Integration of Science, Technology and Innovation for better human life

Science & Technology in everyday life

Professor Freeman J. Dyson, of Institute of Advanced Studies, Princeton, in his book "Infinite in all Directions," had this to say about Technology: *"Technology is a gift of God. After the gift of Life, it is perhaps the greatest of God's gifts. It is the mother of civilization, of Arts and of Sciences. Technology continues to grow to liberate mankind from the constraints of the past. The most revolutionary aspect of technology is its mobility. Anybody can learn it. It jumps easily over barriers of race and language. And its mobility is still increasing."*

- Developments in science and technology are fundamentally altering the way people live, connect, communicate and transact, with profound effects on economic development.
- To promote tech advance, developing countries should invest in quality education for youth, and continuous skills training for workers and managers.
- Science and technology are key drivers to development, because technological and scientific revolutions underpin economic advances, improvements in health systems, education and infrastructure.
- The technological revolutions of the 21st century are emerging from entirely new sectors, based on micro-processors, tele-communications, bio-technology and nano-technology.
- Products are transforming business practices across the economy, as well as the lives of all who have access to their effects. The most remarkable breakthroughs will come from the interaction of insights and applications arising when these technologies converge.
- Through breakthroughs in health services and education, these technologies have the power to better the lives of poor people in developing countries. Eradicating malaria, a scourge of the African continent for centuries, is now possible.
- Cures for other diseases which are endemic in developing countries are also now possible, allowing people with debilitating conditions to live healthy and productive lives.
- Access and application are critical. Service and technology are the differentiators between countries that are able to tackle poverty effectively by growing and developing their economies, and those that are not.
- The extent to which developing economies emerge as economic powerhouses depends on their ability to grasp and apply insights from science and technology and use them creatively. Innovation is the primary driver of technological growth and drives higher living standards.
- As an engine of growth, the potential of technology is endless, and still largely untapped in Africa and other developing world regions across the globe. Less developed countries not only lack skilled labour and capital, but also use these less efficiently.
- Inputs account for less than half of the differences in per capita income across nations. The rest is due to the inability to adopt and adapt technologies to raise productivity.

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- Computing for example, through unlocking infrastructure backlogs and managing integrated supply chains, can transform economic performance by enabling affordable and accessible services in education and healthcare.
- The combination of computers and the Internet, and mobile devices and the "cloud", has transformed human experience, empowering individuals through access to knowledge and markets, changing the relationship between citizens and those in authority, as well as allowing new communities to emerge in virtual worlds that span the globe

Role of science and technology for future development

- The role of science and technology in a future Indian society may be broadly stated as one of meeting felt needs by technological innovation and scientific advancement and of realizing long-term national goals for the next century. These goals fall under the following headings:

1. **To ensure national security and social stability-**

- For a country like India, conserving energy and oil-substitutable energy is vital. Food technology is similarly important to maintain social stability.
- Science and technology are expected to play a vitally important role in ensuring national security and social stability.

2. **To sustain the growth of the national economy and to improve its efficiency**

- In the past, technological progress made only a minor contribution to the growth of national income, and this should be changed.
- Furthermore, the technological gap with developed countries should be reduced in certain strategically selected areas.

3. **To prepare for a smooth transition to an information society**

- Societal change to an information society will demand the development of information-related industries centred around micro-electronics, communications, computers, etc.
- Moreover, reducing the labour component of production systems through automation technology will require re-education of displaced labour.

4. **To improve the quality of life**

- Technology in areas of public health such as disease control, medicine and medical electronics needs to be developed.
- Another area is the protection of the environment for better dwelling conditions on the one hand, and for increased productivity of the land on the other.
- Development of information technology directly related to daily living, it should be noted, will increase social benefits, and this in turn will help reduce urbanization.
- The preference for urban living will disappear with the development of an information system on a nationwide scale.

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5. **To create a new culture suitable for the new society**

- A conflict between traditional cultural values and progressive contemporary values has existed in Indian society during the recent process of industrialization.
- A national consensus should be created for the development of science and technology.
- Another far-reaching goal of science and technology is the creation of a new culture for the next century

Long-term goal of S&T development

- The long-term goal of science and technology should be in accordance with that of national development.
- Because of the limitation in available resources, priority areas should be established through consideration of, among other things, national needs and comparative advantage.
- The role of S&T is to lead national development and to support socio-economic needs.
- The priority areas that have been identified are:
- Development of electronics, information, and communication technologies.
- Development of selected high technologies to lead the industrial structure adjustment.
- Development of key technologies to increase the international competitiveness of existing Korean industries.
- Development of technologies related to resources, energy, and food for social and economic stability.
- Development of technology in the area of health care, environmental protection, and social information systems to improve the quality of life and social benefits.
- Fostering of creative basic research to promote scientific advancement and to expand sources of technological innovation.
- These priority areas were identified using the following basic criteria:
    - Economic return and growth potential in view of limited development resources.
    - Probability of success in view of development capability and experience.
    - Indispensability in relation to national security and socio-economic stability.
    - Industrial and technological linkage.
    - Future contribution in relation to public welfare and new industrial possibilities.

Science and Technology Role in Industrial Development

- India is aggressively working towards establishing itself as a leader in industrialisation and technological development.
- Significant developments in the nuclear energy sector are likely as India looks to expand its nuclear capacity. Moreover, nanotechnology is expected to transform the Indian pharmaceutical industry.
- The agriculture sector is also likely to undergo a major revamp, with the government investing heavily for the technology-driven Green Revolution.
- Government of India, through the Science, Technology and Innovation (STI) Policy-2013, among other things, aspires to position India among the world's top five scientific powers.

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- Industrial development encourages the development of science and technology. The industrial enterprises conduct research and develop new products. Ethanol in the form of biofuel is an example of industrial development.
- Industry conducts research on its wastes and develops byproducts like biodiesel from Jatropha seeds.
- Due to industrialisation, we have made progress in atomic science, satellite communication and missiles etc

Government Initiatives

- A five year technology fund with US$ 4 million yearly investment, called Israel India Innovation Initiative Fund (I4F), has been launched by India and Israel to boost bilateral ties.
- Mr Nitin Gadkari, Minister for Road Transport, Highways and Shipping, Government of India, is planning to introduce biofuel vehicles for road and water transportation on a large scale and has already directed Niti Aayog to conduct a research on methanol-powered vessels like cars and ships developed by China.
- The Department of Science and Technology (DST), Government of India has launched a scheme named 'Visiting Advanced Joint Research Faculty' (VAJRA), in a bid to bring together the Indian scientists abroad and India-based researchers for conducting joint researches in India.
- The Government of India aims to develop India into a global innovation hub by 2020 on the back of effective government measures taken to provide an enabling environment for growing research and development in India, says Mr Y. S. Chowdary, Minister of State for Science and Technology & Earth Sciences, Government of India.

Developments/Investments:

- With support from the government, considerable investment and development has incurred in different sectors such as agriculture, healthcare, space research, and nuclear power through scientific research.
- For instance, India is gradually becoming self-reliant in nuclear technology.
- Recently, the Kudankulam Nuclear Power Project Unit-1 (KKNPP 1) with 1,000 MW capacity was commissioned, while the Kudankulam Nuclear Power Project Unit-2 (KKNPP-2) with 1,000 MW capacity is under commissioning.

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Role of Science and Technology in Urbanisation

- Urbanization is a key environmental issue as well.
- The rapid pace at which urbanization is taking place in the developing world has an impact on climate change and other global environmental issues.
- Cities account for more than two-thirds of the global energy demand and result in up to 80 per cent of global greenhouse gas emissions.

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- The urban planning and investment choices that a few large developing countries will make therefore represent one of the most important environmental issues of the twenty-first century.
- Entire new industries are forming with the aim of switching to clean and renewable energies and managing the world's resources in a more efficient manner, primarily in developed countries but also in the developing world.

Role of science, technology and innovation in the urban context

- Science, technology and innovation are key elements of sustainable urbanization and will play a growing role as such. Their use may not solve all urbanization problems, yet can provide a multitude of solutions that can be leveraged by cities.
- The use of science, technology and innovation in the urban context implies the application of both high and low technology and innovative approaches to urban planning and institutional innovation.
- Science, technology and innovation approaches are widely available for cities to draw upon, yet cities are complex structures that require integrated responses to their problems and there are sometimes difficulties related to such integration.
- Urban systems need to be designed with multiple uses in mind. Science, technology and innovation offer a range of related options, including high technology, low technology and innovative governance.
- Combining science, technology and innovation to solve urban problems is often contextual, although there are several good practices to draw upon from cities across the globe.
- Science, technology and innovation contribute to sustainable urbanization in a variety of ways, including with regard to new capabilities in spatial planning, socioeconomic research, and enhancing cooperation between urban departments, optimizing mobility and enabling sustainable resource management.
- A science, technology and innovation-oriented mindset also brings about innovative models of thinking in urban governance, such as for participatory budgeting and regional urban planning.
- Finally, science, technology and innovation contribute to social inclusion by improving the tools available to urban planners to respond to the needs of excluded groups and to increase sensitivity to gender equality.
- Each urban setting faces different challenges and has different technology needs. In some cases, inexpensive and readily available technologies may be the best solution to urban problems.
- For example, intermodal transport services can be designed without necessarily requiring expensive high technology means of transport.
- Promoting bicycles, an affordable, healthy, clean and energy-efficient technology, may be the best option to improve mobility in many cities, for both younger and older citizens.
- Furthermore, innovation, which in the urban context may refer to any new method, business model, policy, institutional design or regulation, could meet the needs of urban populations in a more efficient, effective and sustainable way.

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