Evolution of the Concept – Rio Summit and sustainable development - various definitions of sustainable development - Components of sustainable development: Social, environmental and economic components – Sustainable Development Goals – Quality education, Gender equality, innovation and infrastructure, peace and justice - Sustainable engineering practices.

INTRODUCTION- MEANING OF SUSTAINABLE DEVELOPMENT

Sustainable development is a development based on patterns of production and consumption that can be pursued into the future without degrading the human or natural environment. It involves the equitable sharing of the benefits of economic activity across all sections of society to enhance the well-being of humans, protect health and alleviate poverty.

Sustainable Development is the way to preserve our natural resources and protect the earth from all kinds of issues and extinctions to save the natural resources for the future generations. It can be defined as a development where we fulfil the needs of present day and we don't compromise on the ability of the future generation to fulfil their own needs.

Sustainable development is a core concept within global environmental policy. It provides a mechanism through which society can interact with the environment while not risking damaging the resource for the future.

Sustainable Development: Principles and Objectives

Principles:

➢ Support responsible development that promotes efficiency and enhances the quality of life.

➢ Protect the environment in both a proactive and remedial manner, with emphasis on anticipation and prevention.

➢ Make decisions that recognize the interdependence of humans and nature in a common ecosystem. Promote responsible resource use and conservation practices.

➢ Have regard for environmental, economic and social costs and benefits in the development and use of resources, products and services.

➤ Promote responsible stewardship to ensure equitable use of natural and environmental resources in order to meet essential needs of both present and future generations.

Objectives:

➤ *Protection of Natural Resources:* Preserve and extend accessible green spaces, shorelines, natural water courses and the Niagara Escarpment for future generations.

➤ *Reforestation of the City:* Promote the replanting and management of vegetation on private and public property within the city.

➤ *Full Public Participation in Development Decisions:* Allow the public to be part of all planning decisions. Economic, environmental and social impacts of proposed developments should be considered.

➤ *Actively Promote Sustainable Development:* Advocate changes at the senior levels of government, as well as in the city, in order to evolve towards sustainability.

➤ *Make the Best Use of Land:* Land-use decisions based upon an ecosystem approach to ensure environmental integrity and diversity. To include, but not be limited to, promoting environmentally sensitive lands and using fertile soil for agriculture throughout the municipality.

➤ *Protection and Enhancement of Natural Features:* Protect and enhance natural features by ensuring that the physical features of shorelines, agriculture lands, flood plains, forestry tracts and notable landmarks are preserved for future generations.

➤ *Natural Storm Water Management:* Protect water courses in their natural state and for those water courses that have been significantly altered, restoration to a more natural state will be encouraged as opportunities arise.

➤ *Balanced Development:* Provide a community plan and an economic strategy aimed at creating sustainable and appropriate forms of development that reflect human scale and a sense of community as well as representing a balance between urban development and natural surroundings.

➤ *Efficient Urban Design:* Increase the efficiency of land use in the urban community in terms of energy and time, promote intensification and diversification policies rather than policies that generate urban sprawl.

➤ *Minimal Discharge of Toxic Pesticides and Other Toxic Chemicals:* Promote the elimination of private and public use of toxic pesticides and other chemicals that have negative effects on the environment, particularly those known to be persistent.

➢ **Accessible Community Development:** Form a new type of community development which includes readily available local community components such as commerce, shopping, employment, education and recreation within walking distance of all residences.

➢ **Responsible Use of Natural Resources:** Encourage conservation of natural resources, nations should work towards ensuring that users are charged for the full local costs of their individual use of water, electricity and sanitary sewers. There should also be educational programs to encourage conservation of natural resources.

➢ **Integration of Natural Features and Green Space:** Integrate natural features and green space in all new developments and intensification projects.

➢ **Energy Conservation:** Promote energy conservation through efficient land use planning and building design.

➢ **Ecosystem Auditing:** Prepare an objective ecosystem audit of the entire municipality at regular intervals.

➢ **Balanced Transportation System:** Develop a balanced transportation system including transit, pedestrian, and cycling amenities and best use of the road system for movement of goods and people, with the existing facilities used to their fullest capacity.

➢ **Evaluation of Development:** Continuous monitoring and evaluation of development should take place to ensure that it does not have adverse impacts on the city's finances and the environment.

EVOLUTION OF THE CONCEPT – SUSTAINABLE DEVELOPMENT

Throughout the evolution of the concept of "sustainable development" there was consensus on the fact that it does not focus solely on environmental issues. The three interdependent and mutually reinforcing pillars are: economic development, social development, and environmental protection. Indigenous peoples have argued that the fourth pillar of sustainable development is also cultural diversity.

The idea of sustainability dates back to the early 20th century in the era of industrial revolution when two opposing factions had emerged within the environmental movement: the conservationists and the preservationists. The conservationists focused on the proper use of nature, whereas the preservationists sought the protection of nature from use. Put another

way, conservation sought to regulate human use while preservation sought to eliminate human impact altogether.

As the first evidences of an environmental crisis began to appear, several reactions took place. The International Union for Conservation of Nature (IUCN) was founded in October 1948 following an international conference in Fontainebleau, France. Its promoter's sought to ensure that any use of natural resources is equitable and ecologically sustainable.

The Club of Rome, a think tank composed of a small international group of people from the fields of academia, civil society, diplomacy, and industry, raised considerable public attention in 1972 with its report *The Limits to Growth* that predicted that economic growth could not continue indefinitely because of the limited availability of natural resources, particularly oil.

Sustainable development was a key theme of the United Nations Conference on the Human Environment in Stockholm in 1972. The concept was coined explicitly to suggest that it was possible to achieve economic growth and industrialization without environmental damage.

In the ensuing decades, mainstream sustainable development thinking was progressively developed through the World Conservation Strategy (1980), the Brundtland Report (1987) and the United Nations Conference on Environment and Development in Rio (1992), as well as in national government planning and wider engagement from business leaders and non-governmental organisations of all kinds.

Over these decades, the definition of sustainable development evolved. The Brundtland Report defined sustainable as 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs'. This definition was vague, but it cleverly captured two fundamental issues, the problem of the environmental degradation that so commonly accompanies economic growth and yet the need for such growth to alleviate poverty.

The core of mainstream sustainability thinking has become the idea of three dimensions, environmental, social and economic sustainability.

COMPONENTS OF SUSTAINABLE DEVELOPMENT: SOCIAL, ENVIRONMENTAL AND ECONOMIC COMPONENTS

The three pillars of sustainability
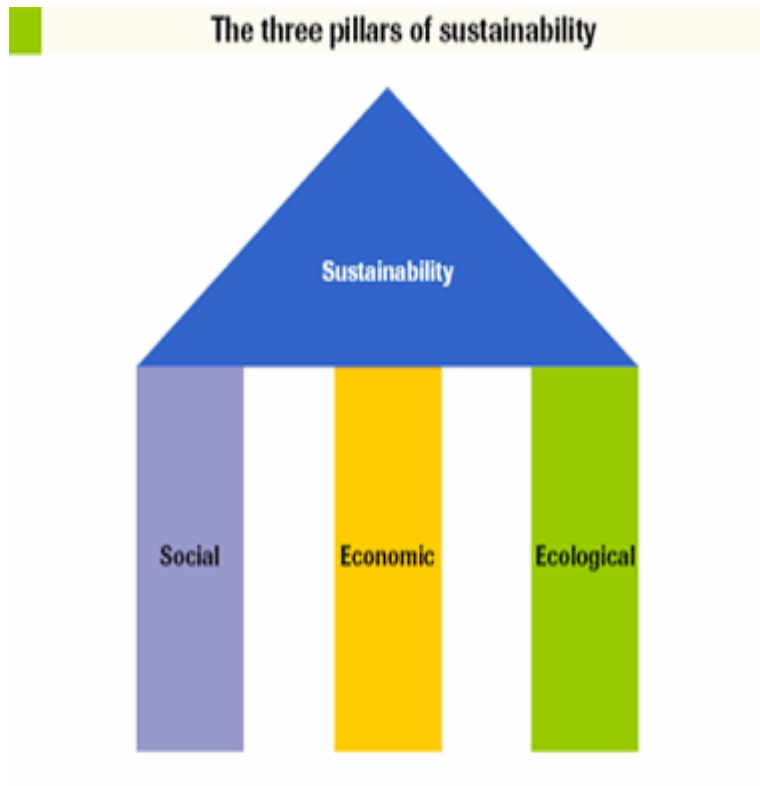
Sustainable development is a holistic approach to growth and development that aims to meet the needs of the present without compromising the ability of future generations to meet their own needs. It involves balancing economic, social, and environmental considerations to achieve long-term prosperity, equity, and health for all. Sustainable development is often referred to as having three core pillars, often called the "three pillars of sustainability" or the "triple bottom line." These pillars are:

1. Economic Sustainability

Economic sustainability refers to the ability of an economy to support a defined level of economic output over time without causing environmental degradation or social inequality. It involves creating systems and policies that promote long-term economic growth while ensuring that resources are used efficiently and fairly distributed.

Key Aspects:

- **Economic Growth with Equity**: Sustainable development requires growth that benefits everyone and reduces poverty and inequality. This includes fostering economic opportunities for all, especially marginalized communities.

- **Efficient Resource Use**: Sustainable economies optimize resource use, promote innovation, and focus on reducing waste and inefficiency. This involves encouraging renewable resources and reducing reliance on non-renewable resources.
- **Diversification and Resilience**: A sustainable economy is diverse and resilient to external shocks, such as financial crises, climate change, or natural disasters. It can adapt to changing circumstances while maintaining stability.

Examples:

- Encouraging green businesses and eco-friendly technologies.
- Investing in renewable energy (solar, wind, hydro).
- Promoting fair trade and inclusive economic growth.

2. Environmental Sustainability

Environmental sustainability focuses on maintaining and preserving the natural environment and its ecosystems. It emphasizes responsible management of natural resources, reducing environmental degradation, and ensuring the health of ecosystems for current and future generations.

Key Aspects:

- **Conservation of Resources**: Efficient use of natural resources like water, energy, land, and raw materials to avoid depletion. This includes transitioning to renewable resources and using resources in a way that does not exceed the Earth's carrying capacity.
- **Pollution Control**: Reducing emissions of pollutants into the air, water, and soil to prevent harm to the environment and human health. This includes tackling climate change, promoting clean energy, and reducing waste.
- **Biodiversity and Ecosystem Protection**: Protecting biodiversity and maintaining ecosystem services, such as clean air, water, and fertile soil, which are essential for human survival.

Examples:

- Adopting sustainable agriculture practices (e.g., organic farming, agroforestry).

- Reducing carbon emissions through energy efficiency and green technologies.
- Protecting forests and wildlife habitats.

3. Social Sustainability

Social sustainability focuses on ensuring that all people have access to basic human rights, equitable opportunities, and a good quality of life. It promotes social justice, equality, and respect for cultural diversity. Social sustainability involves ensuring the well-being of current and future generations by addressing issues such as poverty, health, education, and social inclusion.

Key Aspects:

- **Equity and Social Justice**: Ensuring that everyone, regardless of their background, has access to the resources they need to lead a fulfilling life. This includes addressing inequalities related to income, gender, race, and education.
- **Health and Well-being**: Promoting access to healthcare, sanitation, and clean drinking water, and improving the quality of life for all people.
- **Education and Empowerment**: Providing quality education and opportunities for skill development to ensure that people can contribute to the development of society and improve their own lives.
- **Cultural and Social Integration**: Respecting cultural diversity and promoting social cohesion, tolerance, and the participation of all members of society in decision-making processes.

Examples:

- Providing access to quality education for all, especially for marginalized communities.
- Ensuring fair wages and safe working conditions for all workers.
- Promoting gender equality and protecting the rights of women and children.

Interconnection of the Three Pillars

Sustainable development cannot be achieved by focusing on just one of the pillars. All three pillars—**economic**, **environmental**, and **social**—are interconnected and must work together

to create a sustainable future. For example, economic growth that depletes natural resources or exacerbates inequality can undermine long-term sustainability. Similarly, environmental protection that does not consider the social implications may leave marginalized communities without access to necessary resources.

The United Nations and the Sustainable Development Goals (SDGs)

In 2015, the **United Nations (UN)** adopted the **17 Sustainable Development Goals (SDGs)** as part of the **2030 Agenda for Sustainable Development**. These goals are designed to address the key challenges of sustainable development, such as poverty, hunger, health, education, gender equality, water, sanitation, energy, climate change, and peace. The SDGs serve as a global blueprint for achieving sustainable development across all three pillars.

The three pillars of sustainable development—**economic, environmental, and social**—represent the foundation of a sustainable future. By balancing these aspects, we can ensure that development occurs in a way that benefits all people, protects the planet, and maintains long-term prosperity. Achieving sustainable development requires collective action from governments, businesses, communities, and individuals, as well as a commitment to intergenerational equity and the preservation of our planet's resources.

Why are the Pillars important?

Most national and international problem solving efforts focus on only one pillar at a time. For example, the United Nations Environmental Programme (UNEP), the environmental protection agencies (EPA) of many nations, and environmental NGOs focus on the environmental pillar. The World Trade Organization (WTO) and the Organization for Economic Cooperation and Development (OECD) focus mostly on economic growth, thought the OECD gives some attention to social sustainability, like war reduction and justice. The United Nations attempts to strengthen all three pillars, but due to its consensual decision making process and small budget has minor impact. The United Nations focuses mostly on the economic pillar, since economic growth is what most of its members want most, especially developing nations.

This leaves a void. No powerful international organization is working on the sustainability problem as a whole, which would include all three pillars.

However, as the Great Recession of 2008 demonstrated, weakness in the other pillars can directly weaken the environmental pillar. Many nations and states are cutting back or postponing stricter environmental laws or investment, since their budgets are running deficits. Many environmental NGOs are seeing their income fall. If the Great Recession grew substantially worse and morphed into another Great Depression, you would expect the environmental pillar would get severely less attention. The social pillar is critical too. Once a war breaks out environmental sustainability has zero priority. If a nation lives in dire poverty, the environment is pillaged with little thought for the future. Therefore, solutions to the sustainability problem must include making all three pillars sustainable.

RIO SUMMIT AND SUSTAINABLE DEVELOPMENT

The Rio Summit, also known as the **Earth Summit** or the **United Nations Conference on Environment and Development (UNCED)**, was held in **Rio de Janeiro, Brazil**, in **1992**. It was a pivotal event in global environmental policy and laid the foundation for many international efforts toward sustainable development. The summit aimed to promote environmental protection, economic development, and social well-being, with a focus on achieving **sustainable development**.

Objectives of the Rio Summit:

1. **Sustainable Development**: The central objective was to promote the idea of sustainable development, where economic growth, social progress, and environmental protection are harmonized for long-term benefits, ensuring that present development does not harm the prospects of future generations.

2. **Environmental Protection**: The summit aimed to address global environmental issues, such as deforestation, biodiversity loss, pollution, and climate change, by encouraging policies and actions to safeguard the planet's ecosystems.

3. **Global Cooperation**: Another key objective was to foster international collaboration among nations, as many environmental challenges are global in nature and require coordinated solutions, particularly from both developed and developing countries.

4. **Integration of Environment and Development**: It aimed to demonstrate that economic development could be achieved without compromising the environment.

The objective was to find a way to integrate environmental considerations into economic and social development strategies.

5. **Social Equity**: The summit also emphasized social justice and equity, particularly focusing on the needs of the poor and vulnerable, and ensuring that sustainable development benefits are distributed fairly across all communities and countries.

Key Highlights of the Rio Summit and Its Relationship to Sustainable Development

1. Agenda 21:

One of the major outcomes of the summit was **Agenda 21**, a comprehensive action plan that outlines strategies for sustainable development at local, national, and global levels. It addressed areas such as combating poverty, conserving natural resources, and promoting social equity.

2. The Rio Declaration on Environment and Development:

The **Rio Declaration on Environment and Development** outlined 27 principles that serve as guidelines for sustainable development. Key principles include:

- ✓ **Principle 1: Human beings are at the centre of concerns for sustainable development**: Sustainable development should be driven by the goal of improving the well-being of people, ensuring their health, education, and equitable access to resources.
- ✓ **Principle 2: Right to development**: Every country has the right to pursue its own development path, provided it does not harm the environment or the rights of others.
- ✓ **Principle 3: Equity and social justice**: Sustainable development must ensure that future generations have the same opportunities for development and that resources are distributed equitably across the population.
- ✓ **Principle 4: Environmental protection is an integral part of development**: Environmental protection should not be seen as separate from development. It is essential to integrate environmental considerations into all aspects of development.
- ✓ **Principle 5: Respect for international laws**: Countries must respect international environmental laws, and cooperation should be based on the principle of equity and

common but differentiated responsibilities, acknowledging the varying capacities of countries to address environmental challenges.

✓ **Principle 7: Cooperation in global environmental protection**: The summit emphasized that countries should cooperate to solve global environmental problems and recognize the shared responsibility for global environmental governance.

✓ **Principle 10: Access to information and public participation**: Public participation in decision-making processes concerning environmental and development matters is vital. People have the right to access environmental information and to participate in decisions that affect their environment.

✓ **Principle 15: Precautionary approach**: In the face of uncertain environmental threats, precautionary measures should be taken to prevent harm, even when scientific evidence is not definitive.

✓ **Principle 16: Polluter pays principle**: Those who cause environmental degradation should bear the cost of remedial actions to prevent or mitigate damage.

✓ **Principle 17: Role of international cooperation**: International cooperation is essential to deal with global challenges such as climate change, biodiversity loss, and resource depletion.

3. The Convention on Biological Diversity (CBD):

The summit led to the adoption of the **Convention on Biological Diversity**, a landmark international treaty aimed at conserving biodiversity, promoting its sustainable use, and ensuring the fair distribution of benefits derived from genetic resources.

4. The Framework Convention on Climate Change (UNFCCC):

Another major outcome of the summit was the creation of the **UN Framework Convention on Climate Change**, which set the stage for future climate change negotiations. The UNFCCC established the principles of international cooperation to address climate change and its impacts.

5. The Concept of Sustainable Development:

The summit played a key role in defining and popularizing the concept of **sustainable development**, which involves balancing economic growth, environmental protection, and social equity. It emphasized that development should meet the needs of the present without compromising the ability of future generations to meet their own needs.

6. Partnerships and Commitments:

The Earth Summit also highlighted the importance of multi-stakeholder partnerships, involving governments, businesses, and civil society in advancing sustainable development. It was recognized that solutions to global environmental issues required broad-based collaboration and cooperation.

In summary, the **Rio Summit of 1992** was a landmark event in shaping global sustainability policies, providing frameworks and agreements that continue to influence international environmental governance and sustainable development practices today. The **objectives** of the Rio Summit focused on advancing sustainable development through a balanced approach to environmental protection, economic development, and social equity. The **principles** emphasized fairness, cooperation, respect for international law, and the integration of environmental concerns into development policies and actions. These objectives and principles continue to guide global sustainable development efforts today.

United Nations Conference on Sustainable Development, Rio+20

Rio+20, officially known as the **United Nations Conference on Sustainable Development**, was held in **Rio de Janeiro, Brazil**, in **2012** to mark the **20th anniversary** of the **1992 Earth Summit (Rio Summit)**. The conference aimed to take stock of progress made since the original summit and further advance the global agenda on sustainable development.

Key Goals of Rio+20:

- ✓ **Reaffirm the Commitment to Sustainable Development**: Rio+20 sought to reaffirm the principles of sustainable development agreed upon in the original Rio Summit and Agenda 21, emphasizing the need for continued international cooperation.
- ✓ **Green Economy in the Context of Sustainable Development and Poverty Eradication**: One of the main themes of the conference was to discuss how to

transition to a **green economy** — one that promotes environmentally sustainable, low-carbon, resource-efficient, and socially inclusive growth. The green economy concept was seen as a way to tackle poverty while addressing global environmental challenges.

✓ **Institutional Framework for Sustainable Development**: The conference also focused on strengthening the institutional framework for sustainable development. It aimed to improve the coordination and effectiveness of international environmental governance and the United Nations system in supporting sustainable development efforts.

Outcomes of Rio+20:

✓ **The "Future We Want" Outcome Document**: The main outcome of Rio+20 was the adoption of the **"The Future We Want"** document, which includes commitments by governments to advance sustainable development in various sectors. The document:

  ○ Emphasized the importance of eradicating poverty, promoting equality, and improving the well-being of all people.

  ○ Recognized the need to protect the environment while promoting economic and social development.

  ○ Called for actions to address emerging challenges like climate change, biodiversity loss, and sustainable use of natural resources.

  ○ Proposed the establishment of **Sustainable Development Goals (SDGs)**, which would later be formalized in 2015 as part of the **2030 Agenda for Sustainable Development**.

✓ **Sustainable Development Goals (SDGs)**: Rio+20 laid the groundwork for the development of the **Sustainable Development Goals (SDGs)**, a set of universal goals to address a broad range of global issues, such as poverty, inequality, climate change, and environmental degradation. The SDGs were formally adopted by the United Nations in **2015** as part of the **2030 Agenda**.

✓ **Establishment of the High-Level Political Forum (HLPF)**: One of the key institutional outcomes was the creation of the **High-Level Political Forum on Sustainable Development (HLPF)**, which was tasked with overseeing the implementation of the SDGs and reviewing progress at the global level. The HLPF

serves as the central platform for political discussions on sustainable development within the UN system.

✓ **Green Economy and Transition**: Rio+20 emphasized the importance of transitioning to a green economy, with countries agreeing to implement policies that foster economic growth while reducing environmental degradation. The conference recognized the potential for green investments to promote job creation, reduce poverty, and address inequality.

Key Principles and Themes of Rio+20:

✓ **Poverty Eradication**: A central theme of Rio+20 was addressing poverty and its link to environmental sustainability. The conference emphasized that sustainable development must be inclusive, equitable, and address the needs of the world's most vulnerable populations.

✓ **Sustainable Economic Growth**: Rio+20 called for sustainable economic growth that respects the planet's ecological limits. The shift toward a **green economy** was highlighted as essential for achieving long-term prosperity and environmental health.

✓ **Social Inclusion**: The conference stressed the importance of **social inclusion**, ensuring that development benefits are widely distributed and that marginalized communities are included in decision-making processes.

✓ **International Cooperation and Partnerships**: Recognizing the need for global collaboration, Rio+20 highlighted the importance of partnerships among governments, businesses, and civil society to achieve sustainable development.

✓ **Environmental Protection**: Protecting the environment remained a critical priority. Rio+20 reaffirmed commitments to tackle issues such as climate change, deforestation, biodiversity loss, and pollution.

Legacy and Criticism:

While Rio+20 was a significant milestone, it faced criticism for its lack of binding commitments and concrete actions. Some observers felt that the conference did not deliver ambitious enough outcomes to address the scale of global challenges, particularly regarding climate change. Nonetheless, **Rio+20** played a crucial role in shaping the post-2012 sustainable development agenda, particularly through the establishment of the SDGs and the

ongoing conversation about how to build a more sustainable, inclusive, and equitable global society.

Sustainable Development Goals – Quality education, Gender Equality, Innovation and Infrastructure, Peace and Justice

The 2030 Agenda for Sustainable Development, adopted by all United Nations Member States in 2015, provides a shared blueprint for peace and prosperity for people and the planet, now and into the future. At its heart are the 17 Sustainable Development Goals (SDGs), which are an urgent call for action by all countries - developed and developing - in a global partnership. They recognize that ending poverty and other deprivations must go hand-in-hand with strategies that improve health and education, reduce inequality, and spur economic growth – all while tackling climate change and working to preserve our oceans and forests.

SDG4 Quality Education

Education liberates the intellect, unlocks the imagination and is fundamental for self-respect. It is the key to prosperity and opens a world of opportunities, making it possible for each of us to contribute to a progressive, healthy society. Learning benefits every human being and should be available to all.

Education is at the heart of the 2030 Agenda for Sustainable Development: it is identified as a stand-alone goal (Sustainable Development Goal 4) and is also present as targets under other SDGs on health, growth and employment, sustainable consumption and production, and climate change. Education has been characterised as 'the golden thread' that runs through all 17 SDGs. SDG 4 broadens the depth and breadth of education to people of all ages and expands its scope to a lifelong process spanning formal, non-formal and informal settings. It emphasises quality of educational access, particularly for girls and women and marginalised groups. Inclusive education that builds and reinforces positive attitudes towards forests, as well as relevant knowledge and competencies, and that helps individuals and communities feel or stay connected to forests, will foster and sustain pro-forest behaviours. This requires that education systems respect, nurture and enable Indigenous and traditional knowledge; promote forest-related environment and sustainability education; strengthen forest-related professional, technical and vocational education and capacity development; and capitalize on the power of both established and new media that will continue to evolve and emerge over time.

SDG4 in a nutshell:

- Ensuring lifelong learning opportunities for all, from early childhood to adult education;
- Ensuring equity, inclusion and gender equality;
- Ensuring effective learning and the acquisition of relevant knowledge, skills and competencies;
- Ensuring the relevance of learning, in terms of vocational and technical skills for decent work as well as for global citizenship in a plural and interconnected world.

SDG4's three underlying principles:

- **Education is a fundamental human right and an enabling right**. To fulfil this right, countries must ensure universal equal access to inclusive and equitable quality education and learning, which should be free and compulsory, leaving no one behind irrespective of their gender, disabilities, social and economic situation. Education shall aim at the full development of the human personality, and promote mutual understanding, tolerance, friendship and peace. Education should go beyond basic literacy and numeracy skills, and equip individuals with creative, critical thinking and collaborative skills, while building curiosity, courage and resilience.
- **Education is a public good**, of which the state is the duty bearer. Education is a shared societal endeavor, which implies an inclusive process of public policy formulation and implementation, in which civil society, teachers and educators, the private sector, communities, families, youth and children have important roles. The role of the state is essential in setting and regulating standards and norms.
- **Gender equality** is linked to the right to education for all. Achieving gender equality requires a right-based approach that ensures that boys and girls, women and men not only gain access to and complete education cycles, but are empowered equally in and through education.

Goal 5: Gender Equality

Gender bias is undermining our social fabric and devalues all of us. It is not just a human rights issue; it is a tremendous waste of the world's human potential. By denying women equal rights, we deny half the population a chance to live life at its fullest. Political, economic

and social equality for women will benefit all the world's citizens. Together we can eradicate prejudice and work for equal rights and respect for all.

Achieve gender equality and empower all women and girls

Empowering women and promoting gender equality is crucial to accelerating sustainable development. Ending all forms of discrimination against women and girls is not only a basic human right, but it also has a multiplier effect across all other development areas.

Since 2000, UNDP together with our UN partners and the rest of the global community has made gender equality central to our work, and we have seen some remarkable successes. More girls are now in school compared to 15 years ago, and most regions have reached gender parity in primary education. Women now make up to 41 percent of paid workers outside of agriculture, compared to 35 percent in 1990.

The Sustainable Development Goals (SDGs) aim to build on these achievements to ensure that there is an end to discrimination against women and girls everywhere. There are still gross inequalities in access to paid employment in some regions, and significant gaps between men and women in the labour market. Sexual violence and exploitation, the unequal division of unpaid care and domestic work, and discrimination in public decision making, all remain huge barriers.

Ensuring universal access to sexual and reproductive health, and affording women equal rights to economic resources such as land and property, are vital targets to realizing this goal. There are now more women in public office than ever before, but encouraging more women leaders across all regions will help strengthen policies and legislation for greater gender equality.

Gender equality is one of 17 Global Goals that make up the 2030 Agenda for Sustainable Development. An integrated approach is crucial for progress across the multiple goals.

SDG 9 Innovation and Infrastructure

Sustainable Development Goal 9 seeks to build resilient infrastructure, promote inclusive and sustainable industrialisation and foster innovation. This SDG encompasses three important aspects of sustainable development: infrastructure, industrialisation and innovation.

Infrastructure provides the basic physical systems and structures essential to the operation of a society or enterprise. Industrialisation drives economic growth, creates job opportunities and thereby reduces income poverty. Innovation advances the technological capabilities of industrial sectors and prompts the development of new skills. Inclusive and sustainable industrial development is the primary source of income generation, allows for rapid and sustained increases in living standards for all people, and provides the technological solutions needed for environmentally sound industrialisation.

Targets linked to the environment:

- **Target 9.1:** Develop quality, reliable, sustainable and resilient infrastructure, including regional and trans border infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all
- **Target 9.2:** Promote inclusive and sustainable industrialization and, by 2030, significantly raise industry's share of employment and gross domestic product, in line with national circumstances, and double its share in least developed countries
- **Target 9.4:** By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities
- **Target 9.a:** Facilitate sustainable and resilient infrastructure development in developing countries through enhanced financial, technological and technical support to African countries, least developed countries, landlocked developing countries and small island developing States.

Goal 16: Peace, Justice and Strong Institutions

The main aim of Goal 16 is to promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels.

Compassion and a strong moral compass is essential to every democratic society.Yet, persecution, injustice and abuse still runs rampant and is tearing at the very fabric of civilization. We must ensure that we have strong institutions, global standards of justice, and a commitment to peace everywhere.

The Targets

Everyone can help to make sure that we meet the Global Goals. Use these twelve targets to create action to promote peace, justice and strong Institutions.

TARGET 16.1 Reduce Violence Everywhere

Significantly reduce all forms of violence and related death rates everywhere.

TARGET 16.2 Protect Children from Abuse, Exploitation, Trafficking and Violence

End abuse, exploitation, trafficking and all forms of violence against and torture of children.

TARGET 16.3 Promote the Rule of Law and Ensure Equal Access to Justice

Promote the rule of law at the national and international levels and ensure equal access to justice for all.

TARGET 16.4 Combat Organized Crime and Illicit Financial and Arms Flows

By 2030, significantly reduce illicit financial and arms flows, strengthen the recovery and return of stolen assets and combat all forms of organized crime.

TARGET 16.5 Substantially Reduce Corruption and Bribery

Substantially reduce corruption and bribery in all their forms.

TARGET 16.6 Develop Effective, Accountable and Transparent Institutions

Develop effective, accountable and transparent institutions at all levels.

TARGET 16.7 Ensure Responsive, Inclusive and Representative Decision-Making

Ensure responsive, inclusive, participatory and representative decision-making at all levels.

TARGET 16.8 Strengthen the Participation in Global Governance

Broaden and strengthen the participation of developing countries in the institutions of global governance.

TARGET 16.9 Provide Universal Legal Identity

By 2030, provide legal identity for all, including birth registration.

TARGET 16.A Ensure Public Access to Information and Protect Fundamental Freedoms

Ensure public access to information and protect fundamental freedoms, in accordance with national legislation and international agreements.

TARGET 16.B Strengthen National Institutions to Prevent Violence and Combat Terrorism and Crime

Strengthen relevant national institutions, including through international cooperation, for building capacity at all levels, in particular in developing countries, to prevent violence and combat terrorism and crime.

TARGET 16.C Promote and Enforce Non-Discriminatory Laws and Policies

Promote and enforce non-discriminatory laws and policies for sustainable development.

<u>Sustainable Engineering Practices</u>

Sustainable engineering refers to the integration of social, environmental, and economic considerations into product, process, and energy system design methods. Additionally, sustainable engineering encourages the consideration of the complete product and process lifecycle during the design effort. Sustainable Engineering may be defined as engineering for human development that meets the needs of the present without compromising the ability of future generations to meet their own needs.

Sustainable engineering practices aim to minimize environmental impact, optimize resource use, and improve social and economic outcomes while meeting the needs of the present

generation without compromising future generations' ability to meet their own needs. These practices are increasingly critical in addressing challenges such as climate change, resource depletion, and environmental degradation.

Examples of Sustainable Engineering include: Using methods that minimize environmental damage to provide sufficient food, water, shelter, and mobility for a growing world population, designing products and processes so that wastes from one are used as inputs to another, incorporating environmental and social constraints as well as economic considerations into engineering decisions. Sustainable engineering is the process of using resources in a way that does not compromise the environment or deplete the materials for future generations. Sustainable engineering requires an interdisciplinary approach in all aspects of engineering and it should not be designated as a sole responsibility of environmental engineering. All engineering fields should incorporate sustainability into their practice in order to improve the quality of life.

True sustainability is more of a collective effort, upheld by the entirety of an organisation or team. That said, certain individuals tend to hold more weight, civil engineers being an excellent example. Because engineers are responsible for designing, building and supervising development projects, they have a lot of control over what's happening in regard to a job's requirements. They can help select and procure project materials and supplies, for example. They might also come up with efficient use of machinery and equipment to get a task done faster. Ultimately, the point is that engineers are mainly responsible for the efficiency and success of a project. When they adopt more sustainable practices, it's likely that the team's environmental impact will see a reduction too. Here are six of the key principles every engineer should keep in mind.

1. Use Resources Effectively: Non-renewable resources should be adequately and sparingly used, both to reduce their consumption and to cut down on waste. When resources are depleted considerably in an area, it's up to the engineers to ensure proper restoration.

2. Eliminate Excess Waste: Where applicable, more sustainable practices should be deployed to make use of renewable resources and honour minimal-footprint operations. Swapping to electric-only vehicles to cut down on fuel consumption and emissions is an excellent example of a change that will significantly cut down on waste.

3. Take Advantage of Renewable Resources: Instead of choosing conventional power for a build, planning to develop or tap into renewable energy sources can be remarkably beneficial. Solar, wind, geothermal and hydropower are great alternatives to fossil-fuel and coal-based power.

4. Remember Adaptability: Sustainability is also about the longevity of a project or process, particularly when it comes to withstanding changing conditions and natural or human-made disasters. Engineers should always consider these elements during the planning and work phases, ensuring that the necessary economic, environmental and social resources are available as needed. Building homes or other structures in a flood-prone area, for example, would call for appropriate precautions, like hurricane shutters on windows and doors and water-resistant designs. Proper erosion control and protection is a similar concern.

5. Consider Material Alternatives: In the process of acquiring materials for a job, there are innovative supply channels to consider. Recycled or reused materials, for example — such as steel, wood and concrete — can help repurpose what would otherwise be wasted. More importantly, applying them instead of procuring new, non-renewable alternatives is an intelligent use of existing resources.

6. *Digital and Smart Technologies for Sustainability: Engineers* can use AI, IOT, and big data for optimizing resource use in industries and cities and deploying block chain for transparent and sustainable supply chains.

7. *Pollution Control and Waste Management:* Engineers can implement air and water pollution control measures, such as scrubbers and bio filters, encourage zero-waste manufacturing and sustainable product design and use advanced recycling technologies to recover valuable materials from waste.

7. Do the Work Right: The longer a project takes to finish, the more materials used, the more waste builds up and the higher the labour costs. Not to mention, the impact of development on the surrounding community also grows exponentially. You see this a lot with infrastructure projects, where communal roadways and projects end up impacting not just the environment, but people too. It's crucial for engineers to plan out a project beforehand and manage it effectively throughout its life cycle. Cutting down on development time can be incredibly beneficial for everyone, including those who do the work. In the end, the real focus

should be to improve sustainability across the entire industry. It starts at a foundational level with engineers, yes, but that doesn't mean they should be the only professionals involved

__Points to remember__

Interdependent Relationship between Nature, Technology and Institutions

Nature gives us resources. The technology helps us to establish institutions (entities that augment economic development, like industries) to use such resources optimally. In the absence of resources, there can be no technology for the usage of resources and no institution either. In the absence of technology, such resources cannot be converted into a form that can be used for the institutions. Moreover, in the absence of institutions, neither can the resources be used nor can the technology be developed to use the sources.

Sustainable Development So Often Associated with Protecting the Environment

- Sustainable development is the practice of developing land and construction projects in a manner that reduces their impact on the environment by allowing them to create energy efficient models of self-sufficiency.
- This can take the form of installing solar panels or wind generators on factory sites, using geothermal heating techniques or even participating in cap and trade agreements.
- The biggest criticism of sustainable development is that it does not do enough to conserve the environment in the present and is based on the belief that the harm done in one area of the world can be counter balanced by creating environmental protections in the other.

What can I do, as a citizen, for development to be more sustainable?

Citizens already do many things for more sustainable development, often for environmental reasons. For example:

- by reducing your consumption of over-packaged products;
- by walking, bicycling or using public transit instead of your car;
- by sweeping your driveway instead of using the hose, by not watering your lawn, or by not letting the tap

- run to avoid wasting water;
- by choosing a more energy-efficient automobile.

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