

✚ **Smart Infrastructure & Intelligent Transport Systems:**

The infrastructure has evolved from muscle power based bullock cart in Iron Age, to sensors based systems in present automation age. The recent break-through technologies in sensing, energy efficiency and emphasis on maintaining the ecology of the earth has truly made the present age infrastructure “Smart”. Today, every manufacturing processes bring to its realm energy efficient and environment friendly techniques, contributing towards making its infrastructure an epitome for future generations.

- **Improving Green Cover:** Industrialization has led many countries to emerge as economic powerhouse, by large scale cutting of trees. Green cover on the planet is essentially an important component in preserving the ecosystems. Recent changes in climate calls for increasing green cover in every region of planet.
- **Intelligent Transport Systems (ITS):** In its arena, ITS, includes innovative services relating to various modes of transport and enable users to keep a better check on availability and make a coordinated and smarter use of transport networks.
- **Disaster Management:** In spite of progressing many strands in prediction techniques about the natural disaster, we must develop proactive measures against the risk of various disasters. Hence, continuous research in management plans and disaster prevention techniques is a must for any project of infrastructure which helps prevent vulnerability to other risks.
- **Water Harvesting:** Over-Irrigation and Under-Irrigation in different regions has led to depletion of water resources. Therefore, an effort can be made to collect rain water that can be utilized judiciously to enhance ground water capacity.
- **Infrastructure Updation and Maintenance:** Infrastructure maintenance plays vital role in sustaining life of the assets or provision of the services at minimum possible costs. Various techniques help preserve and extend the service life and leads to improvement in the quality of life.

✚ **Sustainable Development:**

The development which ushers the new era of infrastructure have to be a process which takes an estimate of the resources needed by the future generations, reserving their share while meeting the present needs of resources. It include the emergence of technologies which exploit the optimum natural renewable resources available to mankind. Sustainable development should be a caretaker of natural environment habitats and economic efficiency of the projects. It brings a set of transformations which sets in a harmony of present and future needs of natural resources and the direction of the technological advancements.

- **Water Energy Nexus:** The amount of water needed to produce as well as channelize energy leads to the amount of energy needed to bring, store, clean and dispose of water, plays a cyclic and vital role in sustainable development. It establishes the inter-dependence between Water for Electricity and Electricity for Water.
- **Zero Discharge:** Zero Discharge concept focuses on the building structures and systems that collect the energy resources on its own and make the optimum re-use of the processed resource to make it compatible again for its assigned task, thus reducing the consumption of external supply of energy. The concept propagates the intensive use of renewable sources of energy.
- **Effluent Treatment Technologies to achieve Zero Spent Wash Discharge (ZSD):** Deleterious pollution has increased the requirement of energy along with the rising cost of water. Development of a suitable technology with lower investments, higher energy recovery and effluent treatment efficiency have enabled distilleries to attain Zero Liquid Discharge. ZSD can lead to minimal pollution in surface water bodies.
- **Power Quality and Energy Efficiency:** Power quality focuses on the compatibility between the electrical system and the equipment it powers and the devices that share its distribution space. Energy efficiency addresses the management and restraint over the growth in energy consumption. The devices delivering more services for the same energy consumed as conventional devices are the target of Energy Efficiency programme.
- **Restoration of Eco-systems:** Ecological restoration is an international activity that initiates or accelerates the recovery of an ecosystem with respect to its health, integrity and sustainability. It represents scientific study supporting the practice of ecological restoration, which is the practice of renewing and restoring degraded, damaged or destroyed ecosystems and habitats in environment by active human intervention and action.

- **Harvesting Energy:** Energy harvesting is the process by which energy is derived from external sources (e.g. solar power, thermal energy and wind energy) captured or stored for small, wireless autonomous devices, like those used in wearable electronics and wireless sensor networks.

✚ **Information & Communication Technology (ICT):**

ICT, in particular, are reshaping many aspects of world's economies, governments and societies. ICT refers to bundle of technologies capable of handling telecommunications, broadcast media, intelligent building management systems, audiovisual processing, transmission systems, network-based control and monitoring functions.

- **Smart Grid:** It is a holistic solution to reduce electricity waste and energy costs. Smart grid involves smart metering which empowers electricity consumers to use energy, based on price signals given, as rates fluctuates. The development of the smart grids has ceased the power thefts.
- **Novel Sensors & Monitoring Systems:** A new method of continuously monitoring the status of machinery is currently being developed. The mobile tablet-based system supplies information on the operational state of various infrastructure systems and can inform operators if a part needs to be replaced or if a repair can be postponed. The system uses sensors that continuously acquire data on parameters such as vibrational frequency or temperature. Relationship between sensor signal patterns and incipient malfunction or damage is used by the engineers to teach the system so that in future it will be able to identify these states automatically.
- **Flood Control Monitoring:** For many communities, monitoring of rainfall and water levels is key for prevention of property damage and loss of life. Although, we are able to forecast rainfall or to track storm path very precisely from the satellite images, the need to have real-time monitored data such as flow, precipitation level, or water level is essential in order to make a reasonable decision on the actions necessary to be performed to mitigate flood and/or to prevent flooding of drains.
- **Smart Vehicle Systems:** Instead of using humans to monitor and react to traffic flow, the new signals use radar sensors and cameras to detect traffic, and sophisticated algorithms to instantly adjust signals based on real-time conditions and develop algorithms that allow major transportation agencies to use high-resolution models of traffic to solve optimization problems.

Feasibility & Finance

- **Investment in Infrastructure:** Of all the problems that we face in today's world, like low standards of living, improper facilities & amenities and unreliable security, investment in infrastructure is a solution common to all such grievances as it may not only help in building up new facilities but also in improving the conditions & elevating the status of already existing establishments.
- **Develop V/s Redevelop:** The motive of giving our great nation self-sustaining, efficient smart cities corners us before a dilemma. We find ourselves facing a crossroad showing two possibilities to achieve our utopic dream. For the effective overall development we may either develop plans for new cities guided by the ideology of smart cities, or we may redevelop our already growing cities to be molded to achieve the same.
- **Case Studies, Business Models and Innovative Applications for Smart(er) Cities:** Smart cities is a clearly defined term but at the same time it is also a very fluid one, as there exists no rigid constriction as to only what makes a city smart & is thus ever open to innovative suggestions, which can help achieve final effectiveness & self-sustainability.
- **Planning & design challenges for Smart cities:** Successful establishments of smart cities is easier said than done, as it not only asks for effectiveness but also self-sustainability & the capability to help elevate the surrounding cities. It's a newer approach towards development, a greener approach, and so can be expected to bring unforeseen challenges & hindrances which must be brainstormed beforehand for a more probable success.