



Role of Basic Sciences in Achieving Sustainable Development

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The declaration of the year 2022 as the “International Year of Basic Sciences for Sustainable Development (IYBSSDD 2022)” by the UN highlights the important role basic sciences can play in achieving the 17 Sustainable Development Goals (SDGs) as part of Agenda 2030. These SDGs address the various challenges mankind faces and are essential for improving the quality of life and well-being of the people of the world. Science, through new approaches and solutions to the various challenges relating to the SDGs, can be a driver and enabler of sustainable development in the world. There is a need through Education for Sustainable Development (ESD) to empower people to assume responsibility for creating and enjoying a sustainable future.

What is Sustainable Development?

In contemporary times, the concept of sustainable development has assumed great importance. This concept can be best understood by what Mahatma Gandhi once remarked: “*One must care about the world one will not see.*”

Sustainable development is a way of understanding the world and a method for solving global problems. The world population continues to rise rapidly and is expected to reach 8.6 billion by 2030. This increasing population needs basic essential things for survival such as food, safe water, health care and shelter. According to FAO, there will be 1.8 billion people with acute water scarcity in 2025.

Further, there is also a problem of continuing environmental degradation and climate change leading to rising sea-levels and increase in atmospheric temperature. This is where the concept of sustainable development comes into play. Sustainable development means ‘*meeting the needs of the present generation without compromising the ability of future generations to meet their own needs*’.

Sustainable Development Goals (SDGs) and Agenda-2030

The United Nations in 2015 adopted 17 Sustainable Development Goals (SDGs), also known as the Global Goals, as a universal call to action to end poverty, protect the planet, and ensure that by 2030 all people enjoy peace and prosperity. These SDGs constitute what is known as AGENDA-2030.

The 17 SDGs address the global challenges humanity faces such as poverty, hunger, inequality, climate change, energy, food, water resources, environmental degradation, etc. and are essential to improve the quality of life and well-being of the people across the world. One striking aspect of

Why Concern for Sustainable Development ?

Population Explosion

1950s: 2.7b
2000 : 6.1b
2021 : 7.8b
2050: 9.7b

Fast Depletion of Resources including Food, Minerals and other natural Resources

Water Scarcity FAO report:
By 2025
1.8 b people with **acute water scarcity**

Problem of Environmental Degradation

Climate Change
Rising Sea levels
Increase in atmospheric Temperature

What is Sustainable Development



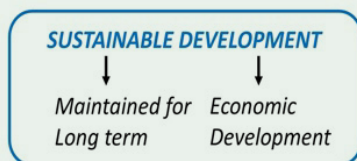
Sustainable → Something Which can be maintained for long period of time (For future generation)

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Development → Progress or Economic Development (for current generation)

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Sustainable Development → Development which meet needs of current Generation without compromising ability of future generation to meet their needs



these SDGs is that they are all integrated and inter-dependent and thus balance social, environment and economic sustainable development – the three pillars of sustainable development. These three pillars are informally referred to as people, planet and profits (3Ps) – also sometimes known as equity, ecology and economy (3Es).

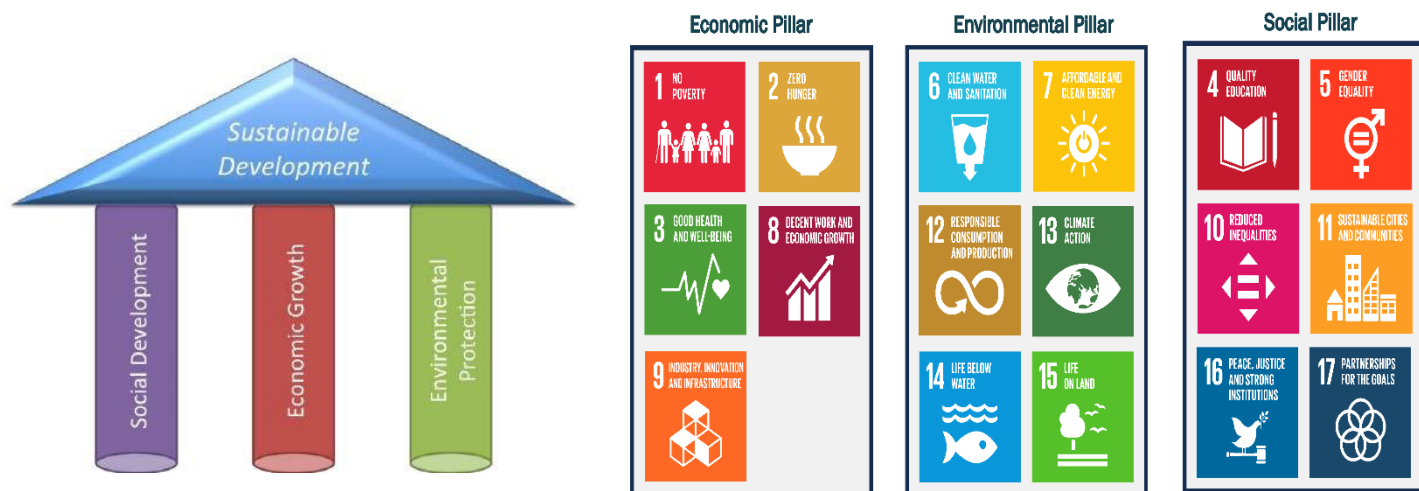
International Year of Basic Sciences for Sustainable Development-2022

The United Nations declared the year 2022 as the International Year of Basic Sciences for Sustainable Development (IYBSSD 2022). The official inauguration of IYBSSD 2022 was done on 8 July 2022 at the UNESCO headquarters in Paris. This declaration highlights the important role basic scientific disciplines such as physics, chemistry, mathematics and biology can play in achieving the 17 sustainable development goals (SDGs) adopted by the UN General Assembly.

IYBSSD 2022 proposes to encourage exchanges between scientists and stakeholders, be it grassroot communities or political decision-makers and international leaders, associations, students and local authorities. Throughout the year, researchers from all disciplines have been reaching out to the general public and decision-makers, both public and private, to support the development of basic sciences,

193 countries including India are signatory to this UN Agenda 2030





particularly in areas where they are still underdeveloped. If this amalgamation takes place, the strategies and policies that are adopted to effect the SDGs will have results that improve people's lives.

Basic Sciences for Achieving SDGs

The thinking behind declaring 2022 as IYBSSD is that science is critical to help meet the challenges for sustainable development as it lays the foundation for new approaches, solutions and technologies to identify, clarify and tackle global challenges for the future. As the nature and the depth of the challenges relating to sustainable development vary from region to region, there can be no single road map for achieving these 17 SDGs. However, scientific research and technology can play a key role, directly or indirectly.

Some of the SDGs that benefit directly from advances in basic sciences and technology are being elaborated below.



Goal 2, Zero hunger: In respect of this goal, scientific research needs to focus on protection of plants from pest infestations, ways to improve food production and minimize food spoilage, extend the shelf life of food through advances in packaging, and maintain food quality and safety. High-yield

seeds in combination with new approaches to fertilization can help increase food production and help to reduce soil erosion. Fortification of food and crop can help combat malnutrition in areas with limited access to healthy foods. As an application for the Internet of Things, networks of sensors could help farmers decide when to use precious water resources to water their crops, helping to promote sustainable agriculture.



Goal 3, Good health and well-being: An understanding of how human health is impacted by diseases and hazardous chemicals in food, water and environment and looking for innovative solutions for reducing pollution should be the focus areas of scientific

research. Science can play a critical role in medical diagnosis and drug development, enabling people to live longer and healthier lives. Science, especially chemistry can offer new solutions for reducing pollution and its impacts on human health. The application of green and sustainable chemistry can help eliminate or reduce hazardous chemical pollution. Further, the recently proposed computer model of climate and disease interactions that provides reliable forecasts of malaria outbreaks allows health workers and planners to react in a timely manner to reduce the severity of the outbreaks.



Goal 6, Clean water and sanitation:

In view of increasing shortfall in fresh water resources in the world coupled with a rising population, there has been a growing challenge of water scarcity throughout the world. Scientists can help society meet the clean water and sanitation goal in several ways. New

methods of water purification and lower cost desalination processes can contribute to achieving universal access to safe and affordable drinking water. Water quality can be improved through the deployment of greener technologies and pollution prevention strategies. Research is also needed to find new low-energy, high-efficiency separation methods for removal of metals and micropollutants. The chemical industry can work toward manufacturing practices that minimize water usage and waste management practices that avoid pollution. It also needs to be investigated how climate change will affect water resources.



Goal 7, Affordable and clean energy:

Basic research is needed to develop newer materials for renewable energy, advancing cleaner fuel technologies and improved manufacturing efficiency in chemical industries. A major issue with renewable energy production is the use of scarce and/or hazardous materials for solar and wind conversion, and

energy storage. Researchers are working on the development of Earth-abundant advanced materials for renewable energy production, including photovoltaics, wind turbines, thermal

energy collection, batteries, supercapacitors and energy storage solutions. Chemical processing industries can improve manufacturing efficiency through new catalysts, optimized process design, and new separations processes. Research also needs to be done to address the scientific challenge of providing cheap and clean energy to the world by looking for alternative ways to harvest the Sun's energy. The goal is to find a way to make solar cells economically viable for developing countries.



Goal 9, Industry, innovation and infrastructure: This goal seeks to build resilient infrastructure, promote inclusive and sustainable industrialisation and foster innovation. Realizing this goal by 2030 will require scientific research to focus on overcoming resource constraints, building and strengthening

developing countries' capacities, and exploring innovative ways to solve development challenges. Scientists should strive to conduct research that has an impact beyond the lab and can be useful to policymakers.



Goal 13 (Climate action): Climate change is affecting every country on every continent. It is disrupting national economies and affecting lives. Weather patterns are changing, sea levels are rising, and weather events are becoming more extreme. Advances in atmospheric

chemistry to understand causes of global climate change, ways to mitigate and adapt to climate change, advanced materials for renewable energy, developing high yielding seeds and fertilizers for increased food production to combat climate change can be a big help. Similarly green chemistry research can help a great deal in sustainable development by designing chemical products and processes that reduce or eliminate the use or generation of hazardous substances.

India and UN SDG Report 2022

India has taken many initiatives that directly or indirectly help in achieving SDGs. These include amongst others *National Health Policy (NHP)-2017*, *National Education Policy (NEP)-2020*, *Swachh Bharat Mission (SBM)-2014*, *Beti Bachao Beti Padhao (BBBP)-2015*, *Pradhan Mantri Awas Yojana (PMAY)-2015*, *Pradhan Mantri Jan-Dhan Yojana (PMJDY)-2014*, *Deen Dayal Upadhyay Gram Jyoti Yojana (DDUGJY)-2015* and *Pradhan Mantri Ujjwala Yojana (PMUY)-2016*. India has also recently imposed a ban on single-use plastic items and thus set a global example in the fight against plastic pollution.

Despite all this, India's performance is still far from satisfactory. India's SDG preparedness ranking continues to decline. India ranks 180 in the 2022 Environmental Performance Index (EPI) and 121 in the 2022 Sustainable Development index.

According to the recent UN SDG Report 2022, which provides a global overview of progress on the implementation of the 2030 Agenda for Sustainable Development, the corona pandemic, climate and geopolitical crises (3Cs) are





Environmental Performance Index 2022

India Ranks 180

India Ranks 121 in UN SDG Report 2022

Education for Sustainable Development (ESD) is recognized as an integral part of SDG-4 on Quality Education and a key enabler of all other SDGs



jeopardizing the achievement of Agenda 2030 and pushing millions of people into extreme poverty all over the world. The Report details the reversal of years of progress in eradicating poverty and hunger, improving health and education, providing basic services, and much more. It also points out areas that need urgent action in order to rescue the SDGs and deliver meaningful progress for people and the planet by 2030.

In India, there is a lack of awareness about SDGs among the masses. There is a need for 'Education for Sustainable Development' (ESD) with focus on developing the knowledge, skills, perspectives and values to empower people of all ages to assume responsibility for creating and enjoying a sustainable future. ESD is also recognized as an integral part of SDG-4 on Quality Education and a key enabler of all other SDGs.

SDGs need to be made a part of curriculum both at school and higher education levels. Besides, both teaching-learning and research also need to be aligned with the SDGs. Researchers need to be aware of the challenges of sustainable development and should align their research work to meet



What is Education for Sustainable Development (ESD)?

"It seeks to develop the **knowledge, skills, perspectives** and **values** to empower people of all ages to assume responsibility for creating and enjoying a sustainable future."⁽¹⁾

ESD is also a process of **learning how to make decisions** that consider the long-term future of the **economy, ecology** and **equality** of all.

the SDGs through locally relevant and globally competent research work. With only eight years left to meet these SDGs, it is imperative that India integrates sustainable development with education as quality education can go a long way in helping achieve the SDGs and enjoying a sustainable future.



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