Nature-Based Solutions

2023

A Simplified Introductory Guide
To understand the theory and application *of Nature Based Solutions in Egypt*

Attribution-NonCommercial 4.0 International (CC BY-NC 4.0)

This is a human-readable summary of (and not a substitute for) the license.

Disclaimer.

You are free to:

- Share — copy and redistribute the material in any medium or format
- Adapt — remix, transform, and build upon the material

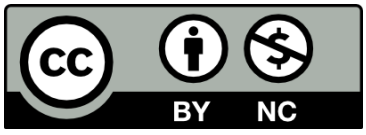
The licensor cannot revoke these freedoms as long as you follow the license terms

Under the following terms:

- Attribution — You must give appropriate credit, provide a link to the license, and indicate if changes were made. You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use.
- Non-commercial — You may not use the material for commercial purposes.
- No additional restrictions — You may not apply legal terms or technological measures that legally restrict others from doing anything the license permits.

Notices:

- You do not have to comply with the license for elements of the material in the public domain or where your use is permitted by an applicable exception or limitation.
- No warranties are given. The license may not give you all of the permissions necessary for your intended use. For example, other rights such as publicity, privacy, or moral rights may limit how you use the material.



About Greenish

Greenish is an Egyptian foundation with a vision to improve the health and wellbeing of residents in the MENA region. The organization's mission is to develop environmentally conscious practices through environmental Research, Advocacy, Capacity Building and Education (RACE). Greenish's work largely targets young people and local communities to empower them through localized knowledge and access to opportunity.

Manual Team

Authors

Mohamed Kamal – *Director at Greenish*

Rasha Emad Eldin – *Urban Planner and Cofounder of BENAA*

Ahmed Atia Rezk – *Spatial Planner and Project Manager at BENAA*

Islam Abo Elardaa – *BEU Director at BENAA*

Janna Radi – *Researcher at Greenish*

Review and Support

Eman Emad – *Project Manager at Greenish*

Yasmine Ibrahim – *Project Coordinator at Greenish*

Fareeda Essam – *Student President of the Greenish Clubs Programme 2022/2023*

Randa Khaled – *Student Vice President of the Greenish Clubs Programme 2022/2023*

Deenah Abdelaziz – *Educational Expert*

Designed By:

Alaaedeen Tawfik – Brand Manager at Greenish

Ahmed Adel Bayoumi – Senior Graphic Designer

Yara Sherif – Graphic Designer

Acknowledgement

This Manual was developed through the partnership between Greenish and Benaa foundation, with the content being largely based on the built environment experiences of both organizations and a compilation of available resources regarding Nature Based Solutions in Egypt and the MENA region. This manual is an attempt to simplify the subject for newcomers and create a reference point for researchers and practitioners when aiming to find information regarding Nature Based Solutions given that the subject is becoming more mainstreamed in different sectors as a form of intervention that can support our transition to a more sustainable and circular economy.

This manual is made possible by the generous support of the American people through the United States Agency for International Development (USAID). The contents are the responsibility of Greenish Foundation and do not necessarily reflect the views of USAID or the United States Government. This was financed under the support package from USAID through the Governance Integration for Stabilization and Resilience in the Middle East and North Africa (GISR MENA) MENA Youth for Climate Action (MYCA) Activity, Task Order Number 7200AA18M00014. The MYCA Activity seeks to support youth-led efforts in advancing climate action across the MENA region and leverage growing windows of opportunity to increase dialogue and awareness of climate change.

The Butterfly effect never ends, the Butterfly effect never fades.

All the Greenish Educational Manuals are a tribute for Greenish's founding partner

Medhat Mohamed Mohamed Benzoher

He left us on April 1st, 2018, one month before his 29th birthday after he ignited a spark of change in our hearts with his vision and inspired us with his smile and his art.

You left our world with your body, but your traces and your love have never left our hearts.

We truly hope that this guide and the young participants in the Greenish Clubs programme will continue your journey in raising environmental awareness to create a green world, generous and sincere as your heart. We hope that those who did not meet you will see you through your impact on our souls and our actions as the butterfly effect does not end or disappear.

We remain loyal to your memory,

Your friends,

Your second family,

Greenish Team

Introduction:

This manual was developed by local experts in Egypt to provide a simple and reliable introduction for Nature Based Solutions, that can guide any practitioner, researcher, reader, and learner, on what to consider and how to adopt Nature Based Solutions or (NbS) in their respective sector and line of work. It provides a simplified framework by which you can further explore and learn the subject, based on Case Studies, the up-to-date knowledge, and agreed definitions on the subject.[1]

This manual was designed to not require any prerequisites with regards to readings or knowledge and acts as a standalone guidance on the subject. The narrative writes up for the theoretical and scientific segments of this manual, are primarily narrated towards facilitators rather than practitioners, as the core rationale behind the manual is to provide a consumable document that can be utilized by facilitators to deliver sessions and workshops regarding Nature Based Solutions.

How to use this Manual:

This manual was developed in a way which allows for a smooth flow for the content, so that any reader is able to easily consume the content provided. However, it has a number of prompts which include:

- Certain images across this manual are hyperlinked, as to make it easier for the learner to reach the reference for the image or logo.
- The chapters of this manual include small prompts in Red that are a reference to activities applicable to the presented information. These activities can be found annexed at the end of the document. These activities are designed to aid facilitators in

[1] Taking into consideration, that up until the date of publishing this manual the UNEP Consultations for Nature Based Solutions are still ongoing (2023) and that there is yet to be an internationally agreed definition of Nature Based Solutions and its respective application.

delivering engaging sessions and content regarding NbS. These prompts are always on the right side of the document opposite to the text.

- The manual includes narrative segments which aim to utilize basic storytelling, focused on the context of Egypt, to better connect the reader to Nature Based Solutions.
- This manual is not designed to be an academic publication or book or even a replacement to scientific publications. Thus, it is highly recommended that readers and facilitators utilizing this manual explore the references provided across the document for more information, data and knowledge. While the manual was reviewed by subject experts on built environment, ecosystems, biodiversity conservation and climate, it did not go through a formal peer-review process.
- All the recommended readings for this manual are open-source and accessible for the general public. If a link expires, check the most recent edition on Greenish's website or follow the link source.
- You can take parts of this manual and utilize it for your own work, as long as you abide by the Creative Commons requirements (CC-BY-NC 4.0). All figures for this manual were created on the Canva platform and if you wish to have access to the source files for the figures and shapes, please send an email to info@greenishheart.com stating this request.

Chapter One

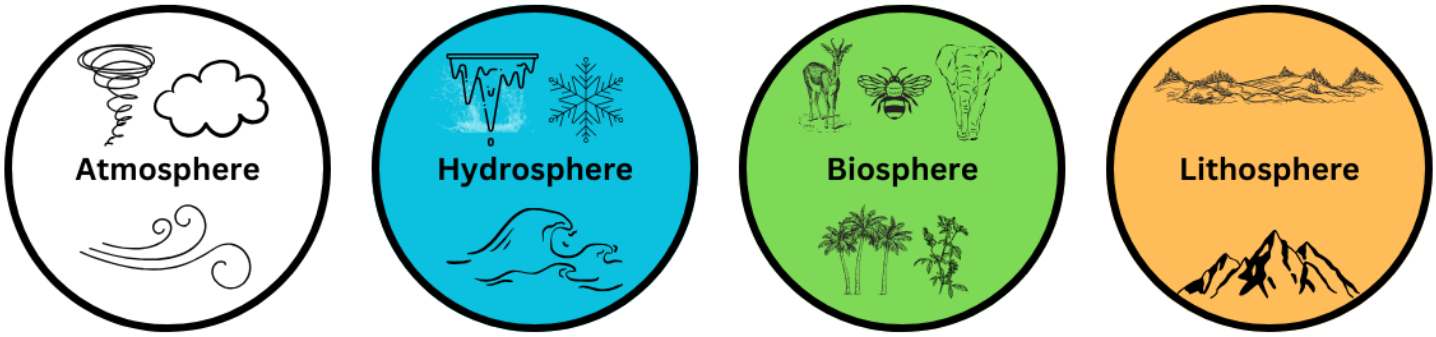
1. Defining Nature

1.1 Nature

Activity 1

Nature is the core source of life on our planet. Before we engage with a subject like Nature Based Solutions, it is key that we understand what actually makes up this term and concept. Nature encompasses all living organisms, ecosystems, and the intricate web of interactions between them. The following is a simple breakdown of the components of Nature:

- Flora: This term encompasses all plant life including trees and any form of vegetation
- Fauna: The animal life, ranging from insects to mammals on land or in the sea.
- Ecosystems: This term refers to the interconnected communities of plants animals and even microorganisms, a place where the different type of animals and plants come together. Examples of ecosystems include forests, wetlands, deserts, oceans etc.
- Earth Systems: Everything that happens within planet earth's system, happens within one of four primary subsystems: land, water, air and organisms. These four subsystems are called spheres.
    - Lithosphere: This includes all the solid land that makes up the crust of the planet. This covers elements such as mountain ranges, and more flat areas as we find in the desert.
    - Hydrosphere: This contains all the solid, liquid and gaseous water of the planet. Only a small portion of the hydrosphere includes fresh water (non-salty), as the majority is salty water.
    - Biosphere: All living things on the planet are part of this sphere, or in other words organisms and microorganisms. Biomes are found within this sphere, which is a term used for referring to ecological communities.
    - Atmosphere: This sphere largely protects the biosphere from the dangers of the sun's ultraviolet rays as it extends over 10,000km above the planet's surface and it includes all the air in the Earth's system.



In Geosciences, which is largely the study of the earth including fields like geology, there are sub spheres under the above four primary spheres of Planet earth. For example, the Cryosphere is a term that references the frozen water that is part of the hydrosphere.

To better understand the earth's sphere, consider that anything "located" within a sphere is part of it. A good example of that is clouds, which are an important part of the water cycle but theoretically they are part of the atmosphere and not the hydrosphere. Thus, the earth's sphere is very tangible and physical, even the gaseous elements, and it largely depends on where something is located to be able to determine it is part of which sphere.

The Convention on Biological Diversity (CBD) defines Nature as follows:

Nature is all the existing systems created at the same time as the Earth, all the features, forces, and processes, such as the weather, the sea, and mountains.

Convention on Biological Diversity

Another important component of nature is natural events which usually are based in one sphere but have direct and indirect impacts on other spheres. These events are usually composed of a set of interactions that occur in the earth's system and a result of chain reactions (one interaction results in another). Events can be major or minor, significant, or insignificant.

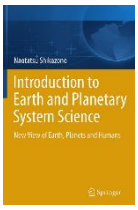
For example, a major event that occurs in the lithosphere are Volcanic Eruptions which largely involve the eruption of molten rock, ash, and gases from Volcanoes. This occurs in the Lithosphere, has direct effects on the atmosphere (changes in temperature) and hydrosphere (fluctuations in water flow) and indirect effects on the biosphere (danger to living organisms from the molten rocks).

On the other hand, a minor event that occurs in the biosphere is photosynthesis, which is the process by which plants and algae convert carbon dioxide and sunlight into energy and oxygen. While a small event basically at the organism's level, it has a chain reaction on the ability of other organisms to exist and the ability of the hydrosphere and atmosphere to remain balanced.

The interplay and responses between different spheres are fundamental aspects of the natural world. For instance, when a volcano erupts into the atmosphere, it introduces particles that serve as the basis for the creation of water droplets in the hydrosphere. This, in turn, can lead to rainfall, which plays a role in catalyzing the growth of various plant life within the biosphere. It's worth noting, though, that these interactions can be quite complex. The given example is a simplification because a volcanic eruption also involves the release of various gases into the atmosphere, and these gases can have diverse impacts on the other Earth spheres.

Further Reading:

For a more in-depth introduction and to gain a stronger understanding of the Earth's system and spheres, the following book and chapter are recommended:



Naotatsu Shikazono (2012). Introduction to Earth and Planetary System Science. Chapter 2. Springer eBooks. Springer. doi:https://doi.org/10.1007/978-4-431-54058-8.

Narrative – Egypt's Nature

Imagine standing by the banks of the Nile River, Egypt's lifeline, where the rich soil stretches as far as you can see. Here, you witness nature in action. Tall date palms with their leaves swaying in the breeze represent one part of nature - the plants. These include the majestic palms and sturdy desert shrubs, all playing a vital role in Egypt's unique natural world.

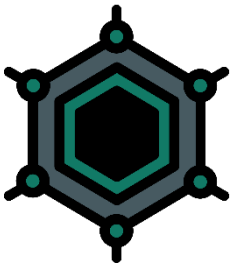
But nature in Egypt goes beyond just plants. As you explore the dry landscapes, you might come across various animals. Desert foxes quietly moving through the sand and Cattle Egret's flying over the landscape in search for soil in early stages of its agricultural cycle for food, are examples of Egypt's diverse wildlife. These creatures, along with many reptiles, insects, and birds, make up the country's rich biodiversity, which is the primary component of Nature.

Yet, nature is more than just the sum of its individual components. It's the intricate relationships that bind these organisms together. Picture a bee buzzing among the blossoms of an Egyptian lotus flower, unwittingly aiding in pollination. Or consider the ancient Egyptian practice of cultivating the fertile Nile floodplains, where the annual inundation nourished the soil and sustained a flourishing agriculture. These interactions, often imperceptible to the human eye, underpin the delicate balance of Egypt's unique ecosystems.

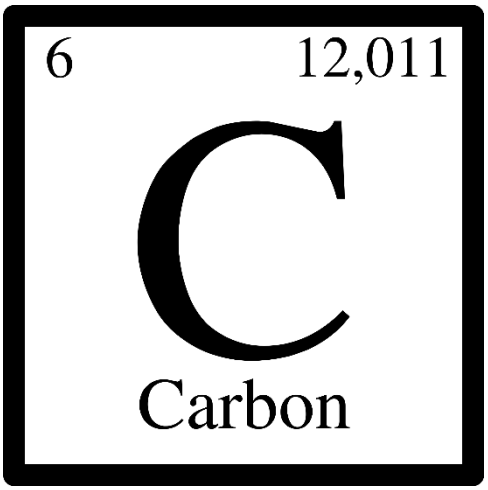
As you continue your journey, you'll come across Egypt's distinctive ecosystems – from the lush oases in the Western Desert to the unique wetlands of the Nile Delta. These ecosystems, shaped by millennia of interaction between nature and human civilization, are a testament to Egypt's enduring relationship with its environment. Nature, in all its diversity, is a complex and interconnected web. It is this interplay between living organisms, ecosystems, and their environment that defines nature.

Activity 2

1.2 Carbon



When conceptualizing nature and trying to understand its respective composition, there is a silent orchestrator that played a fundamental role for essence of existence of life on earth, and that is the Carbon. As we embark on the exploration of nature-based solutions, it is imperative to unravel the profound connection between carbon and all living organisms.



Carbon, the fourth-most abundant element in the universe, is the elemental backbone of life as we know it. Its unique ability to form stable bonds with other atoms, especially itself, lays the foundation for the rich diversity of organic compounds. Carbon plays a central role in the formation of biomolecules. The molecular choreography begins with the carbon atom's propensity to form four strong covalent bonds. This exceptional bonding capacity grants carbon the capability to construct complex and diverse molecular structures, laying the groundwork for the kaleidoscope of life forms populating our planet.

From the grandeur of ancient trees to the microscopic intricacies of single-celled organisms, carbon is the unifying thread. It constitutes the very fabric of proteins, nucleic acids, lipids, and carbohydrates — the building blocks of life. Each living entity, irrespective of its size or complexity, echoes the universal mantra written in the language of carbon. Beyond its structural significance, carbon is a custodian of the Earth's carbon cycle, a delicate equilibrium that sustains life. As mentioned in the previous subsection plants absorb carbon dioxide during photosynthesis, they convert it into organic compounds, releasing oxygen in the process. This intricate ballet between flora and fauna maintains the atmospheric balance crucial for the survival of myriad life forms.

Unveiling the significance of carbon transcends mere scientific exploration; it serves as the linchpin for unlocking the potential inherent in nature-based solutions. Delving into the intricacies of carbon's interactions within ecosystems not only enhances our scientific knowledge but also provides profound insights into sustainable practices. These insights, derived from understanding the delicate interactions of carbon within the natural world, empower us to harness the regenerative prowess of nature. At its core, the essence of carbon-based life embodies a philosophy of balance and interconnectedness, principles that intricately guide the development of solutions firmly rooted in the harmonious rhythms of the natural environment.

Watch
What this video by Vox news regarding Carbon and its influence on life (and how this is disrupted)

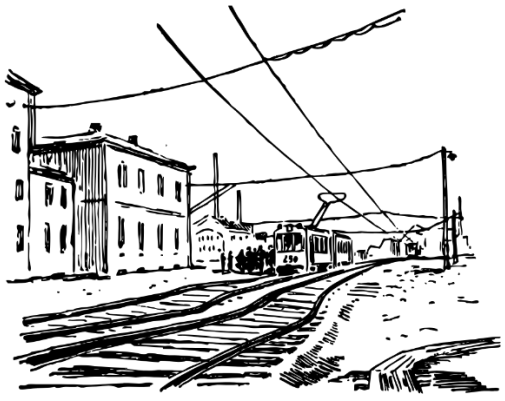
1.3 Humans and Nature

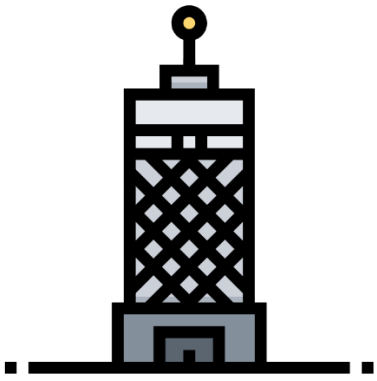
According to the United Nations Environment Programme (UNEP), nearly three-quarters of the land on Earth and two-thirds of the oceans are now impacted by human related activities. Thousands of years ago, Humans largely were part of Nature and Natural events dictated the livelihood and movement of humans across the planet. Fast forward to today's industrial world, humans now are largely dictating the future of the natural environment. Humans have a complicated relationship with nature, one that spans thousands of years and has gone through different phases and changes.

Humans have largely developed various technologies and general understanding of science, based on observing nature and collecting information from the thousands of years we spent living in sync with nature. We entirely rely on Nature for our existence as a species. Regardless how far we have advanced if the natural system that allows photosynthesis to produce Oxygen by using Carbon Dioxide is interrupted just for a day, the entirety of the planet could have a halt. Further to that, humans have largely developed living environments and cities based on observing and living in the natural environment. These are usually referred to as Human-made environments.

Understanding Human-made Environment

A setting designed by humans to meet their needs is referred to as a "human-made environment." Humans have molded their surroundings by constructing structures such as buildings, roads, and bridges.





Since the industrial revolution, we have seen the development of Human-made environments that are not in harmony or considerate of the surrounding environment. This has caused and is causing long-term risk, damages, and changes to the natural environment. The development of human-made environments is a form of "modification" to nature and has largely been done across history without adequate considerations for the lost ecosystem and ecosystem services as science was not advanced enough for the majority of human development to understand the implications of certain actions. These actions, which we now know have serious implications

and impacts on the natural environment without adequate mitigation measures in place, are presented in the following list (this is not an exhaustive list rather a set of examples):

- Extracting Materials from Earth (ranging from fossil fuels to other minerals)
- Construction of various structures from houses to bridges, roads amongst others
- Developing industrial complexes, irrigation canals and other methods to industrialize various industries

Anthropogenic Mass and Biomass

"Anthropogenic"

- refers to something that is created or caused by human activity. It is often used to describe environmental changes, such as pollution or climate change, that result from human actions rather than natural processes.

"Anthropogenic mass"

- refers to the cumulative weight of materials shaped, influenced, or created by human activities. In environmental science and waste management, it quantifies the impact of human actions on Earth, encompassing the mass of structures, infrastructure, waste, and other materials linked to human endeavors.

"Biomass"

- refers to the total mass of living organisms, usually in the context of a specific area or ecosystem. It includes the combined weight of all plant and animal life present, from microorganisms to large trees and animals. Biomass is often measured in terms of dry weight and is a key indicator of the ecological productivity and health of an ecosystem. Additionally, the term is used to describe organic materials, such as wood, agricultural residues, and other biological matter, that can be used as a renewable energy source through processes like combustion or conversion to biofuels.

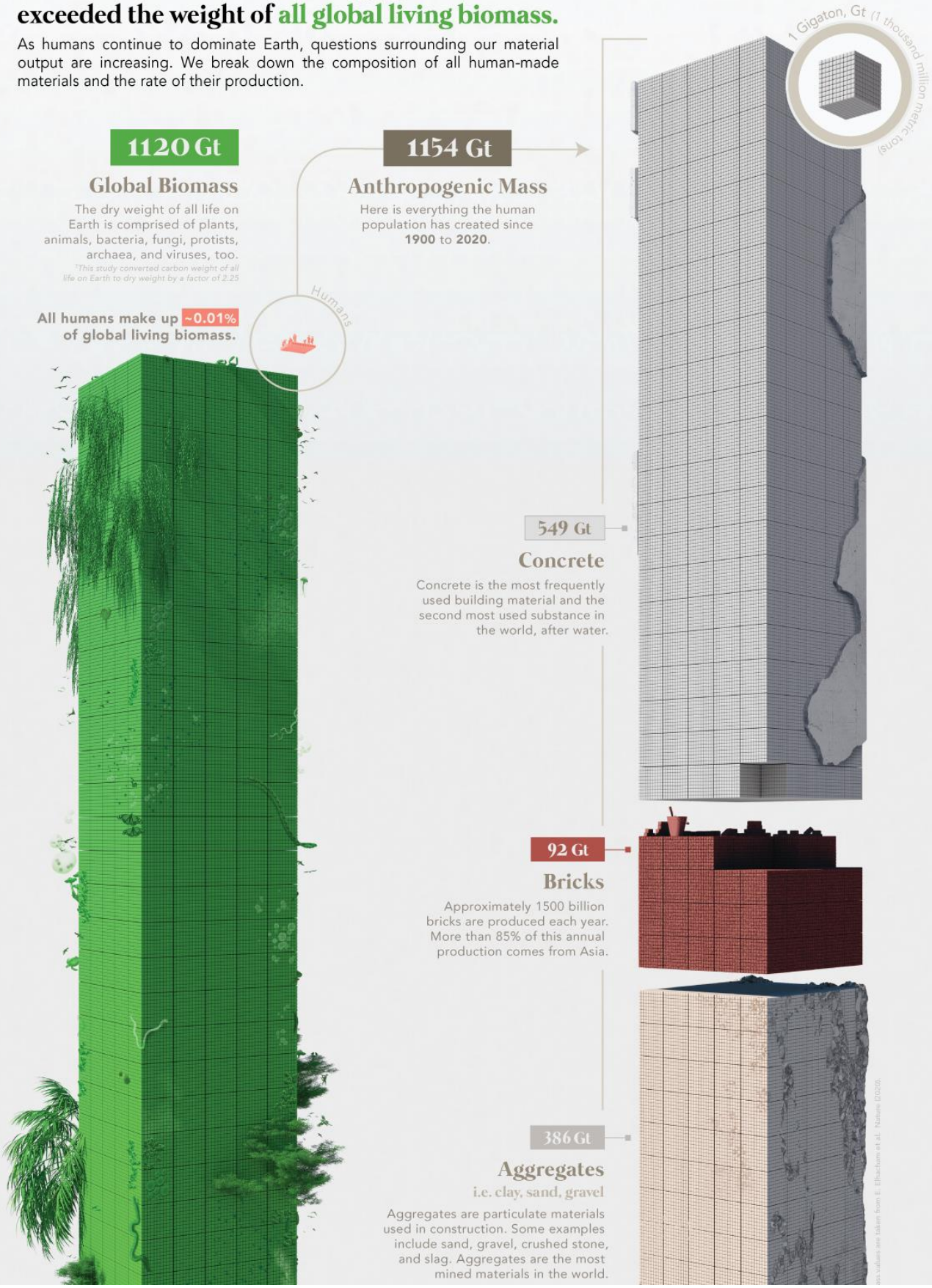
Currently, the global population stands at around 8 billion individuals, a stark contrast to the approximately 3 billion people at the conclusion of World War II. Unfortunately, the equitable distribution of world resources remains a challenge, with a considerable portion of the population still grappling with poverty—a persistent issue from the past. Moreover, the ongoing climate crisis exacerbates socioeconomic disparities, intensifying the divide between the affluent and the underprivileged. The repercussions of climate change extend beyond economic inequalities, as it accelerates species extinction and contributes to widespread pollution of the Earth, its atmosphere, and water sources.

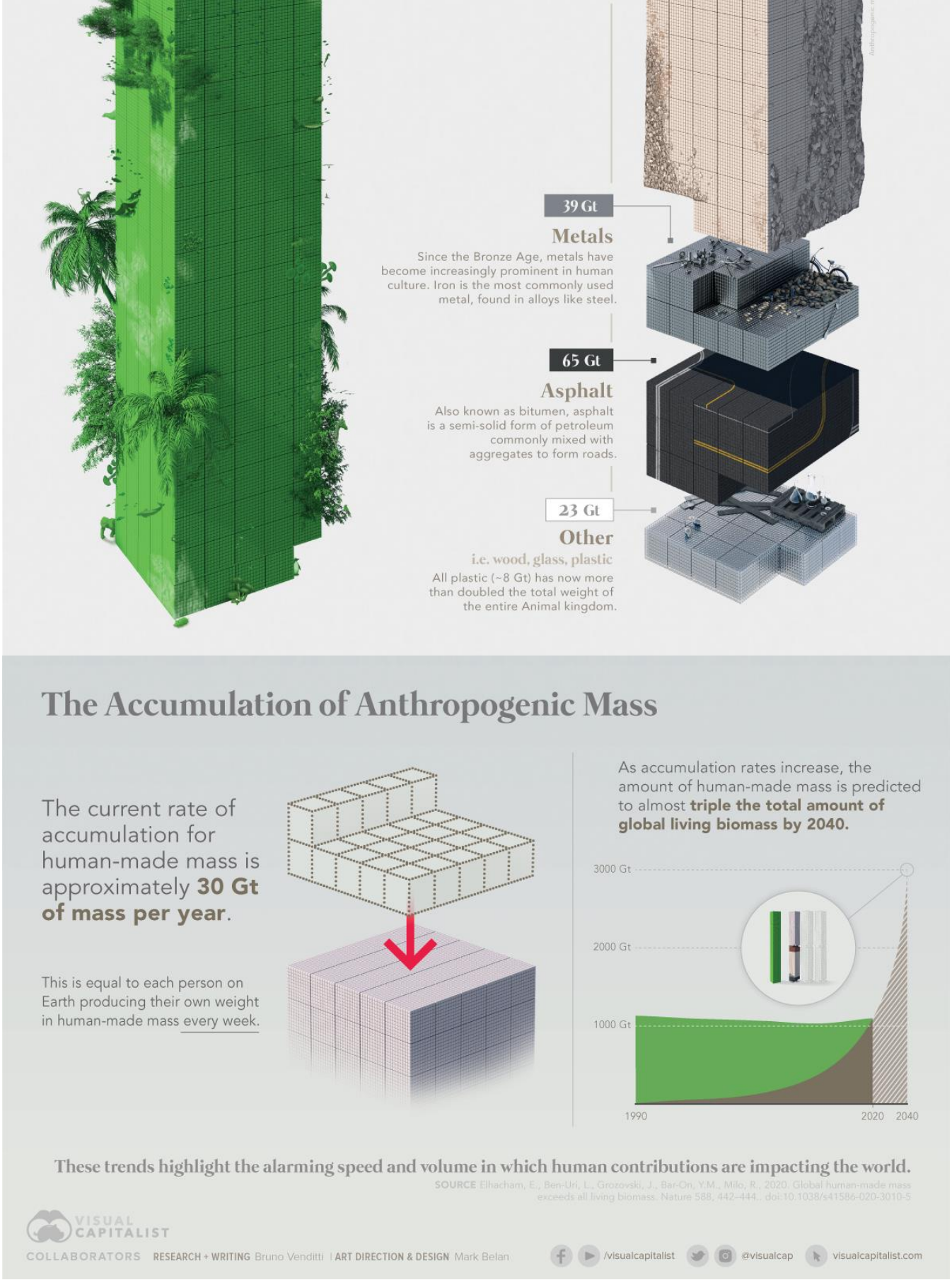
Visualizing the Scale of Anthropogenic Mass

Anthropogenic mass, or **human-made mass,** refers to the materials embedded within inanimate solid objects that are made by humans.

In 2020, the amount of anthropogenic mass exceeded the weight of all global living biomass.

As humans continue to dominate Earth, questions surrounding our material output are increasing. We break down the composition of all human-made materials and the rate of their production.





Source: Visual Capitalist, 2021

Our current global economy operates on an extractive model that has influenced how we interact with nature. This system, centered on exploiting resources, has driven economic growth but at the expense of harming the environment. Relentless pursuit of raw materials has strained ecosystems, leading to the loss of biodiversity and threatening the delicate balance of our planet. As we approach a transformative era, it's crucial to reassess this extractive approach. Moving toward sustainable solutions requires a fundamental shift, recognizing the close link between human well-being and the health of our natural world.

Discussion

How has this paradigm shaped our relationship with nature, and what are the environmental consequences of this extractive status quo? Reflect on the impact on ecosystems, biodiversity, and the delicate balance of our planet.

It is recommended to facilitate this discussion by going through different industries and materials that are used (cement, sand, soil for construction – water, pesticide etc. for agriculture)

As technological advancements propel us into the future, our reliance on critical minerals has become increasingly pronounced. These minerals, essential for the production of modern technologies, underscore the intricate interplay between human innovation and the Earth's resources. Ironically, even as we strive for sustainability through renewable energy and green technologies, the demand for critical minerals continues to rise, which are all finite. This intricate dance between progress and resource utilization prompts a critical examination of our evolving connection with nature. The challenge before us is to forge a sustainable path that not only meets the needs of a growing population but also respects the inherent interconnectedness between technological progress and the delicate balance of our natural environment.

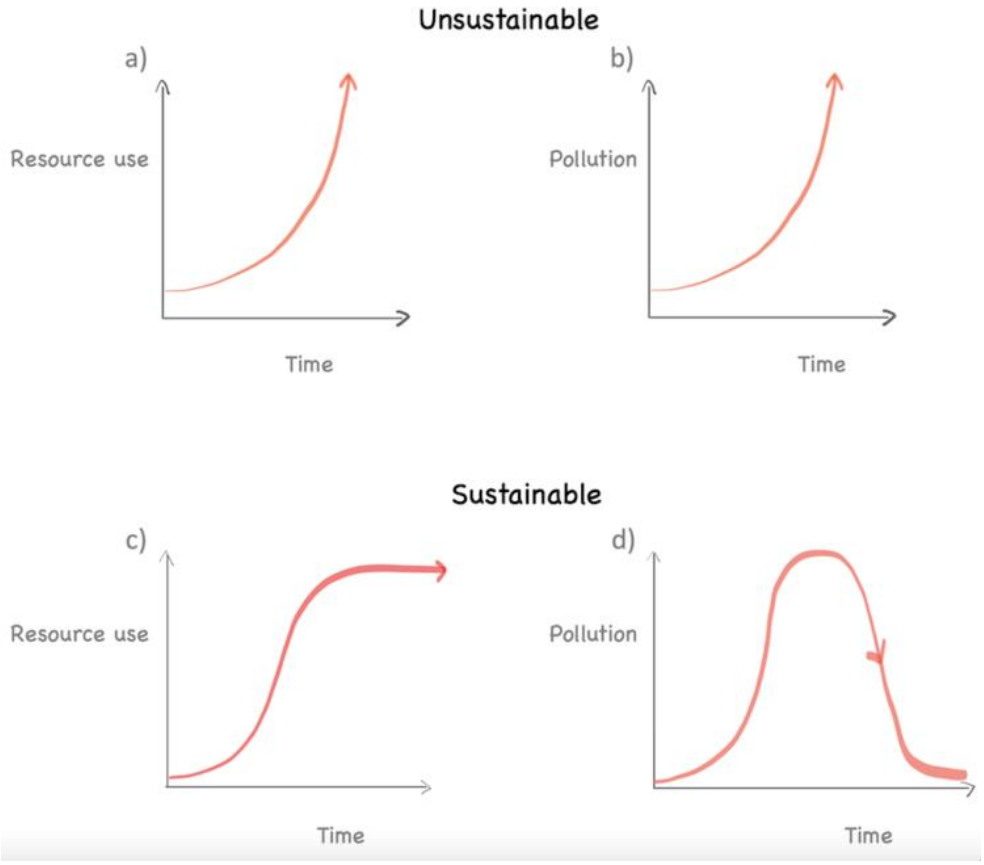
It is important to reiterate and stress the point that technological advancements will never be able to replace the role of nature and that ensuring a health and adequately functioning ecosystem is essential for the survival of humans. It is as simple as that, but unfortunately due to current state of industrial development, consumer behavior directly related to mass production of goods, rapid growth in population and the unsustainable concept of economic development, the Natural Environment is being shift to a state of no return.

Further Reading

For a more in-depth analysis and material flow mapping of the current use of natural across the global economy, the following publication is recommended

The use of natural resources in the economy – A Global manual on Economy-Wide Material Flow Accounting. UNEP 2023 https://wedocs.unep.org/handle/20.500.11822/36253

The prevailing paradigm of the current global economy hinges on the notion of infinite economic growth, a concept inherently at odds with the principles of nature. Nature operates within finite boundaries, where resources are limited, and ecosystems maintain delicate balances. The relentless pursuit of perpetual economic expansion disregards these ecological constraints, leading to the overexploitation of natural resources and environmental degradation. As we confront the consequences of climate change and biodiversity loss, it becomes evident that a paradigm built on infinite growth is unsustainable in the long run. The challenge lies in reimagining our economic framework to align with the regenerative capacities of the natural world.

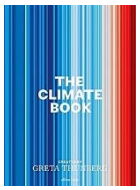


As we reflect on the current global economy's pursuit of infinite growth, it becomes clear that such a trajectory is out of sync with the natural world's finite resources. Now, let's shift our focus towards a more balanced and sustainable path. In the two chapters to follow, we'll explore nature-based solutions that offer a way forward to develop our future but in harmony and in sync with nature. These solutions recognize the intrinsic connection between human well-being and the health of the environment.

Further Reading

[not a free book] To better understand how the current global trends and economy are not aligned with Nature, the following reading is recommended

The Climate Book by Greta Thunberg – 2022



Chapter Two

2. The Theory of Nature-Based Solutions

2.1 Defining Nature-based Solutions

Nature-based solutions are multi-purpose solutions that draw inspiration from ecosystems to address societal limitations. Communities resort to these solutions to manage the relationship between society and ecosystems. This harmony is achieved by devising interventions that address societal problems and work in favor of the environment, not against it. To design these solutions, humans rely on nature and existing ecosystems or on borrowing from existing systems to create a new ecosystem that faces the targeted problems. These solutions enrich ecosystems by making the natural and built environment more diverse and enhancing biodiversity and public health.

Recently, several proposed frameworks have emerged for the widespread adoption of nature-based solutions. These frameworks arose based on the scientific community's expectation that these solutions would mitigate and reduce the risks of natural disasters. Studies conducted by Ruguero and Nervan in 2014 and 2017 confirmed this hypothesis. They both studied the impacts of nature-based solutions in coastal areas of the United States. The researchers found that these solutions are more sustainable and adaptable to climate change and changing social and economic conditions.

This chapter aims to develop a local framework appropriate to the Egyptian environment for understanding and developing nature-based solutions. There are various global sources for classifying and developing these solutions. But all these sources agree that nature-based solutions are local solutions that are inspired and in harmony with the nature of the place. Therefore, this guide must be developed to provide a resource in the Arabic language that is compatible with the natural environment in Egypt. Therefore, this chapter begins by mentioning the most important features of the international sources that talked about these solutions. Then we develop together a new framework for thinking about these solutions as solutions derived from the environment surrounding us in Egypt.

2.2 Global definitions and frameworks for nature-based solutions

The World Bank mentioned nature-based solutions for the first time in 2008. Global studies continued since this time until the European Commission launched the first official definition of these solutions in 2015. This definition explains nature-based solutions as interventions that target natural, social and economic challenges at the same time. This is done by maximizing the benefits of nature and drawing inspiration, transfer, or reliance from/on nature. In 2020, the International Union for Conservation of Nature stated another definition of these solutions, which is that they are interventions to protect, rehabilitate and manage nature and the ecosystem in a sustainable manner that aims to solve societal problems effectively and flexibly and preserve biodiversity and human safety.

Different definitions of nature-based solutions arise from the intersection of many fields such as biology, chemistry, management, and ecology. Therefore, some find these definitions confusing and indefinite because they were developed by a group of scholars from diverse backgrounds, and each of them saw these solutions as appropriate to their field. For example, the second definition mentions biodiversity conservation as a primary goal of nature-based solutions while the first definition mentions solving economic problems as a primary orientation for the same solutions. Accordingly, each definition is able to answer some questions related to nature-based solutions.

Prompt Question
What factors should be considered in nature-based solutions?
This question is open-ended by design and should be used a prompt to better investigate the concept of NbS before delving into the detail

The International Union for Conservation of Nature answered the above question by stating eight basic principles: (1) nature conservation, (2) consideration of (2) natural and (3) cultural contexts, (4) fairness and (5) justice in achieving societal benefits, (6) application at the landscape scale, and (7) forward-thinking while developing ecosystems and (8) their associated benefits. These principles take us to another question, which is how can the solution be described as nature-based, and what is the dividing line between it and traditional solutions?

Prompt Question
How does the solution become nature-based?
This question is open-ended by design and should be used a prompt to better investigate the concept of NbS before delving into the detail

Bitchover and his research group reported in 2017 that the boundaries between nature-based solutions are still blurry. This is because it depends on the level of human intervention in the ecosystem and whether it can be considered acceptable interventions or whether procedures inspired by nature - known as biomimicry - are included within nature-based solutions.

The two most pressing issues in the environment surrounding you	In your opinion, what is the most effective solution to this problem? (past or future solution)	To what extent can this solution be considered environmentally acceptable? (0 to 5)	Who benefits the most from this solution?

"Human-centrism" is one of the most controversial problems in traditional solutions to societal problems. Anthropocentrism assumes that the primary goal of the environment is to achieve the well-being of society and individuals. Most of the current solutions focus on achieving the greatest possible benefits for humans and neglect the impact of these solutions on the environment. This is because the traditional approach to problem solving emphasizes social and economic benefits, resource efficiency, and the combination of technical, business, financial, governance, and innovation solutions..

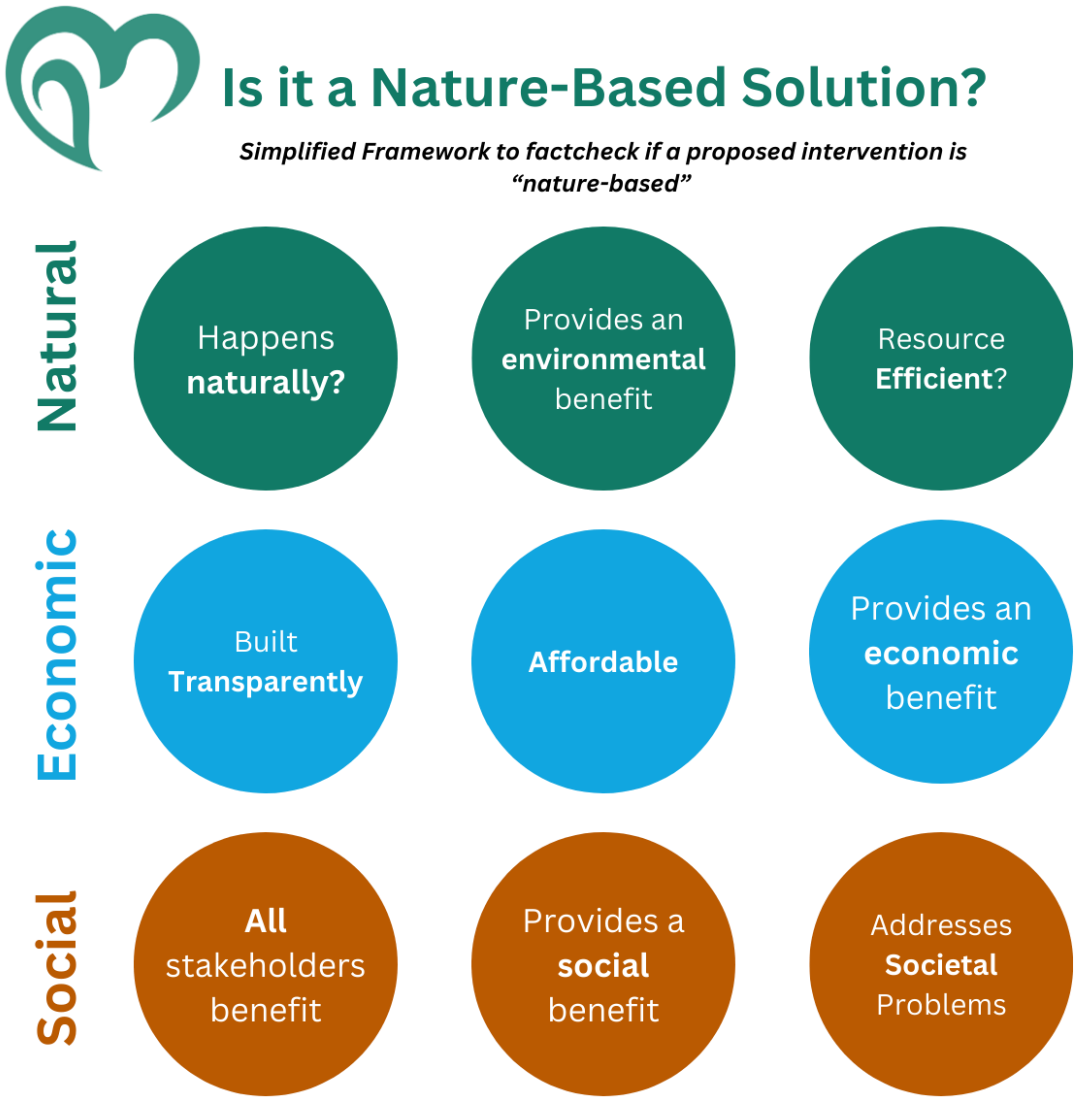
Many researchers have discussed the problem of the anthropocentrism of traditional solutions and mentioned some alternative trends that may help create more sustainable solutions. Among these trends are environmental engineering and reliance on the environment to reduce the risk of natural disasters and manage natural reserves. These trends aim for long-term solutions that focus on adapting to the environment and creating green infrastructure in which the ecosystem is interconnected to solve societal problems. On this basis, the European Commission stated five basic questions to determine whether this solution is based on nature or not:

1. Does this solution use a mechanism or process that happens naturally in the environment (without human intervention)
2. Does this solution provide a public social benefit?
3. Does this solution provide a public economic benefit?
4. Does this solution provide an environmental benefit?

5. Do all stakeholders benefit from this solution?

Sovinska Svirkos and Garcia argue in their study published in 2022 that nature-based solutions necessitate targeting more than one benefit at the same time. Therefore, these solutions must be highly efficient and rely on transparency in their design and implementation, which is likely to add a group of other questions to the European Commission's questions:

- Is this solution affordable?
- Is this solution resource efficient?
- What societal problems can this solution address?
- Is this solution built transparently?
- Do all groups benefit from this solution?

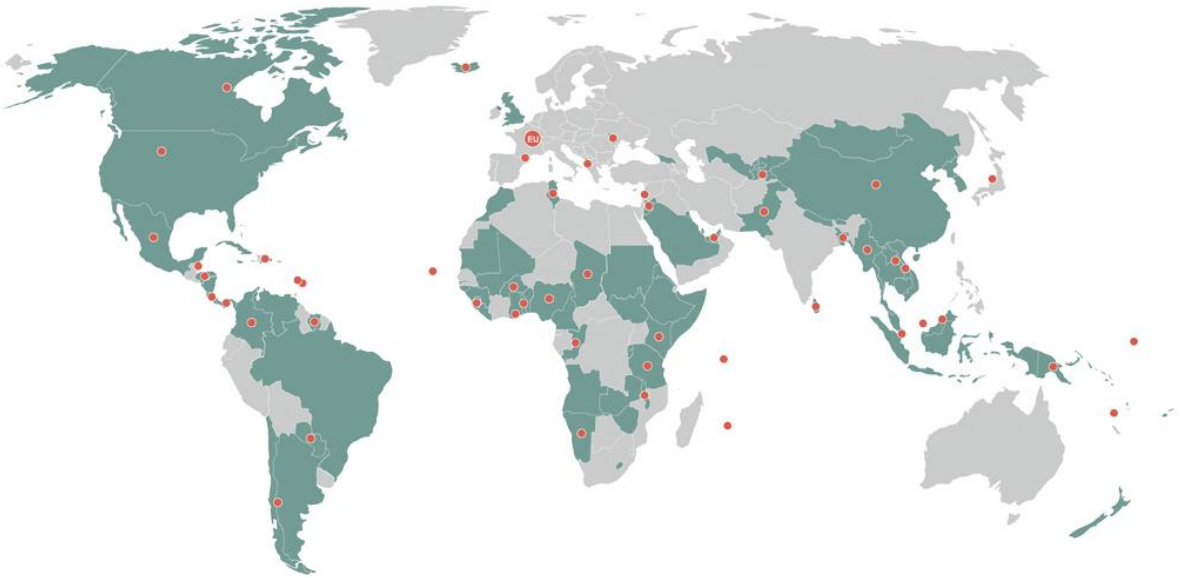


Source: *(developed based on an adoption from Sovinska Svirkos and Garcia, and the European Comission Framework Questions)*

2.3 Nature-Based Solutions as a traditional way of solving problems

Did you know?

Did you know that 66% of countries (member states) that are part of the UNFCCC reference Nature-Based Solutions in their Nationally Determined Contributions (NDCs)?



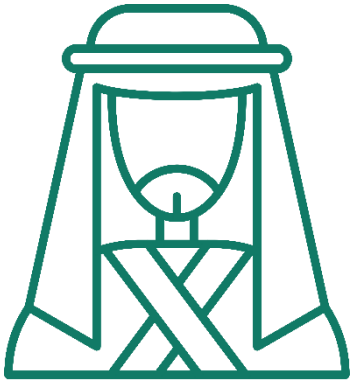
Countries in red explicitly mention "nature-based"

Source: Nature-based Solutions Policy Platform, 2022

"Nationally Determined Contributions (NDCs)" are commitments made by individual countries as part of the international effort to address climate change. These commitments outline the specific actions a country intends to take to reduce greenhouse gas emissions and adapt to the impacts of climate change.

Did you also know that we still lack a global understanding and agreement on what interventions and solutions actually fit under Nature-Based Solutions, let alone an agreed definition on the term?

This can be utilized as another session prompt; the purpose is to showcase how much promise this concept has but also how it can be misused or used prematurely when we are yet to adequately define the concept and its respective application. This is crucial as we look to avoid misusing the term or for it to be used to "green wash" certain interventions. While NbS presents great potential to reconnect people and society with nature, it can also be misused or intentionally utilized as a phrase or term to change perspectives about development, especially in construction and industrial sectors.



In this section, we would like to point out the origin of nature-based solutions and the sudden interest in them over the past two decades. Perhaps the first thing we would like to point out is that the origin of these solutions is more ancient than in the previous two decades. For thousands of years, indigenous communities around the world have used their indigenous knowledge and sciences to adapt and coexist with nature. This knowledge is called indigenous and local knowledge, and it describes ideas, practices and innovations rooted in the relationship of local communities with nature. This knowledge is formed and developed over time to include resource management techniques, local governance mechanisms that regulate social relations and the relationship with nature.

Indigenous people control 28% of the world's land area. Although they are small in number, estimated at only 6.2% of the world population, they are the first line of defense for biodiversity, management of natural areas, and carry the technical knowledge of intangible heritage. The situation of indigenous people varies globally, but they are classified by the International Labor Organization as "the poorest." This is to widen the gap between the culture of city dwellers and the indigenous cultures practiced by indigenous people, which led to their marginalization and discrimination against them. This led to neglecting the culture and knowledge of these societies and considering them an obsolete culture that does not fit with contemporary challenges.

The negative perception of indigenous culture has changed since the 1980s with the increasing environmental crises around the world driven by climate change. The noticeable loss in biodiversity and the increase in pollution rates have demonstrated the ineffectiveness of contemporary methods in dealing with the environment properly. Therefore, interest has increased once again in the traditional solutions practiced by indigenous peoples and how they have been able to harmonize with the environment for thousands of years. Consequently, academic interest in studying indigenous peoples and highlighting traditional knowledge as a means of creating integrated, multi-benefit solutions has increased. These studies resulted in understanding the knowledge of indigenous peoples and identifying their origins into six basic sources:

- Environmental and land management and martial law
- Preserving nature and rehabilitating it to adapt to emerging challenges
- Cooperating in building knowledge and following up on solutions and evaluating them after implementation
- Confronting unsustainable consumption of resources and addressing environmental injustice
- Providing alternative perceptions of the relationship between humans and nature

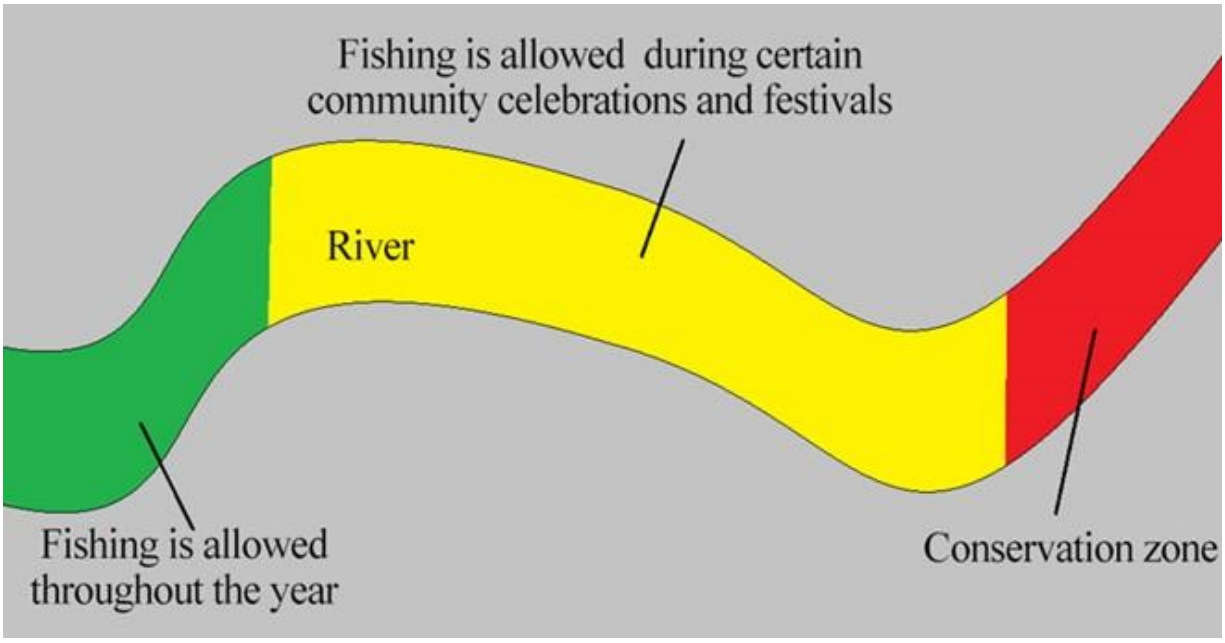
Indigenous peoples rely mainly on social and cultural rules and informal institutions for land and environmental management. These rules and institutions take a variety of forms, such as martial law sessions in land disputes and verbal agreements between individuals on how to use natural resources. These management practices rely

on local knowledge passed down through generations and take into account social factors centered on environmental conservation as a means of survival. Martial law also takes into account indigenous religious beliefs, concern for tangible and intangible elements such as sacred landscapes, water resources, and the preservation of specific organisms for their symbolism to the people.

Perhaps one of the most important methods of environmental management followed by indigenous people is adherence to harvest seasons, attention to natural grazing, and preventing selective harvesting that destroys biodiversity. Studies have recently proven that traditional management methods are more effective for sustaining local practices and preserving resources and biodiversity.

Indigenous Example – Tagal System

An example of customary land management is the Tagal system practiced by some indigenous peoples in Malaysia. This traditional system relies on dividing rivers and lakes into three basic regions. The first is a fishing area and can be fished throughout the year. The second area is an area where hunting can be done during holidays and religious occasions. In the third zone, hunting is prohibited throughout the year. The Malaysian government adopted this traditional system in recent years after it was proven to have a positive impact on fish numbers and preserving the diversity of marine organisms.



Prompt Question

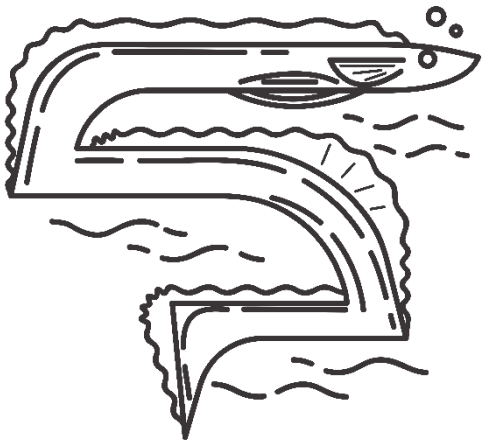
Do you have knowledge of any historical/traditional system for managing land and resources in your surrounding environment and in Egypt in general?

This is not meant to have an answer by design but do take into consideration traditional land and resource management that take place in the Delta and the Upper Egypt.

Another focus area with regards to indigenous knowledge, is preserving nature and rehabilitating it to adapt to emerging challenges. This trend is based on the involvement of local communities in decision-making and planning ways to use environmental resources. This is to focus local knowledge on the mutual benefit between humans and the environment on the one hand. On the other hand, traditional methods of resource management are more flexible in dealing with environmental developments because they depend only on the available resources and how to employ them to preserve the environment and society. This is evident in the fact that lands controlled by indigenous people have fewer modern industries and large-scale agriculture. In this way, these communities preserve natural landscapes such as forests and lakes.

Traditional Knowledge Example – Gunditjmara

An example of involving the local community in preserving resources is the involvement of the Gunditjmara community in Australia in reviving the traditional fishing system. The lands of this community were destroyed by the arrival of Europeans to Australia, which negatively affected the fish wealth. But over the past four decades, the Australian government and research institutions have worked with the indigenous community to restore a fishing system that relies on artificial channel fisheries that allow passage of all fish species other than adult eels. Adopting this traditional solution has reduced the risk of biodiversity facing the Victoria region in Australia.



Think!

Do you know of any heritage/traditional solution to the problems of agriculture and fishing in Egypt? In your opinion, which communities should be involved in agricultural and fishing management plans in Egypt?

The third area of traditional knowledge application is concerned with the production and transfer of knowledge. This knowledge is represented by previous experiences passed down through generations on which solutions are built. In this direction, indigenous people contribute to monitoring environmental changes and sharing them with decision-makers and scientists. This knowledge explains the nature of the societal context, man's relationship with the environment, and his contributions over time to coexistence with it. The ways the local community shares this knowledge are varied, ranging from reporting concrete facts and observations to traditional stories and legends. Perhaps the most obvious of these methods in Egypt are the ancient Egyptian myths that mention the flooding of the Nile and the agricultural seasons and explain the way the ancient Egyptian dealt with and preserved nature.

Lake Qarun – Egypt

Local communities are the first line to restrict and stop any activity that may directly lead to environmental deterioration, because they are the first to be affected by environmental deterioration. The increasing and irresponsible consumption of natural resources is destroying the lands and livelihoods of indigenous people. A clear example of Egypt's irresponsible consumption of chemical fertilizers and pesticides in agriculture. This irresponsible consumption led to the destruction of the marine environment in Lake Qarun, whose fish production declined from 4,000 tons in 1920 to less than 2 tons in 2014.

The environmental decay in Lake Qarun shows the weakness of tools to address environmental risks. Therefore, some indigenous communities around the world sought to gather international support to defend their rights. One example of these societies is the Dangria Kondh tribe in India. This tribe was able to gather the necessary local and international support to prevent the extraction of bauxite ore from their sacred lands. Many researchers attribute the success of these local movements to increased environmental awareness around the world and interest in environmental justice.

The relationship of indigenous peoples with nature is governed by many heritage concepts and beliefs. This conceptual diversity is one of the pillars of preserving nature and biological diversity, as these concepts link nature and culture into a single entity that the indigenous people defend and deal with with a different philosophy. This trend contradicts the current human-centered philosophy in dealing with nature, where the environment has a role other than meeting human needs. An example of these beliefs is the treatment of the people of North Sinai with sacred natural areas such as Mount Al-Tur and the St. Catherine Reserve. The residents of Siwa Oasis in Egypt can also be considered indigenous people who defend the various environmental features such as the mountains and lakes in the oasis as part of their identity and because of its sacred significance to them, which prevents the irresponsible consumption of the oasis' resources.

These beliefs extend to include human interaction with and consumption of living organisms. Examples of this include some beliefs that prohibit the consumption of some types of meat or the slaughter of animals in a human way so that they can be consumed. In Egypt, this may be represented by the concept of halal slaughter, which prohibits Muslims from consuming meat that has not been slaughtered in merciful ways. These methods may be less effective from the producer's point of view, but they remain the only method acceptable to Muslims.

When examining the impact of indigenous peoples' practices, ways of living, and knowledge of environmental management and traditional economics, it becomes clear that indigenous values may contribute to getting out of the current environmental crises. This shift in humans' relationship with nature may be one of the most important turning points in confronting the current environmental crisis. Therefore, studying indigenous practices is one of the essential steps in trying to reach sustainable, nature-based environmental solutions.

Chapter Three

3. Applying Nature-based Solutions

This chapter attempts to provide a simplified framework for the application of Nature-based solutions, utilizing the theory that has already been provided in chapter two. A tool has been developed, based on the expertise of 5 local Egyptian Experts that work in the intersection of climate, public health, natural environment and the built environment, to simplify the adoption and creation of Nature Based Solutions. When applying this tool, it becomes clear that NbS are inherently Ecosystem-based approaches, and that these two terms and sectors are largely intertwined.

Ecosystem-based approaches

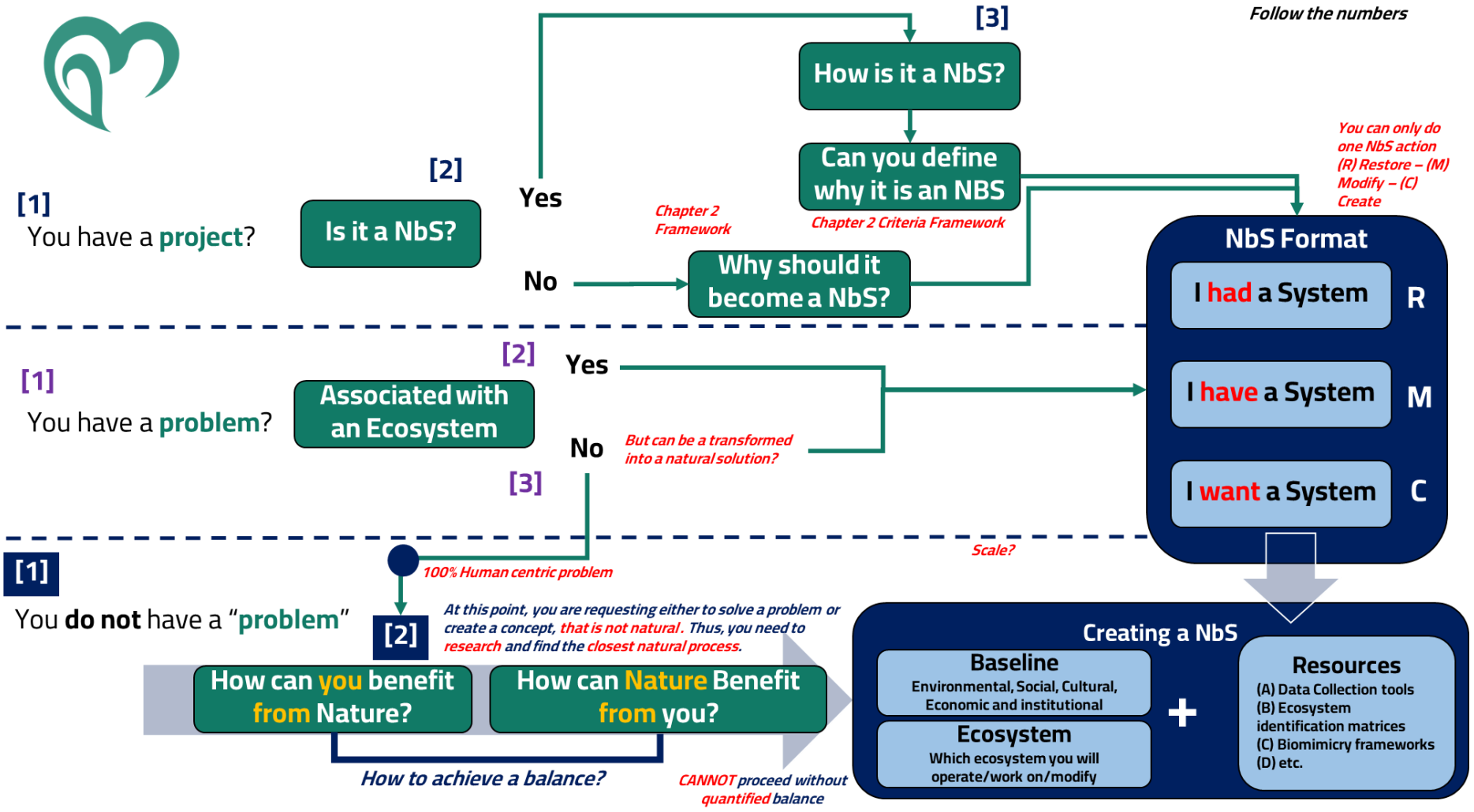
Ecosystem-based approaches focus on ecosystem restoration and enhancement of ecosystem services to protect society against negative impacts of climate change. As climate change makes itself increasingly felt through, e.g., droughts, extreme weather events and flooding, the urgency of adaptation measures increases.

Climate ADAPT
SHARING ADAPTATION KNOWLEDGE FOR A CLIMATE-RESILIENT EUROPE

Identifying the right ecosystem for a nature-based solution is crucial for the success and sustainability of environmental interventions. Each ecosystem possesses unique characteristics, biodiversity, and ecological functions that directly impact its resilience and response to various interventions. Understanding whether an intervention aims to protect, modify, create, or restore an ecosystem is crucial in aligning conservation efforts with the specific needs and dynamics of that ecosystem. For instance, if the goal is protection, it necessitates a focus on maintaining the existing balance and safeguarding vulnerable species within a given ecosystem. Conversely, a modification intervention may involve sustainable alterations to enhance ecosystem services, such as introducing vegetation to prevent soil erosion. The choice between creating or restoring an ecosystem requires a nuanced understanding of historical conditions and the potential introduction of native species, ensuring that the newly established ecosystem aligns with the region's ecological context.

Moreover, the identification of intervention objectives informs the allocation of resources and the development of targeted strategies. Protecting an ecosystem may involve regulatory measures to mitigate human impact, while modifying an ecosystem might require innovative technologies or sustainable practices. Creating or restoring an ecosystem demands a comprehensive approach, including habitat design, species reintroduction, and ongoing monitoring.

Application Tool for NbS



The following matrix provides a breakdown of the different resources and guidance that can guide you to develop a specific type of Nature-based solution (once you reach the *Creating an NbS* from the Application tool).

Publication	Year	Purpose	Link
IUCN Global Standard for Nature-based Solutions	2020	A user-friendly framework for the verification, design and scaling up of NbS	Link
Nature-based solutions for climate change mitigation IUCN	2021	This report analyses the current state of knowledge regarding the role of Nature-based Solutions (NbS) in climate change mitigation. It assesses the role that carbon offsets can play in the overall finance package.	Link
Catalogue of Ecosystem-based measures in Mountains IUCN	2022	This publication presents and highlights the experiences using Nature-based Solutions (NbS) to build climate resilience in three mountain ranges: the Andes in South America, the Himalayas in Asia, and Mt. Elgon in East Africa.	Link
Planning and delivering Nature-based Solutions in Mediterranean cities	2021	Assessing the IUCN Global Standard for NbS in Mediterranean cities to assess performance and gaps	Link
Nature Based Solutions Evidence Platform	N/A	This is a exhaustive and up to date megatool to visualize data, find case studies and better understand how to develop and address a climate impact through a NbS	Link

Chapter Four

4. Case Studies

The following case studies are examples of possible Nature-based solutions or concepts that are aimed to simplify the understanding for learners.

4.1 Natural Environmental Engineers? – Part 1

Nature's engineer, commonly known as *Kundos* **القندس**, stands out as one of nature's environmental engineers, showcasing its remarkable abilities in river ecosystems. The beaver plays a crucial role in mitigating the risk of floods and sustaining water resources.

Environmental engineers can draw inspiration from beavers for implementing nature-based solutions in river management. By studying the beavers behavior of cutting trees and collecting wood to build riverbank dams, engineers can explore similar strategies to construct natural barriers that control river flow. Mimicking these structures can aid in reducing flood hazards, enhancing water retention in soil, and supporting plant life during dry seasons. This nature-inspired approach aligns with sustainable river engineering practices, contributing to both flood control and ecological balance.

4.2 Natural Environmental Engineers? – Part 2

Compost worms, or ديدان السماد, are essential natural environmental engineers in Egypt. These worms naturally produce fertilizer in the soil by consuming excess organic materials and converting them into nitrogenous compounds. Their activities contribute to soil aeration and nutrient cycling.

Environmental engineers can harness the power of ديدان السماد as a nature-based solution for sustainable agriculture and water quality management. By promoting the presence of these compost worms in agricultural settings, engineers can facilitate the natural conversion of

organic matter into nitrogen-rich compounds. This process reduces the reliance on chemical pesticides, preventing their accumulation in river waters and safeguarding marine ecosystems. Additionally, the worms' burrowing activities enhance soil aeration, minimizing the risk of plant root rot. Integrating compost worms into agricultural practices aligns with eco-friendly approaches, promoting soil health and mitigating the environmental impact of conventional farming methods.

To explore more case studies on NbS, please browse and check out the NbS initiative Homepage.

Annex I – Activities

Activity 1: How do we visualize Nature?

(Icebreaker)

Duration:

- 5 mins for the activity – 5 mins for discussion

Description:

Encourage participants to reflect on their personal associations with the word "nature."

Instructions:

- Nature Observation (20 minutes):
  - Begin by spending time in a natural setting, whether it's a park, garden, or any outdoor environment. Engage all your senses to observe the sights, sounds, smells, and textures around you. Pay attention to the intricate details of plants, the play of light, and the overall atmosphere.
- Journal Reflection (15 minutes):
  - Find a quiet spot to sit and reflect on your observations. Use a journal or sketchbook to capture your thoughts, feelings, and any significant moments during your nature experience. Consider questions such as: What aspects of nature caught your attention the most? How did the environment make you feel?
- Visual Representation (30 minutes):
  - Now, translate your observations and reflections into a visual representation. This can take the form of a drawing, painting, collage, or even digital artwork. Let your creativity flow as you express the essence of the natural environment you explored. Focus on conveying the emotions and connections you felt.
- Reflection and Discussion (20 minutes):
  - Conclude the activity with a group reflection and discussion. Explore questions such as: How did the visualization process enhance your connection with nature? What did you discover about your personal relationship with the environment?

Activity 2: Documenting/Observing Natural Components around our homes.

Duration:

- 20 mins for the activity – 10 mins for discussion

Materials:

- Each participant will need a paper.
- Provide each participant with a pencil or pen.

Description:

This engaging activity encourages participants to connect with nature by observing and documenting the natural components they encounter in their daily lives near their homes. It's a versatile activity that can yield diverse results, reflecting the varied environments participants may live in, from rural to urban settings. Facilitator should aim to encourage conversations after the drawings are produced.

Instructions:

1. Distribute paper and writing instruments to each participant.
2. Explain the objective of the activity: Participants are to take a short, 20-minute break to explore and document the natural elements they encounter around their homes.
3. Encourage participants to consider both rural and urban environments. Those in urban areas might notice smaller natural elements, such as potted plants, trees along the sidewalk, or birds in the park. Those in more rural settings may have a wider array of natural components to observe, including local wildlife, flora, and landscapes.
4. Participants should use the paper to sketch or jot down notes about what they observe. They can draw pictures or write descriptions, depending on their preferences and artistic abilities.
5. Encourage them to pay attention to details and appreciate the beauty of even the smallest natural elements in their drawings. This activity can be done physically or done in a workshop space and theoretically.
6. After 20 minutes, gather the participants and provide an opportunity for them to share their observations, whether through discussions or by presenting their sketches or notes. This can lead to interesting conversations about the various connections participants have with nature, regardless of their surroundings.

Annex II – Ecosystem Selection Matrix

This is only applicable for Egypt

Ecosystem Type	Sub-typology	Characteristics	Assessment Finding
Desert	Western Desert		
	Eastern Desert		
	Sinai Desert		
Mediterranean Coastal	Northern Coastal Region		
	Nile Delta Coastal		
Nile Delta	Nile Delta		
Nile River	Across the Nile River		
	Lake Nasser		
Mountain	Sinai Peninsula		
	Red Sea Mountains		
	Elba Mountains		
Oasis	Siwa		
	Dakhla		
	Kharga		
	Farafra		
Coral Reef	Red Sea		
Aquatic	Qarun Lake		
	Burullus Lake		
	Toshka Lake(s)		
	Manzalah Lake		
	Mariout Lake		

	Bardawil Lake		
	Timsah Lake		
	Aswan Dam Reservoir		
	Ismailiyah Irrigation Canal		
	Dahshureya Canal		
	Suez Canal		
Urban (human-made environment)	Greater Cairo		
	Alexandria		
	Delta Cities		
	Upper Egypt Cities		
	Aswan		
	Hurghada		
	Suez Canal cities		