged ranges . Many deep ravines cross the district in a north-south direction and drain a small amount of water Into a few creeks and rivers during the rainy period. There are small areas of gentle slopes in the littoral terraces and in intermont valleys, and there are smooth hili ranges in the plains. The majority of soils are derived from granitic, volcanic and sedimentary parent materials. They are predominately light-textured and have lost large quantities of organic matter as well as their surface structure, vegetation cover and fertility. They are now left exposed to the direct action of rain and the subsequent loss of topsoil. Erosion is evident throughout the entire district and is particularly accentuated near the places where man has settled. The vegetation has deteriorated completely, so that in many landscape units no traces of the climax state remain. The changes have led to reduced productivity and reduced development of human activities.

The small farmers face droughts passively, fatalistically, and in complete submission to the forces of the climate. They do not respond by seeking either technological innovations or new forms of organization which allow them to reduce the effects of the climatic variations. If drought has already set in at the beginning of the season, the fields are not sown; if the sowing has already been done, the crop is considered irreparably lost. Flocks are greatly reduced through death by starvation or sold at a poor price. The sacrifice of 500000 goats in the provinces of Limari and Coapa was announced at the beginning of 1976 as an emergency measure in the face of the impending drought. Moreover, the government was asked to reduce transport costs, and to provide other means of evacuating animals to the regions not affected by the drought

## 3) Desertification In Niger

The area was severely hit by the drought of 1969-73. The plant cover was temporarily or permanently diminished, as happened generally throughout the Sahel. However, the study area did have some special characteristics. Since 1960 the Republic of Niger has applied a concerted

policy to develop the Sahel pastoral zone, as is expressed in the 1959-60 report of the Direction de l'Élevage (Animal Husbandry Service). Animal husbandry was to be promoted and developed through a policy of water management at a time when the Sahel zone was passing through a period of normal to heavy rainfall. This policy was accompanied by legislation designed to safeguard the rights of pastoralists against the agriculturists who were moving north and occupying grazing lands. It was an attempt to develop, modernize and thereby to intensify animal husbandry in a region which was to be dedicated to pastoral use. The first activities were mainly in the Tchénouba district and later in the Agadez district. The study area was therefore privileged in many respects. The Azawak, within the boundaries of one administrative district, is inhabited by a largely Tuareg population, whose traditional political organization coincides with the present-day administrative organization. Hydrogeological conditions are such that deep groundwater can be exploited within the framework of a relatively coherent social system. Finally, the plain surrounding the Air has more recently been chosen for irrigated farming on heavy clay soils, which could benefit from run-off water from surrounding hills and from local artesian groundwater.

#### 4) Desertification In Europe

Projections on climate change in Europe indicate that the risk of desertification is increasing. Hot semi-deserts exist in southern Europe, where studies have identified the climate transforming from temperate to dry. This phenomenon is already extending northwards. Scientific evidence suggests that man-made emissions have substantially increased the probability of drought years in the Mediterranean region

With climate change, water is becoming scarcer in parts of Europe, and studies have identified that droughts occur more frequently. This increases vulnerability to desertification. According to the climate change models used by the Commission, temperatures are projected to increase by more than 2 °C in certain regions (such as Spain) by the end of the century. Over the same time period, summer precipitation is projected to decrease by 50 % or more in southern Europe. In their 2018 report, the Intergovernmental Panel on Climate Change (IPCC) confirmed with high confidence that temperatures on extreme hot days in mid-latitudes will increase by up to about 3 °C at global warming of 1.5 °C and by about 4 °C at 2 °C, and that the number of hot days is projected to increase in most land regions.

The models used by the Commission also provide projections on the risk of desertification, which is expected to be significant in particular in Spain, southern Italy, Portugal, and areas of south-eastern Europe including Bulgaria, Greece, Cyprus and the Danube Delta in Romania. Other studies report particularly strong increases in dryness and decreases in water availability in southern Europe and the Mediterranean when shifting from a 1.5 °C to a 2 °C global warming

## Recommendations

- 1) It must be emphasized that the main task in halting a progressive desertification of the environment is to define the socio-economic development policy to be advocated for arid regions. There are two possible alternatives: - Taking the short-term view, this policy could be based on technical and economic criteria, in which case it must be remembered that studies show that the majority of good-quality ranges are situated in areas that tend to be suitable for cultivation (forestry and cereal crops). In the long term those soils and their vegetation would become degraded at an increasing rate, and the environment would become sterile and therefore unable to support life, resulting in almost total rural depopulation. In other words, the present trend would have to be accepted. - An alternative policy could be based on socioeconomic criteria, which would mean slowing down and if possible arresting rural depopulation; increasing meat production where the locality lends itself to this (meat being a scarce commodity subject to continual price increases); protecting that part of the national heritage represented by water resources, soils and vegetation; and maintaining, or if possible improving, the production potential of that heritage.
- 2) As far as extension of dry cereal farming and forestry are concerned, it is recommended that: Ploughing be discouraged in pastoral areas, and implements which break up and crumble the soil be banned. Farming be encouraged in flood-out areas and along the stream courses after suitable modifications have been made (e.g. embankments, weirs, etc.). The conversion to rangeland of fallow cereal land be encouraged wherever the soil and vegetation have not yet reached a technically irreversible degree of degradation. A possible solution might be to introduce a preferential price policy for the benefit of farmers who agree to carry out such conversion, covering the purchase of corn for human consumption and the sale of lambs and kids.
- 3) There is a need to create employment and raise the level of income for the rural population in order to reduce the intensity of exploitation of the environment. This goal can be achieved by setting up an agro-pastoral programme and establishing industries compatible with the type of area concerned.
- 4) Genuinely effective rangeland-protection programmes could be put into effect by carrying out integrated management of areas of the largest possible size. The utilization of water resources requires rational planning, with priority given to fodder production.
- 5) A mass-education programme should be set up, both in the schools and universities and among the peasant population, to support measures to combat desertification.
- 6) Specialist training might be provided locally for key staff called upon to work in arid regions.

- 7) Intensified research is needed in order to gain a better knowledge of the potential of each environmental area and the extent of rational exploitation possible: - evaluation of water and soil potential (covering both surface water and deep ground water) and studies of ways and means of exploiting them; - evaluation of the genetic potential of vegetable and animal biotypes, and of the possibilities of improving that potential and of introducing adapted, productive biotypes; - evaluation of fodder potential, including agricultural by-products, and study of the ways of using them; - efforts to find new energy sources, such as solar and wind energy; - socio-economic studies which could be used to determine the extent to which socio-economic development aims can be made to coincide with the objective of protecting and conserving renewable natural resources.
- 8) Strategies and actions to combat land degradation that are well aligned with other decision-making areas can more effectively address multiple environmental and social challenges, while unlocking the potential to harness synergies (well established). Institutional coordination, multi-stakeholder engagement and the development of governance structures that bridge different government functions, types of knowledge, sectors and stakeholder groups (including consumers) are a prerequisite for reducing trade-offs, enhancing alignment and harnessing synergies among decision-making areas
- 9) Requirement of a baseline report which documents the status of soil and groundwater before a potentially harmful activity is started combined with the obligation after the cessation of the operation to remediate negative effects to achieve the former status of soils and groundwater
- 10) Mandatory conservation compliance measures in exchange for government payments as a means to allow e.g. farmers to abide by the standards Determination of standards for certain land uses, e.g. agriculture Pesticides, biocides, sewage sludge, nitrate
- 11) Land use planning for designated uses as well as protected areas Protection of land/soil of specific values: prohibition on use Determination of areas which are already degraded: open for primary use Detrimental projects are only allowed if public interests are overriding
- 12) Urban planning requirements combined with an EIA and an offsetting obligation already during the planning phase Obligation to primarily use already developed areas
- 13) General offsetting requirement for degradation of a parcel of land Need for indicators for land degradation and remediation: Eco-account approaches
- 14) Obligation to remediate existing land degradation Obligation for private and public actors, including the owner of the land, independent of whether he or she has caused the damage Obligation of competent authorities to remediate the damage and gain reimbursement rights against the responsible private actors If necessary, also for old brownfields sites
- 15) Specific regulatory provisions for certain land cover types, such as forests or wetlands Planning instruments for the achievement of LDNW Determination of main drivers of

land degradation Determination of programmes of measures • Reduction of land degradation • Remediation of land degradation • Balance has to be zero

- 16) Funding mechanisms which provide for private actors to manage land using practices in the public interest or remediate degradation, e.g., through cost-sharing, low-interest loans, or partial reimbursement by the government, and innovative economic instruments
- 17) Procedural mechanisms that require environmental impacts to be taken into account during the decisions-making process, i.e., EIA and SEA, including plans for activities which might cause land degradation
- 18) Setting land/soil and water quality standards, which would require land-based modifications of use in order to reduce non-point source pollution levels
- 19) Recordkeeping, reporting, tracking systems (e.g., hazardous waste movement), and transparent decision-making process using participatory approaches. Taxation or monetary mechanisms to build up large funding reserves which can be used by government actors to address dangerous pollution incidents quickly rather than wait for the responsible private actor, as well as a cost-recovery mechanism to seek reimbursement for response costs.

### **Additional Solutions to desertification (primary sector related)**

The struggle against desertification can occur at several levels. Since regional variations in climate are the main causes of the loss of dryland productivity, it is important to understand the influence of global warming in specific dryland regions. According to some models of climate change, many grasslands in western North America, for example, are predicted to be at greater risk of drought due to projected increases in summer temperatures and changes to existing rainfall patterns. Many authorities argue that since desertification and global warming are so closely related, one of the main solutions to the former may be the implementation of effective economic policies (such as carbon trading) and technical measures (such as carbon sequestration) that reduce the production of greenhouse gases.

At local scales, however, desertification is often the result of unsustainable land and soil management. To maintain the biological productivity of the land, soil conservation is often the priority. A number of innovative solutions have been devised that range from relatively simple changes in how people grow crops to labour-intensive landscape engineering projects. Some of the techniques that may help ameliorate the consequences of desertification in irrigated croplands, rain-fed croplands, grazing lands, and dry woodlands include:

Salt traps, which involve the creation of so-called void layers of gravel and sand at certain depths in the soil. Salt traps prevent salts from reaching the surface of the soil and also help to inhibit water loss.

Irrigation improvements, which can inhibit water loss from evaporation and prevent salt accumulation. This technique involves changes in the design of irrigation systems to prevent water from pooling or evaporating easily from the soil.

Cover crops, which prevent soil erosion from wind and water. They can also reduce the local effects of drought. On larger scales, plant cover can help maintain normal rainfall patterns. Cover crops may be perennials or fast-growing annuals.

Crop rotation, which involves the alternation of different crops on the same plot of land over different growing seasons. This technique can help maintain the productivity of the soil by replenishing critical nutrients removed during harvesting.

Rotational grazing, which is the process of limiting the grazing pressure of livestock in a given area. Livestock are frequently moved to new grazing areas before they cause permanent damage to the plants and soil of any one area.

Terracing, which involves the creation of multiple levels of flat ground that appear as long steps cut into hillsides. The technique slows the pace of runoff, which reduces soil erosion and retards overall water loss.

Contour bunding (or contour bundling), which involves the placement of lines of stones along the natural rises of a landscape, and contour farming. These techniques help to capture and hold rainfall before it can become runoff. They also inhibit wind erosion by keeping the soil heavy and moist.

Windbreaks, which involve the establishment of lines of fast-growing trees planted at right angles to the prevailing surface winds. They are primarily used to slow wind-driven soil erosion but may be used to inhibit the encroachment of sand dunes.

Dune stabilization, which involves the conservation of the plant community living along the sides of dunes. The upper parts of plants help protect the soil from surface winds, whereas the root network below keeps the soil together.

Charcoal conversion improvements, which include the use of steel or mud kilns or high-pressure compacting equipment to press the wood and other plant residues into briquettes. Conversion improvements retain a greater fraction of the heating potential of fuelwood.

# Eutrophication

Eutrophication, the gradual increase in the concentration of phosphorus, nitrogen, and other plant nutrients in an aging aquatic ecosystem such as a lake. The productivity or fertility of such an ecosystem naturally increases as the amount of organic material that can be broken down into nutrients increases. This material enters the ecosystem primarily by runoff from land that carries debris and products of the reproduction and death of terrestrial organisms. Water blooms, or great concentrations of algae and microscopic organisms, often develop on the surface, preventing the light penetration and oxygen absorption necessary for underwater life. Eutrophic waters are often murky and may support fewer large animals, such as fish and birds, than non-eutrophic waters.

Eutrophication is a leading cause of impairment of many freshwater and coastal marine ecosystems in the world. Eutrophication is characterized by excessive plant and algal growth due to the increased availability of one or more limiting growth factors needed for photosynthesis, such as sunlight, carbon dioxide, and nutrient fertilizers. Eutrophication occurs naturally over centuries as lakes age and are filled in with sediments. However, human activities have accelerated the rate and extent of eutrophication through both point-source discharges and non-point loadings of limiting nutrients, such as nitrogen and phosphorus, into aquatic ecosystems (i.e., cultural eutrophication), with dramatic consequences for drinking water sources, fisheries, and recreational water bodies.

Sixty-five percent of the estuaries and coastal waters in the contiguous U.S. that have been studied by researchers are moderately to severely degraded by excessive nutrient inputs. Excessive nutrients lead to algal blooms and low-oxygen (hypoxic) waters that can kill fish and seagrass and reduce essential fish habitats. Many of these estuaries also support bivalve mollusk populations (e.g., oysters, clams, scallops), which naturally reduce nutrients through their filter-feeding activities.

Eutrophication sets off a chain reaction in the ecosystem, starting with an overabundance of algae and plants. The excess algae and plant matter eventually decompose, producing large amounts of carbon dioxide. This lowers the pH of seawater, a process known as ocean acidification. Acidification slows the growth of fish and shellfish and can prevent shell formation in bivalve mollusks. This leads to a reduced catch for commercial and recreational fisheries, meaning smaller harvests and more expensive seafood.

In recent years, NOAA's National Centers for Coastal Ocean Science (NCCOS), in collaboration with NOAA's Northeast Fisheries Science Center, has enlisted estuaries' indigenous residents, namely, bivalve mollusks, to help slow and, in some cases, reverse the process of eutrophication, since they efficiently remove nutrients from the water as they feed on phytoplankton and detritus.

A groundbreaking modeling project in Long Island Sound showed that the oyster aquaculture industry in Connecticut provides \$8.5 – \$23 million annually in nutrient reduction benefits. The project also showed that reasonable expansion of oyster aquaculture could provide as much nutrient reduction as the comparable investment of \$470 million in traditional nutrient-reduction measures, such as wastewater treatment improvements and agricultural best management practices.

The NOAA scientists used aquaculture modeling tools to demonstrate that shellfish aquaculture compares favorably to existing nutrient management strategies in terms of efficiency of nutrient removal and implementation cost. Documenting the water quality benefits provided by shellfish aquaculture has increased both communities' and regulators' acceptance of shellfish farming, not only in Connecticut but across the nation. In Chesapeake Bay, for example, nutrient removal policies include the harvesting of oyster tissue as an approved method, and in Mashpee Bay, Massachusetts, cultivation and harvest of oysters and clams are part of the official nutrient management plan.

The process of sedimentation and eutrophication in Lake Rawapening leads to a decrease in water quality and quantity, thereby reducing the economic and ecological benefits of Rawapening. Lake Rawapening is a habitat for flora and fauna biodiversity, water sources for agricultural irrigation (Semarang, Demak, and Grobogan regencies), tidal rice fields, water supply for drinking water companies, fishery, water tourism, energy sources for hydroelectric power, water hyacinth craft, water hyacinth-peat mining as a raw material for organic fertilizers, maintain water management, and flood control. However, Lake Rawapening also has several unresolved problems, namely the explosion of the water hyacinth population, lake sedimentation, and eutrophication.

Saving Lake Rawapening's activities carried out in the lake body will be fruitless if the supply of sediment and nutrients from the inlet rivers is not reduced. Therefore, the activities of saving Lake Rawapening in the lake body and upstream areas must be synergistic and sustainable. Raharjo et al. suggested that collective actions are needed to solve Rawapening's problems. For effective actions, social and economy incentives, incentives from government, and the enforcement of norms and laws are also important.

Agricultural activities, especially in the upstream catchment area of Lake Rawapening, are a major contributor to nitrogen and phosphorus supplies. Murtiono and Wuryanta, Nugroho, and Hidayati et al. conclude that of the nine sub-watersheds: Parat, Sragen, Panjang, Kedungringin, Rengas, Legi, Galeh, Ringin, and Torong in which Panjang has the highest pollutant contribution to the lake. Since vegetable farming and Panjang are the most significant land use and sub-watershed, it is necessary to make appropriate, fast and measurable efforts to reduce the nutrients inputs, especially nitrogen and phosphorus into the lake so that efforts to save Lake Rawapening can be realized.

Based on the description above, this research is to identify applicable practices in reducing erosion and eutrophication that can be undertaken in the area.

Field observations show that the agricultural land in Candi Village has a slope of 28-35% with a slope length of 10-40 m. Apriliana analysed land uses changes in Rawapening from 1991 to 2011. The results showed that since then agricultural land were extended by cultivating land with 25-40% slope even steeper than 40%. Within a terrace, the land is divided into several raised beds depending terrace length. The bed width (cultivated land) ranging from 50-100 cm with a drainage of 30-50 cm width. Distances between the terraces are 30-100 cm and terraces heights are 50-160 cm. With these slope values, without land conservations, vegetable farming land will experience degradation. Soil and water conservation in the form of terraces and drainages have been carried out in all vegetable fields. In the dry season, water flowing in the river was clear; however, surface runoff and its materials can still be seen through the muddy water in the river when it rains.

### ***Case Study***

Harmful cyanobacteria blooms is a relevant and pressing issue worldwide. This is usually attributed to increases of dissolved inorganic nitrogen and phosphorus as well as suitable growth conditions.

Vancouver Lake of Washington, USA is a large (~9.3 km<sup>2</sup>), shallow (mean depth ~1.2 m) floodplain lake that is well known for swimming, bird watching, boating, and fishing. In the past, Vancouver Lake was clear, moderately deep (6-8m) that was flushed during spring and fall. However, since the early 20th century, many forms of rapid urbanisation like hydroelectric dam construction as well as land reclamation took place which caused the uncontrolled sediment load and nutrient load. In the 1960s, there were already cyanobacteria blooms and poor water quality. By the 1980s, the lake had shallowed to an average of 1m in depth.

Currently, the lake depth remains at an average of 1m. The water quality continues to be poor, with high levels of dissolved nitrogen and phosphorus, turbidity and pH. According to the Public Health officials, the lake continues to struggle with cyanobacteria because it is shallow, nutrient-rich without any outlets or freshwater sources and experiences very few rain events but is constantly being exposed to sunlight and warm temperatures. Such algal blooms forces the closure of the lake and swim beach periodically on and off during summer season, in order to protect the health of its visitors.

On the hydrological map of the world eutrophication has become the primary water quality issue. The excessive enrichment of waters with anthropogenic sources of nutrients especially nitrogen (N) and phosphorus (P) lead to the transformation of oligotrophic water bodies to mesotrophic, eutrophic, and finally hypertrophic. Mesotrophic and eutrophic phases exhibit intermediate and rich levels of nutrients and show increasing and serious water quality problems, respectively. Eutrophication restricts water use for fisheries, recreation, industry, and drinking because of increased growth of undesirable algae and aquatic weeds and the oxygen shortages caused by their death and decomposition. Associated periodic surface blooms of cyanobacteria (blue-green algae) occur in drinking water supplies and may pose a serious health hazard to animals and humans. Anthropogenic activities are the worst culprit of nutrient enrichment and root cause of eutrophication of water bodies. The explosive growth of the algae and plants can lead to the development of extensive and dense mats of floating plants that make it difficult to set fishing nets in the water. They can also limit the mobility of boats and other fishing vessels. Excess nutrient inputs to water bodies usually come from sewage, industrial discharges, agricultural runoff, construction sites, and urban areas. Eutrophication can be minimized by regulating the nutrient sources, reducing the use of fertilizers, proper soil management practices, implementing mathematical models, phytoremediation etc. Among these, public awareness of eutrophication can play an important role in preventing the eutrophication of water bodies.

Since pollution is a leading cause of eutrophication, reducing it in various forms can help prevent further destruction of water bodies. Cutting back on nitrogen and phosphates discharged into water systems can help lower the nutrient content in the water system, and hence control eutrophication. However, for this solution to work, industries, and municipalities, as well as individuals, should work together in reducing their pollution levels. If industries cut back on their pollution and municipalities continue to pollute water systems, the gains will be very few.

Eutrophication occurs as a result of nitrate and phosphate use. To minimize the presence of phosphate and nitrate in the water bodies, people should substitute nitrate and phosphate fertilizers with compost manure. Compost manure does not contain high elements of nitrates and phosphates that cause eutrophication. Furthermore, all essential elements of compost manure are broken down and synthesized by plants avoiding the eutrophication cycle.

Over the last few years, tech developers and scientists have been working towards creating technologies that can help reduce pollution and even reverse the damages already caused. Ultrasonic irradiation, as an example, is one such technology that has tremendously helped in controlling eutrophication by causing cavitations that produce free radicals that destroy algae cells. Other technologies that convert plant growth present in water bodies into energy have also been advanced. Although innovations are still expensive, they should be advanced towards reversing years of human pollution that cause cultural eutrophication. Governments are, therefore, called upon to as well invest in supporting and encouraging new innovations that deal with environmental challenges.

**Note: The background Guide doesn't restricts plagerism considering its entire purpose is to provide multifaceted view of the agenda. Happy researching.**