MODULE 3: SUSTAINABILITY AND CLIMATE

KEY CONCEPTS

The United Nations is an intergovernmental organisation whose stated purposes are to maintain international peace and security, develop friendly relations among nations, achieve international cooperation, and be a centre for harmonising the actions of nations.

Sustainable development is according to the World Development Report (2003) defined as a strategy that takes care of present and future generations without harming natural resources and the environment.

Agenda 2030 is a plan of action for people, planet and prosperity (the 3PPPs). It also seeks to strengthen universal peace and larger freedom.

Sustainable Development Goals **SDG** also known as Global Goals were adopted by the United Nations in 2015 as a universal call to action to end poverty, protect the planet, and ensure that by 2030 all people enjoy peace and prosperity.

The 17 SDGs are integrated; they recognize that action in one area will affect outcomes in others, and that development must balance social, economic and environmental issues of sustainability[1].

Climate change refers to long-term change in temperature and average weather patterns that have come to define Earth's local, regional and global climates.

Global warming is the long-term heating of Earth's surface observed since the pre-industrial period (between 1850 and 1900) due to human activities, primarily fossil fuel burning, which increases heat-trapping greenhouse gas levels in Earth's atmosphere.

The Paris agreement - a legally binding international treaty on climate change, adopted by 196 Parties at COP 21 in Paris, on 12 December 2015 and entered into force on 4 November 2016. It works on a 5- year cycle of increasingly ambitious climate action carried out by countries through NDCs.

NDCs - nationally determined contributions (NDCs). By 2020, countries submit their plans for climate action known as nationally determined contributions (NDCs), and communicate about actions they will take to reduce their Greenhouse Gas emissions in order to reach the goals of the Paris Agreement. Countries also communicate in the NDCs actions they take to build resilience to adapt and/or mitigate the impacts of rising temperatures.

COP - Conference Of the Parties is the governing body of international Convention or Treaty that reviews and adopts documents and strategies of the said Convention

Greenwashing is the process of conveying a false impression or providing misleading information about how a company's products are more environmentally sound[2].

Environmental migrants - are persons or groups of persons who, for reasons of sudden or progressive changes in the environment thaty affect their lives or living

---

1 (https://www.undp.org/sustainable-development-goals)

2 https://www.investopedia.com/terms/g/greenwashing.asp

conditions, are obliged to leave their homes, or choose to do so, either temporarily or permanently, and who move either within their territory or abroad. (IOM)

Environmental refugees - are persons or groups of persons who can no longer gain a secure livelihood in their homelands because of drought, soil erosion, desertification, deforestation and other environmental problems, together with the associated problems of population pressures and profound poverty[3], or persons who have been forced to leave their traditional habitat, temporarily or permanently, because of a marked environmental disruption (natural and/or triggered by people) that jeopardised their existence and/or seriously affected the quality of their life.

Environmental disruption - defined as “any physical, chemical, and/or biological changes in the ecosystem (or resource base) that render it, temporarily or permanently, unsuitable to support human life (El-Hinnawi).

Global North/South refers to the division of the world regarding countries' gross domestic income.

Polluter - a person or a thing responsible for contaminating the environment with harmful or poisonous substances.

Resilience is the ability to recover from or adjust to distress or damaging change.

Adaptation - the process of changing to suit different conditions.

Development assistance - government aid that promotes and specifically targets the economic development and welfare of developing countries, known as **ODA** - official development assistance.

Land Grabbing - the control, whether through ownership, lease, concession, contracts, quotas, or general power of larger than locally-typical amounts of land by any person or entities, public or private, foreign or domestic - via any means - ‘legal’ or ‘illegal’ - for purposes of speculation, extraction, resource control or commodification at the expense of peasant farmers, agroecology, land stewardship, food sovereignty and human rights.

Multinational companies (MNC) - Transnational corporations (TNCs) -are “legal entities or entities without legal personality consisting of parent companies and their foreign affiliates. The parent company is defined as an enterprise that controls assets of other entities in countries other than the mother country, usually by owning a capital stake. Foreign affiliate is a legal entity or entity without legal personality in which an investor as a resident in another economy holds a share that allows a long-term interest in managing this company" (UNCTAD, 2016).

Carbon neutral - is a state of net-zero carbon dioxide emissions, by balancing emissions of carbon dioxide with its removal.

Zero emissions - releasing no greenhouse gasses to the atmosphere.

Low carbon development - is a new pattern of political and economic development aiming at reducing CO2 emissions and achieving the sustainable development of environment, economy, and society

[3] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1692964/pdf/12028796.pdf

MODULE 3: SUSTAINABILITY AND CLIMATE

Climate positive - going a step further than Carbon Neutral, by saving more greenhouse gas emissions than you are generating by actively removing carbon dioxide from the atmosphere.
Polymerization is the chemical process of connecting small molecules together and creating large chains of molecules of different sizes and shapes, called polymers. Most plastics are made through this process.
Wastes are, according to the **Basel convention** (article 5), defined as substances or objects which are disposed of or are intended to be disposed of or are required to be disposed of by the provisions of national law. The European Union **Waste Framework Directive,** Article 3, defines **waste** as "any substance or object which the holder discards or intends or is required to discard."
E-waste - any electrical or electronic equipment that's been discarded.
Reverse engineering or backwards engineering - to disassemble and examine or analyse in detail a product or device to discover the concepts involved in manufacturing, a skill that can be helpful in recycling diverse wastes.

INTRODUCTION

Sustainability and sustainable development terms emerged in late 80s and have been defined by Brundtland report to United Nations in 1987 which states that sustainable development is "development that meets the needs of the present without compromising the ability of future generation needs[4]," Sustainable originates from the Latin word Sustinere which means to hold on (keep up, bear up, sustain…). Thus from this view, sustainability is addressed from the historical perspective of population growth and its effect on preserving natural resources .
Since then, the global community, academics, world leaders, politicians and other stakeholders paid a collective attention to the pros and cons of the state of our common future. Policies and actions today are focusing on Sustainable Development. The United Nations led initiatives before the world community and provided a package of problem based action oriented, time bound, measurable strategies by adopting the action plan through two documents, Agenda MDGs (2000-2015) and Agenda SDGs (20152030) as global priorities. Both documents were ratified by 193 countries. Agenda MDG sets 8 achievable developmental goals and Agenda SDG sets 17 sustainable development goals with 169 indicators which measure progress toward reaching sustainability.

In this module we elaborate on the historical background and development of sustainability as a concept, case studies, explanation, challenges and arguments.

Content BLOCKS

1. Sustainable development
1. Climate change

[4] Our common future

MODULE 3: SUSTAINABILITY AND CLIMATE

2. Consequences of climate change

1. Sustainable development

In 1987, the United Nations Brundtland Commission defined sustainable as "meeting the needs of the present without compromising the ability of future generations to meet their own needs.", and the US EPA defines it as: "to create and maintain the conditions under which humans and nature can exist in productive harmony to support present and future generations, the ability to be sustained, supported, upheld, or confirmed."

Across the globe, many developing countries in the world are seeking ways of meeting their development needs, but with increasing threats of population growth, poverty, environmental degradation, climate change and financing challenges, those needs remain unattainable. Amid these problems, finding the balance of economic growth, environmental care and social well-being is another test of good governance.

In 1972 the experts from different countries gathered in the Club of Rome to implement a computer simulation that aimed to predict the consequences of what could happen on a planet that has limited resources. Variables included in analysis were monitoring the *interactions between 5 different dimensions – world population growth, industrialization, pollution generation, food production, and nonrenewable resource depletion.* Prediction was that these variables grew exponentially and technology's ability to increase resources was linear.[5] The strongest ending scenario was that an economic and social collapse would happen by the end of the 21st century if man imposes no limits to growth which was presented in the Brundtland report.

Today, we witness the advancement of technology, especially in IT and breakthroughs in new materials (R&D). However, it is also time to question whether the fruits of development are evenly distributed or grabbed by few sections of society, causing environmental degradation, acidification, pollution, extinction of biodiversity, misery, poverty, hunger, malnutrition, disaster, inequalities, unemployment and migration at the cost of advanced technology.

Developing a holistic strategy of sustainable development policies, adoption and mitigation mechanisms in a given timeframe, mobilisation of finance, policy initiatives, engaging institutions across different sectors, embedding sustainable values and new legislations & regulations are indeed demanding challenge that need good governance (participatory), experience sharing, and global cooperation.

[5] Limits to growth and https://youmatter.world/en/definition/definitions-sustainable-development-sustainability/

MODULE 3: SUSTAINABILITY AND CLIMATE

Taylor (2016), characterises the three main pillars of sustainable development as economic growth, environmental protection and social equality[6] with the aim to transform development into *more equitable and striving towards global justice.*

Compared to its first versions, the concept of sustainability, as defined, focuses not only on the protection and management of natural resources, but also on the economic and social aspects essential to the development of society. Economic sustainability refers to practices designed to create the long-term economic development of a company or nation while also managing the environmental, social, and cultural aspects of its activities (figure 1). It is about balancing economic growth and generating profit with the impact on the environment and people. Social aspects can involve such issues as respect for human rights, following fair labor practices, and gender equality. Environmental aspects include responsible consumption, and protecting the air and water from pollution.

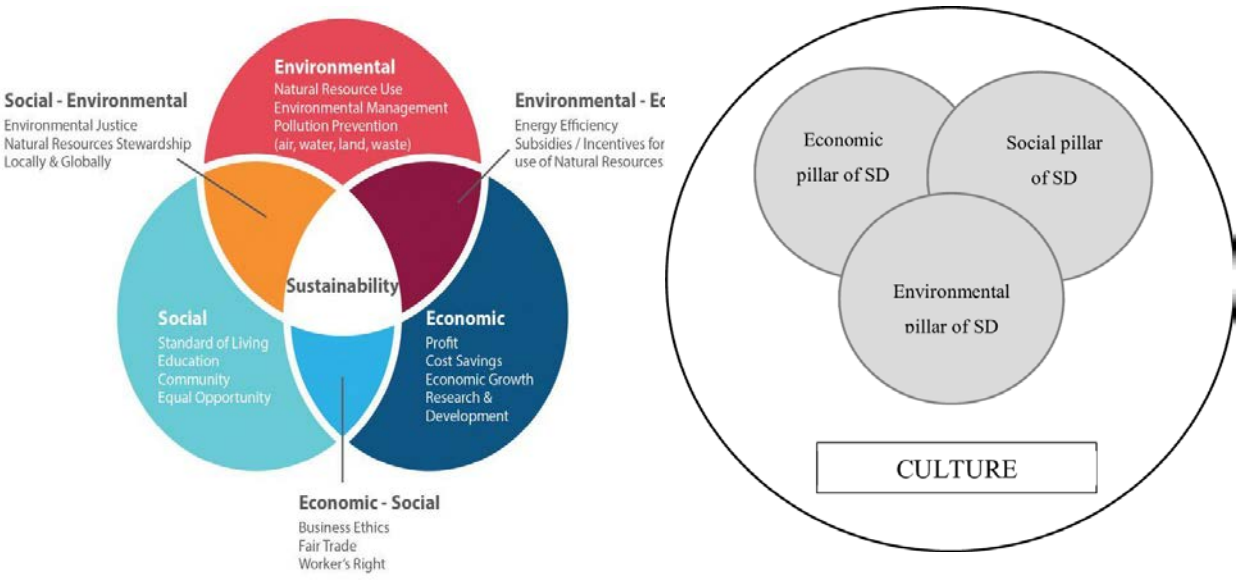


Figure 1: the three main pillars of sustainable development as economic growth, environmental protection and social equality.[7]

1.1. Social aspect of sustainability

- Social sustainability occurs when the formal and informal processes, systems, structures and relationships actively support the capacity of current and future generations to create healthy and livable communities. Socially sustainable

[6] Taylor, S. J. (2016). A review of sustainable development principles: Centre for environmental studies. South Africa: University of Pretoria.

[7] Taylor, S. J. (2016). A review of sustainable development principles: Centre for environmental studies. South Africa: University of Pretoria.

communities are equitable, diverse, connected and democratic and can provide a good quality of life.

- Social sustainability is a process for creating sustainable successful places that promote wellbeing, by understanding what people need from the places they live and work. Social sustainability combines design of the physical realm with design of the social world – infrastructure to support social and cultural life, social amenities, systems for citizen engagement, and space for people and places to evolve.
- The ability of a community to develop and structure itself in a way which not only meets the needs of its current members but also supports the ability of future generations to maintain a healthy community.
- Social sustainability includes identifying and managing positive and negative business impacts e on people. The quality of a company's relationships and engagement with its stakeholders is critical. Directly or indirectly, companies affect what happens to employees, workers in the value chain, customers and local communities. Social sustainability can unlock new markets, help retain and attract business partners, or be the source for innovation for new product or service lines. Internal morale and employee engagement may rise, while productivity, risk management and company-community conflict improve.

1.2. Economic Sustainability

Economic sustainability refers to practices that support long-term economic growth without negatively impacting social, environmental, and cultural aspects of the community. Economic sustainability is a broad set of decision-making principles and business practices aimed at achieving economic growth without engaging in the harmful environmental trade-offs that historically accompany growth. It focuses on reducing the depletion of the natural environment or finding ways to reduce waste, limit carbon emissions, and utilise solar energy. The unifying principle behind economic sustainability is rejecting wasteful, short-term processes and embracing the planet's long-term well-being. A sustainable economy is essential for various reasons and facts[8]:

- The worldwide reliance on unsustainable practices has a necessary end date since the planet's natural resources are not infinite.
- Climate change caused by the overuse of fossil fuels has created a dire situation for Earth and humans' ability to inhabit it. By trying to limit energy consumption and adjusting the approach to food production, humans have the opportunity to preserve the planet for posterity.
- The natural environment has long been a source of discovery and innovation. Therefore, the constant degradation of natural surroundings jeopardises the opportunity to unearth new compounds.

[8] **https://www.masterclass.com/articles/economic-sustainability**

- Digitalisation and innovation canreduce land use and make supply chains more efficient.
- Prioritising low-impact economic development/sustainable businesses creates a waste-free world.

1.3. Environmental sustainability

Environmental sustainability is the responsibility to conserve natural resources and protect global ecosystems to support health and wellbeing, now and in the future, or the capacity to improve the quality of human life while living within the carrying capacity of the earth's supporting ecosystems[9]. Since ecological conditions and economic and social systems differ from country to country, therefore, each country has to work on its own concrete policy to ensure that sustainable development is carried out as a global objective.
Furthermore, recognizing culture as the root of all human decisions and actions is new paradigm in sustainable development thinking since culture and sustainability are so mutually intertwined. If we want to stop taking the planet as a commodity sustainable development should become an embedded value on individual and social levels.

But changing habits is a long process where the brain has to embed new beliefs and values into the unconscious / automatized part of the brain. Today's science estimates that 95 percent of our brain's activity is unconscious, meaning that the majority of the decisions we make and the actions we take, our emotions, values and behaviours, depend on the approx. 95 percent of brain activity that lies beyond conscious awareness, as shown below in table 1.

[9] https://www.liveabout.com/what-is-sustainability-3157876

MODULE 3: SUSTAINABILITY AND CLIMATE

Table 1: Dilts Pyramid of Logical Thinking

The pyramid by Robert Dilts is based on the concept that no problem can be solved by just staying at the same level: to find the best solution, you need to go to a higher level.

- Environment - the environment is our living conditions. Dilts' logical levels are based upon the objective reality of a particular person: their living conditions, where they live, and their surroundings.
- Behaviour - an individual's actions. If the first level is the circumstances of our life, the second level is our reaction to those circumstances.
- Capabilities - this is the level of an individual's skills and experiences. The central question for this level is: "How can I influence the world? What can I do? What do I know?"
- Values and beliefs - at this level, a person structures their values and beliefs, answering why they think in this way and why not differently? What kind of childhood they had, and how their beliefs might be influenced by certain patterns of thinking?
- Identity. In simple terms, identity is the answer to the question "Who am I?" What group does the individual identify with, and how do they view themselves in the world?
- Vision or Purpose. This is the highest level that deals with values and life meaning. At this level, an individual answers the question, "What am I living for?" Often, the underlying causes of our problems and their solutions are found in lower levels.

The Dilts pyramid is commonly used in advertising and marketing because it enables you to look at a client's situation from different angles and find the perfect solution to their problem, which resonates with them.

This concept implies that within the learning process an environment, knowledge and skills shape beliefs and values in such a way that they become a function of the unconscious brain.

In the prototype Playing for Planet ***set of 20 sustainable values (Table 2)*** was designed and developed according to children's cognitive development and their learning skills, as well as conforming to a value centered design process.[10]

Highlighting th***e culture and sustainability*** as an umbrella, value is essential for achieving a future oriented society, responsible for their actions. Translating and simplifying Newton's third law, each action has an equal & opposite reaction to sustainability as collective human actions face earth's reaction.

[10] (Playing for the Planet: Designing Toys that Foster Sustainable values - Scientific Figure on ResearchGate). Available from: https://www.researchgate.net/figure/Final-list-of-sustainability-values_tbl2_258839036

MODULE 3: SUSTAINABILITY AND CLIMATE

Values	Description
Efficiency	Avoid waste
Communication	Interact with others and learn to share
Preservation	Protect and save the environment
Awareness	Being conscious about environmental issues
Accountability	Feel responsible for
Knowledge	Have general and specific information
Learning	Acquire skills
Costs	Learn to the difference between save, afford and worth
Respect	Think of others and of the environment
Fairness	Do the right thing
Empathy	Understand and consider others
Personal Effort	Commit and do more than required
Future generations	Being selfless, humble, protective
Thoughtful	Being considerate and polite
Creativity	Transformation and initiative
Necessity	Dependence and importance of the environment for humankind survival
Negative Consequences	Avoid punishment and unsanitary conditions
Management of resources	Reduce, reuse, recycle, balance usage and consumption
Ability to act	Feel empowered, ability to act and the children's influence on their parents
Cooperation	Sharing and cooperation between different generations

Table 2***: 20 sustainable values***

Since sustainability is becoming one of the most common words used in policy creation, business advertisement and education raising awareness about pollution,

responsible consumption, actions to be taken etc, societies are more and more aware of issues related to the climate crisis.

Accordingly, the more central role of environmental sustainability, sustainable growth and ethical business practice as core business values may provide long term value in sustainable development. Products, services, technological processes are already being reviewed to become sustainable. But the pressure on business also creates greenwashing in an urge to satisfy consumers by promoting their green or sustainable products one one hand and not in the whole business system. A clear example of this is the textile industry where big companies are introducing lines of organic or recycled textile yet continue with extremely problematic fast fashion strategy.

Case-study 1 - Greenwashing

It is generally acknowledged that plastic packaging is one of the main sources of waste. According to Plastics Europe (2020), packaging represents about 40% of total plastics converters' demand. Among different types of plastic packaging, a major role is played by single-use disposable applications, such as those used in disposable consumer items and food packaging. The result is that plastic waste has almost saturated every surface of the planet, including oceans and the highest mountains (Changing Markets, 2020). The impact on wildlife is dramatic and the negative effects of microplastics in the food chain on human health, while difficult to assess, are deemed to pose serious risks by increasing, among others, cancers, genetic problems, and reproductive issues (CIEL, 2019). The growing public concern about plastic pollution and its severe consequences have also prompted several consumer-goods manufacturers to promote voluntary initiatives to reduce (or even eliminate) plastic waste.

The Swiss multinational Nestlé has affirmed its commitment to the cause by promising that by 2025 its plastic packaging will be fully recyclable or reusable. The goal is to eliminate non-recyclable plastics from packaging, Nestlé CEO said iIn 2018.

“Plastic waste is one of the biggest sustainability issues the world is facing today. Tackling it requires a collective approach. Our ambition is to achieve 100% recyclable or reusable packaging by 2025.” Specifically, Nestlé’s commitments are addressed to: (1) develop models for collection, sorting and recycling in the countries where it operates; (2) research different packaging solutions to reduce the use of plastic, facilitate recycling and develop effective approaches to eliminate this type of waste; (3) increase transparency, by including all information useful to guide the consumer towards correct recycling on the product packaging; (4) promote a market for recycled plastics in order to increase the percentage of recycled material in packaging.

In response to Nestlé’s statements, Greenpeace Oceans Campaigner Graham Forbes warns that: “Nestlé’s statement on plastic packaging includes more of the same greenwashing baby steps to tackle a crisis it helped to create. It will not actually move the needle toward the reduction of single-use plastics in a meaningful way and sets an incredibly low standard as the largest food and beverage company in the world. The statement is full of ambiguous or non-existent targets, relies on ‘ambitions’ to do better, and puts the responsibility on consumers rather than the company to clean up its own plastic pollution. A company of Nestlé’s size should be setting a strong standard to actually move toward the reduction — and eventual phasing out — of throwaway plastics. It should know by now that recycling

efforts are not going to clean up our oceans, waterways, and communities. On the contrary, the company's business as usual will only accelerate plastic pollution."

The development of a European sustainability[11]competence framework is one of the policy actions set out in the European Green Deal initiatives as a catalyst to promote learning on environmental sustainability in the European Union. GreenComp identifies a set of sustainability competences to feed into education programmes to help learners develop knowledge, skills and attitudes that promote ways to think, plan and act with empathy, responsibility, and care for our planet and for public

[11] Bianchi, G., Pisiotis, U., Cabrera Giraldez, M. GreenComp – The European sustainability competence framework. Bacigalupo, M., Punie, Y. (editors), EUR 30955 EN, Publications Office of the European Union, Luxembourg, 2022; ISBN 978-92-76-46485-3, doi:10.2760/13286, JRC128040.

health. GreenComp comprises four interrelated competence areas:‘embodying sustainability values’, ‘embracing complexity in sustainability’, ‘envisioning sustainable futures’ and ‘acting for sustainability’. Each area comprises three competences that are interlinked and equally important.

GreenComp consists of 12 competences organised into the four areas below:

1. Embodying sustainability values, including the competences

    1.1. valuing sustainability -To reflect on personal values; identify and explain how values vary among people and over time, while critically evaluating how they align with sustainability values.

    1.2. supporting fairness - To support equity and justice for current and future generations and learn from previous generations for sustainability.

    1.3. promoting nature - To acknowledge that humans are part of nature; and to respect the needs and rights of other species and of nature itself in order to restore and regenerate healthy and resilient ecosystems.

2 Embracing complexity in sustainability, including the competences

    2.1. systems thinking - To approach a sustainability problem from all sides; to consider time, space and context in order to understand how elements interact within and between systems.

    2.2. critical thinking - To assess information and arguments, identify assumptions, challenge the status quo, and reflect on how personal, social and cultural backgrounds influence thinking and conclusions.

    2.3. problem framing - To formulate current or potential challenges as a sustainability problem in terms of difficulty, people involved, time and geographical scope, in order to identify suitable approaches to anticipating and preventing problems, and to mitigating and adapting to already existing problems.

3. Envisioning sustainable futures, including the competences

    3.1. futures literacy - To envision alternative sustainable futures by imagining and developing alternative scenarios and identifying the steps needed to achieve a preferred sustainable future.

    3.2. adaptability- To manage transitions and challenges in complex sustainability situations and make decisions related to the future in the face of uncertainty, ambiguity and risk.

    3.3. exploratory thinking - To adopt a relational way of thinking by exploring and linking different disciplines, using creativity and experimentation with novel ideas or methods.

4. Acting for sustainability, including the competences

    4.1. political agency - To navigate the political system, identify political responsibility and accountability for unsustainable behaviour, and demand effective policies for sustainability.

    4.2. collective action - To act for change in collaboration with others.

    4.3 individual initiative - To identify own potential for sustainability and to actively contribute to improving prospects for the community and the planet.

MODULE 3: SUSTAINABILITY AND CLIMATE

High-quality and inclusive education and training can help improve social and environmental conditions. Green-Comp provides a conceptual reference model that everyone involved in lifelong learning can use.

Global issues are complex and interconnected. To better explore and understand that complexity, Oxfam (an NGO) presented a "Development Compass Rose"[12] (Figure 2) with holistic approaches where all pillars of Sustainability are addressed. It also adds the important dimension of power to understand policies and the decision making process. It is a very practical and useful tool for guiding and shaping key research questions and can be of considerable assistance in preparing evidence-based-debate and decision-making-procedures. The framework encourages users to raise a range of questions about interconnected issues & interconnectedness, be it to questions or explore the interrelationship between environmental, social, economic and political issues. Instead of the binary and traditional division of North & South, East and West, the four main compass points represent: **N** atural/ecological questions, **E** conomic questions, **S** ocial and cultural questions and **W** ho decides? Who benefits? (i.e. political questions). Apart from the key coordinates, the diagonal points can highlight the relationship between the four main points. For instance, NE raises questions about how economic activity impacts on the natural world while SW raises questions about the relationship between the social and political dimensions. The diagonal points often raise the most interesting, useful and challenging questions.

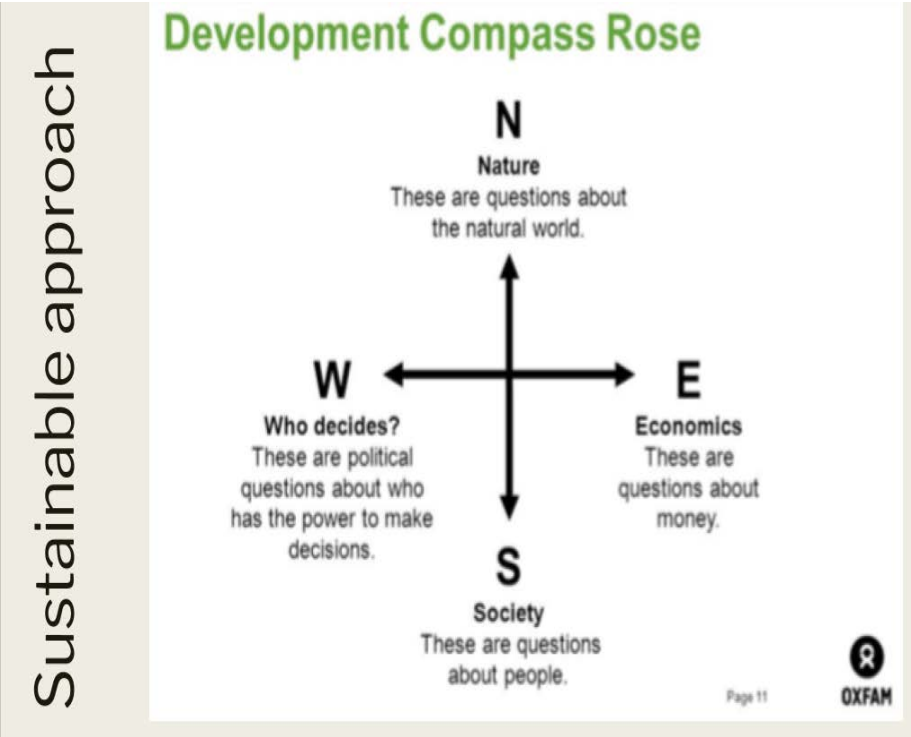


Figure 2: Oxfam Development Compass Rose

[12] Oxfam Development Compass Rose

MODULE 3: SUSTAINABILITY AND CLIMATE

2. Climate Change

Climate change refers to long-term shifts in temperatures and weather patterns. These shifts may be natural, such as through variations in the solar cycle. Global warming is the long-term heating of Earth's surface observed since the pre-industrial period (between 1850 and 1900) due to human activities, primarily fossil fuel burning, which increases heat-trapping greenhouse gas levels in Earth's atmosphere.

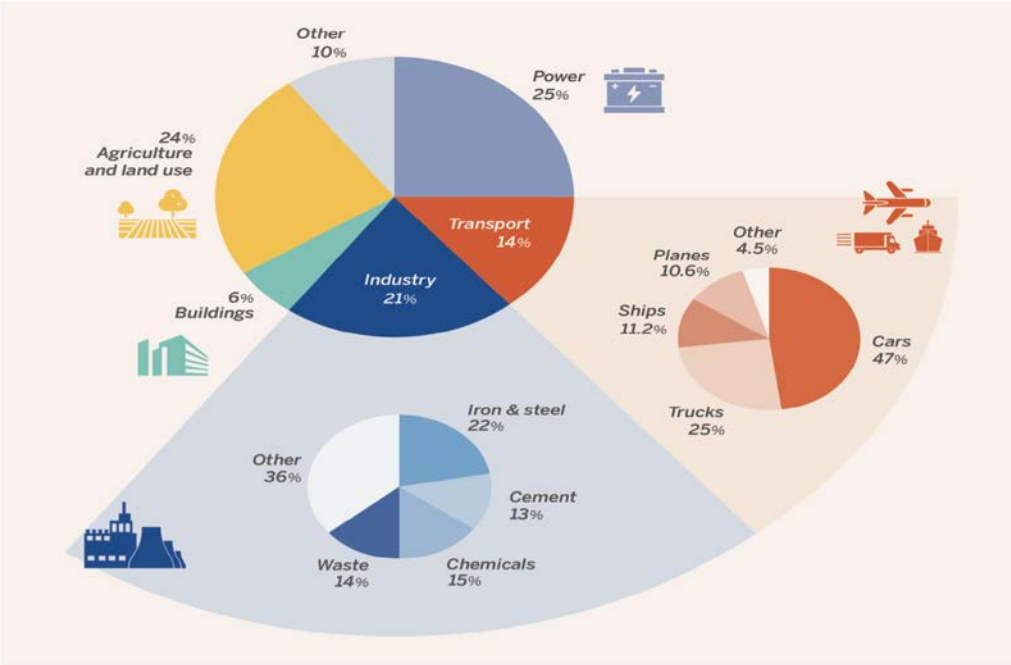
Greenhouse gas (GHGs) emission is the emission of different gases that cause global warming and climate change (figure 2). This include carbon dioxide (CO2), Methane (CH4), Nitrous Oxide (N2O) and Fluorinated Gases known also as Industrial gases (hydrofluorocarbons (HFCs), perfluorocarbon (PFCs), sulphur hexafluoride (SF6), and nitrogen trifluoride (NF3)[13]. GHGs gases are emitted from energy intensive industries (burning coals, wood), transport, buildings, agriculture, landfills and land use.[14]

- Carbon dioxide (CO2) is the most common greenhouse gas, making up nearly 75% of all greenhouse gas emissions,
- Methane only makes up around 17% of greenhouse gases, it's much more harmful than CO2 as its Global warming potential (GWP) is about 28 times higher,
- Nitrous oxide is only 6% of GHGs, but it is 265 times as strong as CO2 when it comes to its ability to warm the planet. It is a naturally occurring greenhouse gas that has recently increased its ratio in the atmosphere because of fossil fuel combustion and use of nitrous oxide in both commercial and organic fertilisers.
- Fluorinated Gases or industrial gases are GHGs created exclusively by human activities, primarily generated through refrigerants, air conditioning, and solvents used in manufacturing. While these gases currently account for only around 2% of the total greenhouse gas emissions into the atmosphere, they are especially powerful in their ability to warm the planet, because they are thousands of times stronger than CO2, and they will remain in the atmosphere for hundreds even thousands of years because they are not a natural part of our environment. A small concentration of these chemicals and greenhouse gases in the atmosphere can result in significant effects on global warming.

❖ Reducing our reliance on fossil fuels and switching to clean energy can help reduce carbon dioxide gas emission,

[13] https://palmetto.com/learning-center/blog/greenhouse-gases-climate-change-definition-examples
[14] https://www.un.org/en/climatechange/what-is-climate-change

- by reducing landfills wastes, meat consumption can help reduce methane emissions.
- While reduction of use of fertilisers and fossil fuels can reduce the proportion of Nitrous oxide; and at last,
- Reduction of industrial gases can only be achieved by finding new methods to contain and eliminate these manufacturing byproducts before they enter the atmosphere.



Source: Emissions data is from the IPCC's Fifth Assessment Report, Working Group III, 2014, and refers to shares of total global greenhouse gas emissions. The split between cars and trucks in road transport emissions is based on the IEA's Energy Technology Perspectives, 2017, since this is not given in the IPCC source.

Figure 2: Global emissions by sector

As a result, the Earth is now about 1.1°C[15] warmer than it was in the late 1800s. The last decade (2011-2020) was the warmest on record. The Earth is a system, where everything is connected, changes in one area can influence changes in all others. The consequences of climate change now include, among others, intense droughts, water scarcity, severe fires, rising sea levels, flooding, melting polar ice, catastrophic storms and declining biodiversity.

Climate change could undo decades of progress in development and dramatically increase global inequalities.

[15] https://www.ipcc.ch/2021/08/09/ar6-wg1-20210809-pr/

MODULE 3: SUSTAINABILITY AND CLIMATE

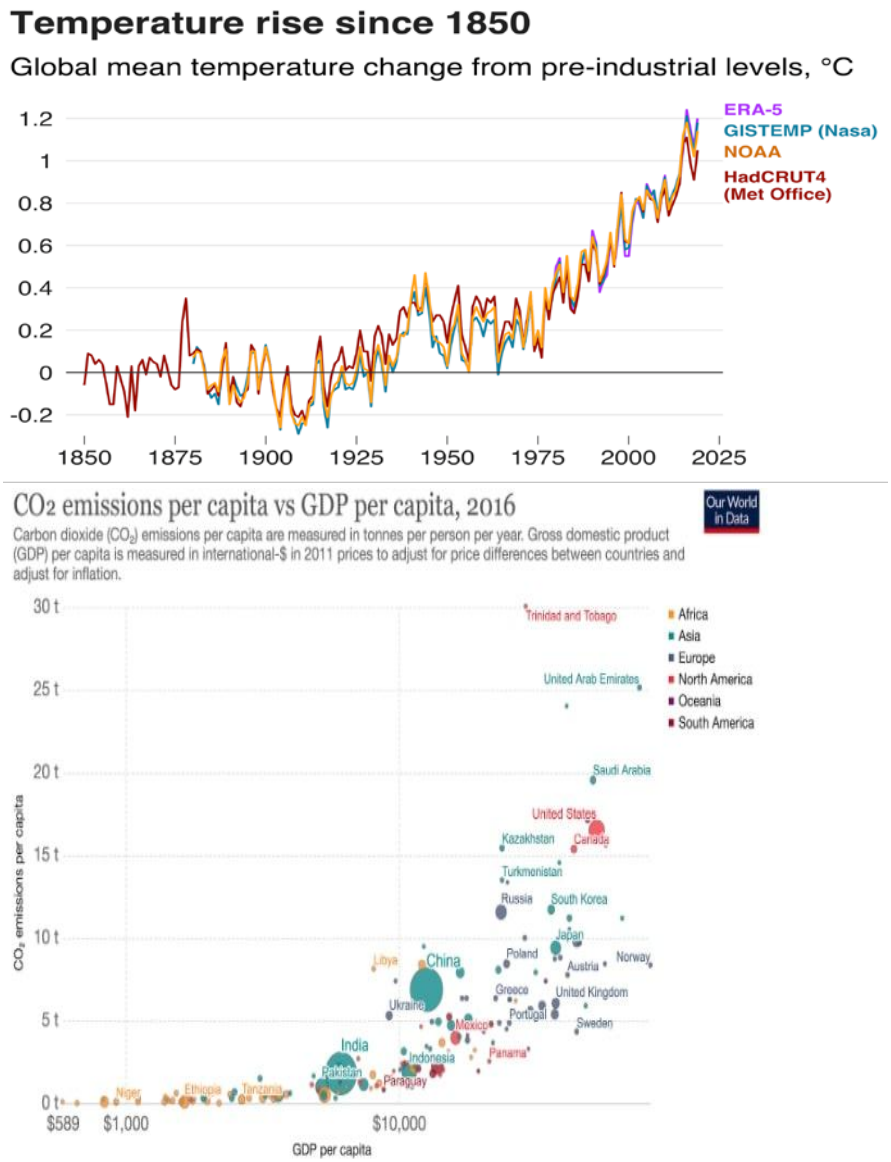


Figure 3: Top - Temperature change since 1850 and CO2 and GDP per Capita

Climate change can affect our health[16], ability to grow food, housing, safety and work. (figure 4). Conditions like sea-level rise and saltwater intrusion have advanced to the point where whole communities have had to relocate, and protracted droughts are putting people at risk of famine. In the future, the number of "climate refugees" is expected to rise.

- In 2017 there were 18,8 million people displaced by extreme weather,
- in 2020 the number reached 30.7 million. By 2050, it is predicted 150 million environmental refugees worldwide.

[16] DPSEEA framework for climate change and Global Public Health, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3617647/figure/F0002/

MODULE 3: SUSTAINABILITY AND CLIMATE

- Experts estimate that for every $1 invested today to prevent climate-related natural disasters, humanitarian aid and recovery costs are reduced by $7.

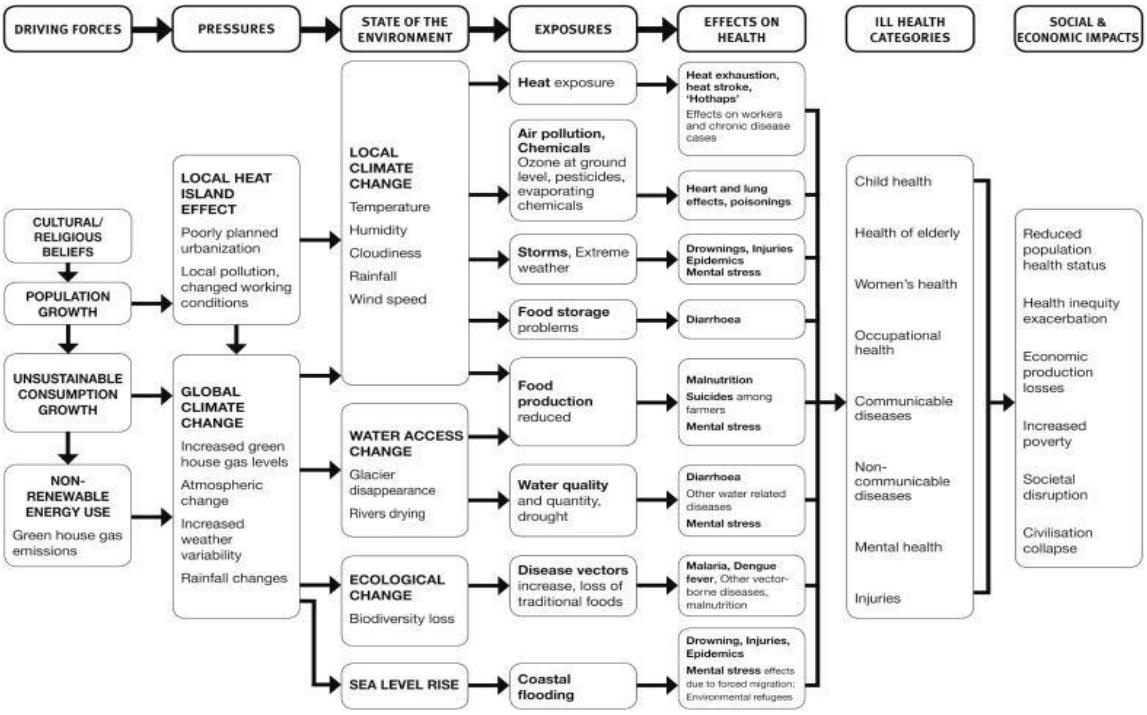


Figure 4: Impact of climate change and Global Public Health on life in general.

2.1. The share of polluters (colonisers)

People living in the richest and most industrialised countries generate the most greenhouse gas emissions per capita, Global North is responsible for 92% of all excess global carbon dioxide emissions, so do western rich countries colonising the atmosphere[17]? n the other hand Global South bears the brunt of the devastation.
It is estimated that people living in the 48 least developed countries are 5 times more likely to die from disasters caused by global warming and in climate change-related disasters. The 100 least-emitting countries generate 3 percent of total emissions. The 10 countries with the largest emissions contribute 68 per cent. Everyone must take climate action, but people and countries creating more of the problem have a greater responsibility to act first.

In addition to that, developed countries are also relocating production to low-income countries, where environmental legislation is less strict and they can continue to pollute. This is known as "pollution heaven". In 2015 the United States bore responsibility for 40% of “excess global carbon dioxide emissions”. The Group of Eight (the United States, the European Union, Russia, Japan and Canada) is responsible for 85% of such emissions. The Global South — which is by far bearing

[17] https://theconversation.com/climate-change-is-white-colonisation-of-the-atmosphere-its-time-to-tackle-this-entrenched-racism-185579

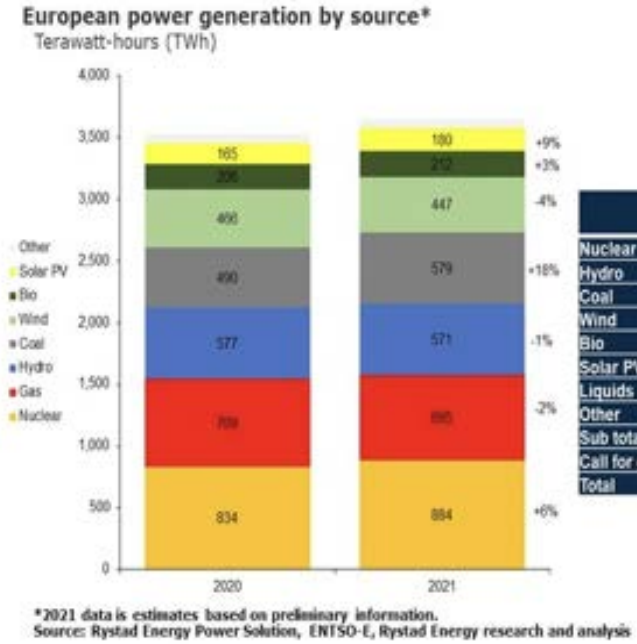
MODULE 3: SUSTAINABILITY AND CLIMATE

the brunt of climate droughts, floods, famines, storms, sea level rise and deaths — is responsible for just 8% of excess global carbon dioxide emissions.

Climate justice is the term used to frame climate change as an ethical and political issue, not just an environmental or physical one. It links the causes and effects of climate change to concepts of environmental and social justice, such as equity, human rights and also climate change responsibilities. Table 2 shows natural resources in correllation to illegal mining & poverty.

Table 2 - Case study - **Electric cars are sustainable**

Policies are moving towards purchasing cars with low CO2 emissions, currently. Some initiatives in the EU are offering subsidies, some tax reductions for purchasing hybrids or. electric cars. Table below shows the sources of electricity in Europe and in 2022, the highest increase of electricity will be in coal. Ingredient in the lithium-ion batteries that are used for electric and hybrid cars as well as smartphones is cobalt. 65% of the world's cobalt supply comes from DR Congo, furthermore 20% of cobalt is mined from illegal mines, where there is no employment, safety nor environmental laws in place resulting in exploitation of workers. UN's development Index according to poverty, ranks DR Congo in the bottom 15 countries in the World. Extreme poverty drives people to work in unacceptable working conditions without suitable protection, often suffering from medical conditions like metal lung diseases, dermatitis and injuries. Illegal mines often lead to pollution of drinking water sources. Many companies acquire their cobalt from refiners or smelters, who may or may not have received it from illegal mines, and often do not ask questions about whether child or unfair labour was involved in the procurement of the cobalt.



RYSTAD ENERGY

	Max potential generation 2022	Change 2022 vs 2021
Nuclear	868	-16
Hydro	566	-5
Coal	641	63
Wind	469	22
Bio	253	41
Solar PV	191	11
Liquids	84	36
Other	30	1
Sub total	3104	
Call for gas power	543	-152
Total	3647	

MODULE 3: SUSTAINABILITY AND CLIMATE

2.2. The Paris Agreement

The Paris Agreementis a legally binding international treaty on climate change. It was adopted by 196 Parties at COP 21 in Paris inDecember 2015 and entered into a force a year later.

Implementation of the Paris Agreement against climate change (emission, Air, land, water, thermal, light, noise pollution sources…) requires economic and social transformation, based on the best available science. Its goal are[18]:

- ➔ to limit global warming to well below 2, preferably to 1.5 degrees Celsius, compared to pre-industrial levels.
- ➔ to achieve a climate neutral (net Zero) world by mid-century (2050).

The Paris Agreement together with the global frameworks and agreements to guide progress, the Sustainable Development Goals, the UN Framework Convention on Climate Change pledged for:

- financial support to reduce climate impacts for adaptation and mitigation,
- technology development and transfer, and
- climate-related capacity-building for developing countries and requests all developed countries to enhance support, encourages
- to cut emissions - committing to net zero emission by 2050, to keep warming below 1.5°C, about half of emissions cuts must be in place by 2030 . Fossil fuel production must decline by roughly 6 percent per year between 2020 and 2030.
- financing required adjustments - 100 billion per year (through bilateral, multilateral, export credits, private finance)[19].

This agreement is a landmark in the multilateral climate change process because, for the first time, a binding agreement brings all nations into a common cause to undertake ambitious efforts to combat climate change and adapt to its effects. Implementation of the Paris Agreement requires economic and social transformation, based on the best available science. The Agreement works on a 5- year cycle of increasingly ambitious climate action carried out by countries which have to submit their plans for climate action known as nationally determined contributions (NDCs).In their NDCs, countries communicate actions they will take to reduce their Greenhouse Gas (GHGs) emissions in order to reach the goals of the Agreement. Countries also communicate in the NDCs actions they will take to build resilience to adapt and/ mitigation to the impacts of rising temperatures. (figure 5 below).

[18] https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement

[19] https://www.oecd.org/climate-change/finance-usd-100-billion-goal/

MODULE 3: SUSTAINABILITY AND CLIMATE

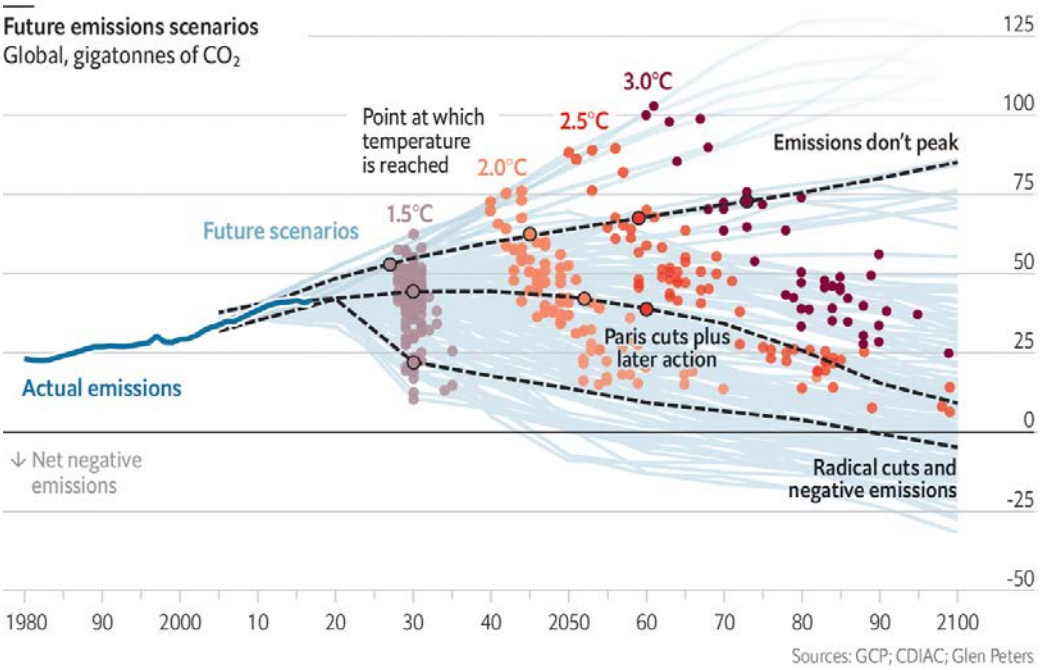


Figure 5: Future CO2 emission - three scenarios (dot lines)

Failure to take actions in line with the Paris agreement will cost more and dearly; as we can expect the rise in the number of floods, storms, droughts, heat waves , fires and landslides, as well as changes in ecosystems, ice melting etc.
The Paris Agreement recognizes the acute climate impacts on local actors and mandates climate action that addresses these impacts at the local level to achieve the global temperature goal[20]. International climate finance for adaptation remains the central instrument for achieving the adaptation objectives set out in the Paris Agreement, i.e. reducing people's vulnerability to climate change (Ayers, 2009; Ellis et al., 2013). However, the deficit in adaptation finance, particularly in developing countries, is large and will grow as countries' adaptation needs increase alongside intensifying climate change impacts (Alcayna, 2020; Khan et al., 2019). Transformational actions are needed to enable marginalized communities to implement climate resilient development approaches using scarcely available resources (Crick et al., 2019). To be most effective, adaptation actions need to integrate local knowledge (Chalise & Naranpanawa, 2016), avoid elite capture, reduce the dependency of local actors on external support, and increase agency and self-sufficiency (Westoby et al., 2021).

Local adaptation ultimately involves responses to past, current, and anticipated climate change risks by individuals, households, small and medium-sized enterprises, and local government authorities and institutions (Colenbrander et al., 2018; Soanes, 2017). Whether and how this finance is delivered determines the extent of adaptation by these local actors.

[20] UNFCCC, 2015

MODULE 3: SUSTAINABILITY AND CLIMATE

2.2. Positive examples by nations and communities

Table 3: Examples of adaptation actions from GCF funds,

A number of efforts are underway to help people adapt to climate change. One is the global Adaptation Fund, which finances pioneering initiatives in developing countries.

Peru - how adaptation works for fisher people in Peru, who are combining traditional knowledge and technology to protect their livelihoods.

Costa Rica - Small farmers develop climate-smart and resilient methods to adapt to floods and droughts, improving water and food security.

I**ndia** - take a journey to India's Himalayan region where marginalised communities are managing climate pressures on water through practices such as spring rejuvenation, rainwater harvesting, drip irrigation and sprinklers.

Kiribati - a small island developing State that is highly vulnerable to climate change, has been among the earliest adopters of climate adaptation. It is improving the management of fisheries to safeguard livelihoods and food security and stepping up early warning systems for disasters.

In Ghana - women farmers are adapting to increasingly erratic rainfall by diversifying their livelihoods. With new skills, they are producing agricultural products such as soy milk and shea butter that fetch higher prices in local markets.

Bosnia and Herzegovina - farmers in Bosnia and Herzegovina have adjusted crop choices to deal with droughts, such as by moving from apples to warmer weather peaches.

Maldives - a declining rainfall and hotter summers have required constructing larger rainwater tanks and desalination facilities to process sea water, while setting up systems to carefully track water use and trigger early warnings of dry periods.

Sri Lanka - is repurposing an ancient system of water tanks to keep water flowing to farms and homes.

Djibouti - the so-called nature-based solutions, people are staying safe by building flood walls. They are also restoring mangrove forests, which protect against sea-level rise, provide food for people and offer a haven for plants and animals.

In Viet Nam - coastal farmers have turned from collecting increasingly scarce marine resources such as snails and crabs to developing beekeeping linked to mangrove restoration.

Albania, one of the countries in Europe hardest hit by coastal erosion, restoring vegetation on the Kune-Vain Lagoon protects shoreline communities. It also helps sustain a globally recognized corridor for migrating birds. It might seem like nature-based solutions are mostly for the countryside. But cities are also boosting resilience by turning to nature.

El Salvador - the capital, San Salvador, aims to become a "sponge city" by restoring surrounding forests to limit landslides and floods, and improving drainage in ways that mimic natural streams and rivers.

United States - the coastal city of Miami is raising street levels and developing green infrastructure, in tandem with ambitious plans to reduce greenhouse gas emissions.

Ethiopia - the horn of Africa's Green legacy project initiated four years ago by its prime minister, every year/annually planted 4 billion trees, 353 million in one day. 20 million people mobilised.

MODULE 3: SUSTAINABILITY AND CLIMATE

2.3. Consequences of climate change and coalition building - Global partnership for Sustainable Development and Climate Change

The effect of climate change is felt globally in the form of floods, storms, droughts, heat waves, ice melting, wildfires, landslides, changes in ecosystems, acidification, etc.

- UN - The United Nations play one of the key roles of forming agendas for development, equality, democracy etc. The UN has taken the leading role in forming policy recommendations to be accepted by their members.
- In 1992 the Rio Declaration called Agenda 21[21] was accepted at the United Nations Conference on Environment and Development (UNCED) and adopted by 178 Governments which is the first global action towards sustainable development. Agenda 21 is focused on integration of environment and development concerns and states that greater attention to them will lead to the fulfilment of basic needs, improved living standards for all, better protected and managed ecosystems and a safer, more prosperous future. It highlights that only joint actions locally, nationally and globally can lead towards sustainable development. With Agenda 21 Global Partnership for Sustainable Development was formed. "Act Local Think Global" became a basis for actions designed in Local Action Planes.

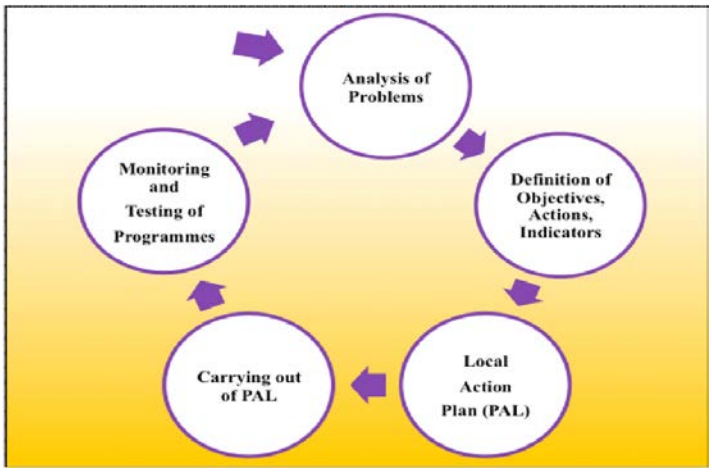


Figure 6: Steps in taking actions designed in Local Action Planes (Act Local Think Global)

- In 2000, the United Nations at the Millenium Summit ratified the UN Millenium Declaration by all UN member states with the aim to fight poverty in all of its dimensions. This was the birth of the Millennium Development Goals (MDG)which aimed at achieving eight specific goals by . MDGs were: 1. eradicate extreme poverty and hunger, 2. achieve universal primary education, 3. promote gender equality and empower women,

[21] (https://sustainabledevelopment.un.org/content/documents/Agenda21.pdf)

4. reduce child mortality, 5. improve maternal health, 6. combat HIV/AIDS, malaria and other diseases, 7. ensure environmental sustainability and 8. global partnership for development. In MDG 2015 report[22], it was recognized as the most successful anti-poverty movement in history.

- In 2015 the UN members again ratified SDG 2030 - an Agenda for Sustainable Development (2015 to 2030) with 17 Sustainable Development Goals (SDG). The Sustainable development Goals is a post 2015 development agenda and world's shared plan to end extreme poverty, reduce inequality, and protect the planet by 2030. It was adopted by 193 countries in 2015.

The SDG Agenda is a plan of action for people, planet and prosperity. It also seeks to strengthen universal peace in larger freedom. It is known as 5P actions towards sustainability. Agenda 2030 recognized that eradicating poverty in all its forms and dimensions, including extreme poverty, is the greatest global challenge and an indispensable requirement for sustainable development. The SDGs emerged from the most inclusive and comprehensive negotiations in UN history and have inspired people from across sectors, geographies, and cultures. Achieving the goals by 2030 will require heroic and imaginative effort, determination to learn about what works, and agility to adapt to new information and changing trends. Graph 7 shows the goals of SDG (17 points).

Figure7: Sustainable development goals (**SDGs**), with 5Ps and **all three pillars**

3. Consequences of climate change (Plastic Waste and our planet - the new challenge of waste management)

Thirty years ago, the UN brought the attention of the global community on the need to develop a holistic strategy on waste management. 'Design for environment' is a term used as a synonym for several other names, such as ecodesign, sustainable

[22] (https://www.un.org/millenniumgoals/2015_MDG_Report/pdf/MDG%202015%20rev%20(July%201).pdf

design, green design, environmentally conscious design, life cycle design or life cycle engineering and also clean design. Sustainable resource management requires 'decoupling' resource consumption with economic growth and a transition towards a circular model of resource consumption, where resource reuse and recycling are introduced through strategic planning throughout the production and consumption chain. This calls for an environmentally sound approach to waste management that must go beyond the mere safe disposal, or recovery, of wastes that are generated and seek to address the root causes of the problem by attempting to change unsustainable patterns of production and consumption (UN, 1993).

Today more than ever, debates and headlines constantly illustrate the problematic relationship between waste & its management, consumption and production in catastrophic narratives to social, cultural and political mechanisms that shape attitudes to waste. Waste as the total sum of desire of abundance, excessive production and consumption which are the workings of capitalism, rooted with a permanent mantra of *more is better than less* has not provided clarity and reason to long standing concerns of postmodernism.

However, recycling waste has a large capacity for creating new jobs worldwide while also making for a better environment for generations to come.

3.1. Plastic waste

Plastics are typically organic polymers of high molecular mass, a material consisting of a wide range of synthetic or semi-synthetic organic compounds that are malleable and, therefore, can be moulded into solid objects. Plasticity is the general property of all materials that involves permanent deformation without breaking.

Around the world, one million plastic bottles are purchased every minute, while up to five trillion plastic bags are used worldwide every year. The world generates 2.01 billion tonnes of municipal solid waste annually, with at least 33 percent not managed in an environmentally safe manner. Worldwide, waste generated per person per day averages 0.74 kilograms. High-income countries, though they only account for 16 percent of the world's population, generate about 34 percent, or 683 million tonnes, of the world's waste, a correlation between waste generation and income level[23]. Today, globally about 400 million tonnes of plastic waste are produced every year. By 2050, global waste is expected to grow to 3.40 billion.

The level of greenhouse gas emissions associated with the production, use and disposal of conventional fossil fuel-based plastics is forecast to grow to 19% of the global carbon budget by 2040[24]. In addition, millions of tonnes of plastic waste are lost to the environment, or shipped to other countries (transboundary E-waste Flows)

[23] https://datatopics.worldbank.org/what-a-waste/trends_in_solid_waste_management.html
[24] https://ewastemonitor.info/wp-content/uploads/2020/11/GEM_2020_def_july1_low.pdf

where it is mostly burned or dumped. Rivers and lakes carry plastic waste from deep inland to the sea, making them major contributors to ocean pollution. Despite current efforts, it is estimated that 75 to 199 million tonnes of plastic is currently found in oceans. Without any change on production, utility and disposal modalities, the amount of plastic waste entering aquatic ecosystems could triple from 9-14 million tonnes per year in 2016 to a projected 23-37 million tonnes per year by 2040.

While plastics have many valuable uses, their durability and resistance to degradation make them nearly impossible for nature to completely break down. The presence of single-use plastic products, including microplastics cause negative and severe environmental, social, economic and health consequences. Microplastics[25] can enter the human body through inhalation, absorption and accumulate in organs, enter rivers, lakes and oceans.

Plastics can be broken down into its original form - light crude oil by a process known as “thermal depolymerisation,” the need for reverse engineering. The products of this breakdown process are a light crude oil, which can then be fractionally distilled into constituent hydrocarbons to be used as fuel or to create new plastics. Other waste materials, such as rubber tires, domestic organic waste and certain agricultural wastes can also be broken down via this process. This process has twofold benefits: it eliminates waste that would otherwise end up in a landfill, and produces a useful commodity from an essentially free waste stock (used plastics).

The consumption of significant amounts of energy and water in the process are the drawbacks. However with the continual development of renewable energy sources, thermal depolymerisation is on the brink of becoming economically viable, with several test plants in operation.

In addition, implementing an integrated waste management and treatment plant (collection, transport, treatment, and disposal or Reduce, Recycling, reuse) is expensive & demanding, at least to low income countries as they experience much more difficulty in recovering costs. In addition, the absence of regulation, legislations and policies across all countries is a challenge; it has no control over transboundary waste that crosses borders to other regions undocumented or accountable. Plastic waste in a rivers, lakes, oceans or on land can persist in the environment for centuries.

3.2. Electronic waste

Electronic waste or e-waste also known as urban mines are discarded electrical or used electronic devices which are destined for refurbishment, reuse, resale, salvage

[25] https://ocean.si.edu/ocean-life

recycling through material recovery, or disposal.[26] According to the Global e-waste Statistics Partnership[27], in 2019, 53.6 MT of e-waste was generated globally, which is up 21% in five years. This figure is projected to grow to 74.7MT per year by 2030.

According to the Transboundary E-waste Flows Monitor,[28] 5.1 MT or. 10% of global e-waste crossed international boundaries in 2019. This study divided transboundary movement of e-waste into regulated and uncontrolled movements and took into account both the receiving and sending regions in order to better comprehend the implications of such movement. Despite existence of the Basel Convention (1988) on the Control of Transboundary Movements of Hazardous Wastes and their Disposal as a multilateral agreement under UNEP, out of the 5.1 MT, 1.8 MT of the transboundary movement is sent under regulated conditions, while 3.3 MT of the transboundary movement is delivered under uncontrolled conditions. In 2019, globally only 17.4% i.e. 9.3 MT is recycled, that amount differs between regions: Africa 0.9%, Americas 9.4%, Asia 11.7%, Oceania 8.8%, Europe 42.5%. For the same year, the value of raw materials global e-waste generated $57 billion USD. With the current documented collection and recycling rate of 17.4% - a raw material value of $10 billion USD was recovered.

The consumption of Electrical and Electronic Equipment (EEE) is strongly linked to widespread global economic development. EEE has become indispensable in modern societies and is enhancing living standards, but its production and usage can be very resource demanding and as such it also illustrates a counter to that very improvement in living standards. On average, the total weight of global EEE consumption increases annually by 2.5 MT. After its use, EEE is disposed of, generating a waste stream that contains hazardous and valuable materials (Waste Electrical and Electronic Equipment (WEEE).

The growing amount of e-waste is mainly fueled by higher consumption rates of EEE, short life cycles, and few repair options. In 2019, Asia generated the highest quantity of e-waste amounting 24.9 MT, followed by the Americas (13.1 MT) and Europe (12 MT), while Africa and Oceania generated 2.9 MT and 0.7 MT, respectively.

Positive developments

- In 2019, encouraging developments took place globally as 71% of the world's population was covered by a national e-waste policy, legislation, or regulation.

[26] https://www.ewaste1.com
[27] https://globalewaste.org/

[28] https://ewastemonitor.info/gtf-2022

MODULE 3: SUSTAINABILITY AND CLIMATE

- Recycling not only saves energy and reduces landfill waste, the recycling industry creates jobs and helps the local economy.
- Recycling creates at least 9 times more jobs than landfills , and reuse creates as many as 30 times more jobs.
- According to the US Recycling Economic Information Study (REI), the US Recycling Industry employed 1.25 million people whereas the US Solid Waste Management industry employed only 0.25 million.
- Europe in general, Sweden in particular is recycling nearly 100% of their waste. The Netherlands, Switzerland, and Austria are also leading the pack by recycling around 50% of their waste.
- Separation of waste and environmental education as subject and value embedded in schools and as way of life.
- Globally, experience sharing and collective advocacy will be strengthened.