Preface

This is our 21st edition of Yojana Gist and 12th edition of Kurukshetra Gist, released for the month of December, 2016. It is increasingly finding a place in the questions of both UPSC Prelims and Mains and therefore, we've come up with this initiative to equip you with knowledge that'll help you in your preparation for the CSE.

Every Issue deals with a single topic comprehensively sharing views from a wide spectrum ranging from academicians to policy makers to scholars. The magazine is essential to build an in-depth understanding of various socio-economic issues.

From the exam point of view, however, not all articles are important. Some go into scholarly depths and others discuss agendas that are not relevant for your preparation. Added to this is the difficulty of going through a large volume of information, facts and analysis to finally extract their essence that may be useful for the exam.

We are not discouraging from reading the magazine itself. So, do not take this as a document which you take read, remember and reproduce in the examination. Its only purpose is to equip you with the right understanding. But, if you do not have enough time to go through the magazines, you can rely on the content provided here for it sums up the most essential points from all the articles.

You need not put hours and hours in reading and making its notes in pages. We believe, a smart study, rather than hard study, can improve your preparation levels.

Think, learn, practice and keep improving! That is the key to success ☺

Creating Infrastructure For Rural Prosperity

Background

India's economic journey from an impoverished nation to one of the fastest global economy has inspired many other developing nations. This rapid economic development has been possible with the contribution from every sector of the Indian economy.

With huge population still living in rural India, rural development plays an important factor for growth of the Indian economy. Rural India is yet to play big role in India's economic voyage and there is dire need for future investments in the rural areas of India to decrease urbanisation and increase employment in small towns and villages.

The economic prosperity of rural India can only be achieved if the critical issues of physical connectivity, electronic connectivity and knowledge connectivity are addressed effectively.

Infrastructure

Infrastructure unlocks the huge potential of the population which is presently wrapped in poverty and its associated deprivations. An analysis of the incidence of poverty across the states depicts that poverty is very closely related to the absence of social infrastructure. The 11th Finance Commission had constructed an index of infrastructure which included economic, social and administrative infrastructure indicators and found that incidence of poverty is low where index of infrastructure is high.

For example, in Punjab, the index of infrastructure is highest and thus the incidence of poverty is lowest at 9.5%.

Urban and rural infrastructural development

While urban India has seen good progress in recent years, the small towns of India continue to lag behind. There are many challenges faced by rural areas including poor road connectivity, primary healthcare system, educational infrastructure and affordable housing.

Rise in Indian exports, industrial development and adoption of modern technologies have mostly helped in generating additional employment in urban areas and rural areas have been left out. Despite the growth of services and other sectors, Indian economy is dependent on agrobased activities with it being the largest (67%) livelihood provider in India. But it adds only 37% to GDP. A majority of rural families spend over 90% of their earnings on basic needs such as food, fuel and health care.

The primary hindrance to growth in rural productivity and subsequent economic growth is lack of basic infrastructure such as electricity, clean water and sanitation.

Hence, the government has placed great emphasis developing rural infrastructure through various schemes.

Connectivity

- There exists a positive relation between connectivity and development in villages in India.
- With better roads and highways, there will be better flow of communication, business and trade.
- A large part of India, especially mountainous areas and remote villages are cut off from the network of roads.
- Though government has allocated thousands of crores for building strong roads, several projects across the country have seen slow progress over the years severely impacting the economic progress of the small towns.

Pradhan Mantri Gram Sadak Yojana

- It is a centrally sponsored scheme which aims to connect remote hamlets to highways.

Benefits

- Due to these roads, now it is possible for producers of perishable products such as milk, fish and vegetables to sell these to a wider base of consumers in nearby towns.
- These roads have assisted in contributing towards the achievement of India's targets for the MDGs relating to poverty reduction and removal of hunger by way of increasing agricultural production and creating job opportunities not only in construction sector but also in primary and secondary sectors of rural economy.
- The PMGSY roads have not only provided both direct and indirect benefits to village community but also greatly benefited to women in terms of more informed choices at their levels and easier access to the outer world.

Housing

- Pradhan Mantri Awas Yojana is a central scheme which strives to ensure that people get a house within their financial capability.
- Launched in 2015, it aims to ensure that 3 crore houses are built across India in next 7 years. The payout per household is Rs. 1.2 lakhs.
- The housing scheme will have linkages with Swachh Bharat Abhiyan to ensure toilets each house with provision of an additional allocation of Rs. 12000 per household.

- This will be coupled with 90-day wage provided under MGNREGS, adding another Rs. 18000 to each household.
- In rural areas, it is called Pradhan Mantri Awas Yojana- Gramin, which was launched in 2016 as a flagship rural housing scheme which is much wider in its scope. It targets to provide pucca houses with in-built basic amenities to all the roof less households and households living in kutcha and dilapidated houses by 2022.
- Its motto is to provide 'House for All' in rural areas.

Electrification

- Pandit Deendayal Gram Jyoti Yojana was launched in 2015 for power sector reforms in rural areas with a view to ensuring round the clock electricity supply to farmers and rural households.
- The new scheme focuses on feeder separation (rural households and agricultural) and strengthening of sub transmission and distribution infrastructure, including metering at all levels in rural areas which includes feeder points, feeders and distribution transformers.
- It is a flagship programme of Power Ministry and will facilitate 24X7 electricity supply.
- The government has electrified over 7000 villages in 2015-2016 which is 37% higher than previous three years.
- Nearly 30 crore people in rural India lack access to grid-connected power, promoting use of archaic sources of energy such as kerosene, diesel, wood-fired chulhas etc. which results in huge government subsidies and also substantial health and environmental hazards.
- Here, Solar power offers an opportunity to bridge this massive infrastructure gap and improve the social, economic, environment and health indicators of 30% of India's population.

Digital India

- Technology will play a significant role for access to quality education, healthcare and financial services in empowering people in non-urban and rural areas.
- PM plans to provide government services online, expand internet connectivity to rural areas and boost manufacturing of electronic goods in the country.
- For this, the Digital India programme is going to help in bridging the rural-urban digital divide through focused initiatives.

- Strengthening digital infrastructure in rural areas is major focus area under Digital India programme. There are various schemes launched under Digital India.
    - **Bharat Net Programme**- aims to establish a high-speed digital highway to connect all 2.5 lakh gram panchayats.
    - **Next Generation Network**- it is a BSNL project to contribute to modernisation of the telecom infrastructure in rural areas.
    - **WiFi hotspots**- to set WiFi hotspots all over the country to accelerate provision of broadband connectivity
- Farmers are experiencing change in their lives through mobile and internet connectivity. They will get weather information such as rain, wind speed etc. by using features like SMS, helplines, voice messages etc.
- The National Digital Literacy Mission proposes to provide ICT training to 10 lakh persons initially, one in every eligible household in selected blocks in each state/UT.
- Central government also plans to launch Rs. 1800 crore Digital Literacy Mission for 6 crore people in rural areas to bridge the gap between those who have access to and can use computers and internet and those who don't.
- Also, the central government is all set to digitally connect all rural post offices by March 2017.
- Thus, by 2019, Digital India envisages that 2.5 lakh Indian villages will enjoy broadband connectivity and universal phone connectivity.

Drinking Water

- Government is making continuous efforts to provide drinking water to all the citizens, especially to rural population.
- The main source of savouring water in India varies from place to place, time to time, area to area and state to state. The use of source relies on changed geo-climatic conditions that India has.
- The proximity and availability of drinking water sources provide a picture of quality of rural people. The proximity of

Table-5: Main Sources of Drinking Water in Rural India (as per cent of Households)

S. No	Sources	2001	2011	Changed (in per cent)
1	Tap Water	24.3	30.8	+26.74
2	Hand Pump/ Tube Well	48.9	51.9	+6.13
3	Well Water	22.2	13.3	(-)40.09
4	Other Sources	4.5	4.0	(-)11.11
5	**Total**	**100**	**100**	

(Source: Census of India-2011, GoI)

drinking water availability is based on three categories: within the premises (35%), near the premises- within 100 meters (42.9%) and away from premises (22.1%).

- Although, drinking water by source and availability has improved over the years due to the continuous efforts of the government, still much is needed to be done to make drinking water available to all rural households on a sustainable basis, considering the adverse effect of climate change on water table.

Health Care

- Though rural population (68.84%) is more than twice than the urban population (31.16%), the irony of the health system since independence is the basic health care facilities and policies are urban centric. All the main and reputed hospitals are mainly located at the state capital and the district HQ.
- In India, there have been two landmark initiatives with regard to health care structure
    - **Bhore Committee, 1946**- it stated that every citizen of India should get the basic health care regardless of their paying capacity. It was a clear message to the newly established post-independence Government of India to take care of the population with the provision of basic health care facility.
    - **Alma Atta Declaration**- it guided all the governments to frame their health care policies.
- The major health policy in India came into effect as National Health Policy in 1983 which was after 36 years of independence. This clearly showed that the government focus was not primarily on the health of the people.
- The NRHM seeks to provide accessible, affordable and quality health care to the rural population, especially weaker sections.
- Key features- making public health delivery system fully functional and accountable to the community, human resources management, community involvement, decentralisation, rigorous monitoring and evaluation against standards, convergence of health and related programmes.

Various Health Care programmes by GOI

1. National Vector Borne Disease Control Programme (NVBDCP)
2. School Health Programme
3. Operational Guidelines / Financial Guidelines
4. Prevention & Control of Non Communicable Diseases
5. Pilot Programme on Prevention and Control of Diabetes, CVD and Stroke
6. National Programme for Prevention and Control of Deafness
7. Universal Immuization Programme
8. National Cancer Control Programme
9. National Aids Control Programme
10. National Mental Health Programme
11. National Iodine Deficiency Disorder Control Programme
12. National Programme for Control of Blindness
13. Revised National TB Control Programme (RNTCP)
14. National Leprosy Eradication Programme
15. National Filaria Control Programme
16. National Tobacco Control Program

Milestones in health care policies

Policy	Year
Health Survey and Development Committee (HSDC) also known as Bhore Committee	1946
National Family Planning Programme (NFPP)	1952
Alma Ata Declaration	1978
National Health Policy (NHP)	1983
Universal Immunisation Programme (UIP)	1985
Reproductive Child Health (RCH)	1996
National Population Policy (NPP)	2000
National Health Policy (NHP)	2002
National Rural Heath Mission (NRHM)	2005

Education

- Rural education is very important as majority of Indians still live in villages.
- Number of rural students attending school is increasing and 96% of children in age group of 6-14 years are enrolled in a school.
- For a strong India, the foundation has to be laid in primary schools and rural areas.
- RTE made education a fundamental right of every citizen of India. But, access to and quality of education is a huge challenge, especially in rural areas as aleast 32% of India's current population is under 15 years.

The education requires robust school infrastructure which includes

- A school building should have 2 acres or permitted measurement of land having a school building and playground.
- The teaching staff has to be adequate as per requirements of the school. Some government schools in rural areas are overly packed with students, leading to a distorted teacher student ratio. Then it becomes difficult for the student to pay full attention towards each and every student.
- There should be a spacious and well equipped library with minimum 1500 books and 15 magazines.
- There should be one computer lab with minimum 10 computers or computer student ratio at 1:20 and internet connection. For this, there should be proper electricity connections in the schools as in absence of it, it is not possible to operate such tools. The internet connection in remote areas will help the students with the facility of smart classed and virtual class rooms.
- Adequate facilities for recreational activities and physical education as well as conduct of various activities for social, cultural and moral development of students should be provided.
- Science labs for secondary students or separate physics, chemistry, biology labs for senior secondary should be available.
- Separate toilet blocks for boys and girls to be installed as per norms. A closed container for disposal of sanitary napkins to be provided within each cubicle for girls. Swachh Vidyalaya Abhiyan is one initiative which is proving to be revolutionary for improving the sanitation facilities in rural schools.
- Safe drinking water source inside the school premises is mandatory.
- There should be proper connectivity to the school which is currently lacking leading to lower attendance of students living in difficult terrain. For this, the road connection schemes should be diligently implemented to support the students attend school.

- An indirect way to encourage parents to send their children to school is to increase employment opportunities in rural areas. If the parents are able to get employment, they will send their children to study instead of sending them to do menial jobs to support household livelihood.
- The schools should be temples of learning where each student has the opportunity to learn and hone their skills. Initiatives like Skill India, PM Kaushal Vikas Yojana are modern ways of imparting education.

Hence, emphasis should be on providing infrastructural support to all existing schools and to ensure quality education rather than increasing the number of schools.

Rural Development in North East

- India's North East Region is endowed with huge untapped natural resources and is acknowledged as the eastern gateway for the country.
- The region comprises of 8 states occupying 8% of India's geographical spread having 4% of country's population.
- Inspite of being endowed with vast natural resources in terms of forests, biological diversity, hydroelectricity, the region has remained largely underdeveloped.
- The region is connected with the rest of country by a narrow stretch of land called 'chicken's neck'. This region needs infrastructure to support and ensure significant investments and developmental aids.
- A good infrastructure and wide connectivity are the key factors for growth and development, both within the region as well as with rest of country.
- The region in past has witnessed a series of insurgencies and was alienated from the economic resurgence experienced by rest of country. But with time, the situation has improved and insurgencies have come to a halt.
- A critical appraisal of the key economic indicators along with a detailed sketch of the individual strengths of the eight states is necessary to achieve a holistic framework to target growth in the region.

Opportunities in and for North East India

- Increasing the speed of industrialisation will lead to rapid economic development. New employment opportunities will be created for educated people and skilled labourers. It will also divert surplus labour from agriculture.
- Modernised means of cultivations should be used to increase employment potential of agriculture. Raising of agricultural productivity through farm mechanisation will help NER economy.
- The traditional educational system has to be replaced with technical and vocational educational system to make it production oriented.

- Employment exchanges should be provided to increase the mobility of labour and reduce unemployment.
- To increase scope of self-employment, liberal institutional finance should be made available.
- Entrepreneurial mindset should be created amongst the indigenous people with government support and NGOs. Efficient implementation of SHG model with modification based on need and situation will deliver positive results.
- Tourism sector should be highly encouraged as NER provides wide range of choices and good value for money with nature's breath-taking scenic beauty, pleasant climatic conditions and extraordinary diverse cultural heritage of people.
- Healthy connectivity in terms of roads and mobile coverage will boost trade and commerce with the rest of the country.
- Special packages have been announced for socio-economic development of NER. Bodoland Territorial Council Package and Special Accelerated Road Development Programme are two of them.
- The Look East Policy of Government of India has made NER more important and strategic. Hence it has to gear up to take more challenges and capitalize on opportunities thrown open by huge market in South East Asian countries.

Surya Jyoti – Photo-Voltaic (PV) Integrated Micro Solar Dome (MSD)

In order to capture day light and concentrate the same inside a dark room, particularly in urban slum or rural areas which lack electricity supply, a low cost and energy efficient Micro Solar Dome has been tested and developed.

Highlights

- The Micro Solar Dome (MSD) is a clear and green energy initiative of the Department of Science and Technology.
- This project will also supplement the Green Energy initiatives.
- The Micro Solar Dome (MSD) is a day and night lighting single device unique in its features, that has a transparent semi-spherical upper dome made of acrylic material which captures the sunlight and the light passes through a sun-tube having a thin layer of highly reflective coating on the inner wall of the passage.
- It also contains a lower dome made of acrylic. There is a shutter in the bottom of the lower dome which can be closed, if light is not required in the daytime. It is leak proof and works throughout the day and 4 hours continuously after sunset.The entire development activities were taken up by an R&D Organisation under the aegis of the Department of Science & Technology.

- The potential users of this device are the 10 million off-grid households in urban and rural spaces and several folds more that do not have reliable access to electricity. When these Surya Jyoti lamps, giving an illumination equivalent of a 60W incandescent lamp, are installed in 10 million households it would lead to a saving of 1750 million units of energy.
- It would also lead to an Emission Reduction of about 12.5 million ton of CO2.

India UK Joint Tech Summit

The focus sectors at the Summit will be, Advanced Manufacturing & Robotics; Life Sciences & Healthcare and Smart Cities. The other tracks of the Summit will be Higher Education, Design, Intellectual Property, Innovation and Entrepreneurship.

The summit marked the high point commemorating 2016 as the 'India-UK year of Education, Research and Innovation'.

Need for harnessing the vast traditional knowledge base in India coupled with modern scientific investigation to provide a holistic approach to preventive healthcare which can help address some of the modern life style diseases.

India-UK cooperation in S&T covers basic science to solution science aimed at addressing societal challenges were started under the 'Newton-Bhabha' program.

India needs active partnership and collaboration with UK for India's flagship programmes like Digital India, Jan Dhan Yojana, Make in India, Smart City Mission and Start up India.

Pradhan Mantri Surakshit Matritva Abhiyan (PMSMA)

It is aimed to reduce maternal and infant mortality rates through safe pregnancies and safe deliveries

To provide free health check-ups to pregnant women at government health centres and hospitals

The national programme aims to provide pregnant ladies free ante-natal services (ANC) and required treatment for free on 9th of every month

The scheme is applicable only for the pregnant women in their pregnancy period of 3 to 6 months. It will provide all kinds of medical check-ups completely free to pregnant women.

These check-ups will take place at the medical centres, government and private hospitals and private clinics across the country.

These free of cost tests will include blood pressure, sugar level, weight, haemoglobin test, blood test and screening.

Women will be marked differently using different colour stickers based on their health problems so that doctors can easily detect the problem.

Different colour stickers will be Red Sticker for Serious patients, Blue Sticker for High blood pressure and Yellow Sticker for Other diseases.

Pradhan Mantri Yuva Yojana (PMYY)

The Union Ministry of Skill Development and Entrepreneurship has launched of Pradhan Mantri Yuva Yojana (PMYY) to scale up an ecosystem of entrepreneurship for youngsters.

It is MSDE's flagship scheme on entrepreneurship education and training. The scheme spans over five years (2016-17 to 2020-21)

It will provide entrepreneurship education and training to over 7 lakh students in 5 years through 3,050 institutes.

It will provide easy access to information and mentor network, incubator, credit and accelerator and advocacy to create a pathway for the youth.

Pradhan Mantri YUVA Yojana has national and international best practices of learning in entrepreneurship education

Strengthening the S&T Roadmap

Department of Science and Technology (DST)

The missions of the Government of India have added impetus to the initiatives of the DST. These include the Make in India, Start up India, Swachh Bharat, and Digital India programmes.

The collaboration in Impacting Research Innovation and Technology (IMPRINT) project entails DST's partnership with the Ministry of Human Resource Development (MHRD) to address major societal and developmental needs, environment and climate change related mitigation and adaptation.

A joint R&D initiative with Ministry of Railways focuses on fuel efficiency enhancement and emission control technologies, alternate fuels, fuel conservation in diesel traction etc.

Reversing Brain drain to Brain Gain

- An Early Career Research Award (ECRA) has been launched to provide rapid research support to pursue exciting and innovative research in areas of science and engineering.
- The National Postdoctoral Fellowship (N-PDF) scheme is aimed to attract and retain young scientists and discourage brain drain in academic/R&D institutions.

Attracting Women to Science

- KIRAN (Knowledge Involvement in Research Advancement through Nurturing) launched in 2014 enables gender parity in science through nurturing research careers of women scientists.
- The programme provides opportunities to women scientists to take up research and emerge as an entrepreneur who had a break in their career primarily due to family responsibilities.

Social Benefits Delivered

Surya Jyoti Lights up homes of poor

- A low cost device named Surya Jyoti has been developed and tested.
- Surya Jyoti is basically a Micro Solar Dome which has a transparent semi spherical upper dome made of acrylic material that captures sunlight.

Indigenous technology for rural industrialisation

- For inclusive development of the country, sustainable industrial activities using local resources in the rural areas are extremely important.
- One such initiative by DST is in a rural industry complex in a plot of wasteland at a village in Jodhpur district of Rajasthan by utilization of local resources and by converting waste to wealth.

North Eastern Centre for Ethno Medical Research

- The centre will undertake scientific validation of traditional herbs and products and help improve socio economic status of local communities and enhance quality of life through better livelihood and benefit sharing.

Going Global Through Mega Projects

Thirty Meter Telescope

India's participation in Thirty Meter Telescope (TMT) project is built at Mauna Kea, Hawaii, USA. The cost would be met by DST and the Department of Atomic Energy (DAE). The other countries participating in the project are USA, Canada, China and Japan.

Associate Membership of CERN

The European Organisation for Nuclear Research (CERN) is the world's largest nuclear and particle physics laboratory where scientists are probing the fundamental structure of the universe. Indian scientists have been actively participating and collaborating at CERN on all aspects of science, engineering and computing through joint funding provided by DAE and DST. The CERN Council admitted India as Associate Member of CERN in Sep. 2016. As an Associate Member of CERN, India will be a part of the huge scientific and technological endeavour.

Enhance quality and quantity of R&D

- The objective is to position India amongst the top 5 countries in scientific research by augmenting the R&D infrastructure, enhance number of active scientists and reverse brain drain to brain gain for societal and industrial development and attract youth to pursue career in science and technology.
- The DST will also intensify industry-academia R&D partnerships, to find solutions to national challenges pertaining to energy, water, health, environment and climate and cyber security.
- There will be steps to leverage the best of international S&T knowledge and infrastructure by cooperating in the selected areas to gain global competitiveness and support S&T capacity building in least developed countries.

Create a Robust S&T Led Innovation and Start-up Ecosystem

DST has developed a national initiative (National Initiative for Developing and Harnessing Innovations- NIDHI) to up-scaling the start-ups. This will promote the culture of innovation among students and rural communities. Create awareness about emerging frontiers and the pervasiveness of science in daily life. The Science Express is a classic initiative the benefits children across the country.

Laser Interferometer Gravitational Wave Observatory (LIGO)

India has agreed in-principle to set up an advanced gravitational-wave (GW) observatory in the country which will be the third such observatory across the world.

Devasthal Optical Telescope

A state of the art world class 3.6 meter Devasthal Optical Telescope was remotely activated jointly by India and Belgium. The telescope is installed at Devasthal near Nainital. It is the largest steerable imaging telescope in Asia; a result of scientific collaboration between Aryabhatta Research Institute of Observational Sciences (ARIES) and Belgian Scientists.

Atoms in the Service of the Nation

Atoms for peace – A Utopian Landscape

- 'Atoms for Peace' was an initiative of the US President, Mr. Dwight D. Eisenhower, launched in the 470th Plenary in the UNGA in 1953, with Smt. Vijayalakshmi Pandit of India being the president of the assembly.
- It focuses on peaceful use of atomic energy, promising the use of radioactivity in energy generation for harnessing the power of the atom.
- Motto of India's nuclear energy programme – the use of nuclear and radiation technology for providing better quality of life to its citizens.
- The International Atomic Energy Agency (IAEA) was thereafter founded by the UN charter in 1955.
- The journey of the Indian Atomic Energy programme began in 1954 with the founding of the Atomic Energy Commission under the leadership of Dr Homi Jehangir Bhabha.

Nuclear Medicine – Diagnosis

- Nuclear medicine uses trace amounts of radioactive substances in the diagnosis and treatment of a wide range of diseases and conditions in a safe and painless way.
- Nuclear medicine procedures help in identification of abnormalities in organ function in early stages of a disease.
- Nuclear medicine has proven its worth in the diagnosis of diseases such as cancer, neurological disorders (like Alzheimer's and Parkinson's diseases), and cardiovascular disease in their initial stages, permitting early treatment as well as reduced morbidity and mortality.

Radio Therapy

Radiation therapy involves the use of high energy radiation either by using special machines or from radioactive substances. The aim of the radiation therapy is to impart specific amount of radiation at tumours or parts of the body to destroy the malignant cells.

Food Preservation – Produce and Preserve

- Radiation processing can provide a viable, effective and eco-friendly alternative to chemical fumigants.
- There is an utmost need to adopt and integrate the irradiated foods into the country's supply chains to ensure food safety and security.
- Radiation processing of food has been approved by various International and National Organizations viz. International Atomic Energy Agency (IAEA), Food and Agricultural Organization (FAO), WHO, WTO, and FSSAI.
- The irradiation based strategies have the potential to bring about a paradigm shift in the agriculture sector and propel our nation towards prosperity.

Energy Security – Nuclear is clean and Green

- Nuclear Energy provides a solution to the problem of global warming, being endowed with the lowest carbon footprint amongst all energy producing sources- including the renewable sources such as solar, hydro and wind power.
- India today needs to rapidly ramp up power production using nuclear energy.
- The atomic energy sector is projected to make a significant contribution to energy security and climate mitigation over the next few decades.

Water-The Elixir of Life

- Isotope hydrology techniques enable accurate tracing and measurement of the extent of new and renewable underground water resources.
- The technique is used for monitoring surface water resources for leakages through dams and irrigation channels. This is used towards resource planning and sustainable management of water resources.
- Scientists have developed low cost and user friendly kits for measurement of contaminants in water. These are used for the detection of fluorine in ground water and chromium in water of river Ganga.
- Technologists of BARC have developed a membrane for filtration for the removal of bacterial contamination and for desalination of brackish water as well as sea water

Space Based Platform for Common Man

Agriculture & Soils

- Crop production forecast
- Saline/sodic soils mapping
- Agro-Met services& disaster surveillance (pest, floods, drought)
- Horticulture development

Bio Resources and Environment

- Forest cover and type mapping
- Wetland inventory & conservation plans
- Bio diversity characterization
- Desertification status mapping
- Coastal, mangroves, Coral Related
- Snow and glacier studies

Rural Development

- National Drinking Water mission
- Wasteland mapping/ updation
- Watershed development and monitoring
- Land records modernization plan

Water Resources

- Irrigation infrastructure assessment
- Water resource information system
- Snow melt run-off estimation
- Reservoir capacity evaluation
- Site selection for hydro-power

Disaster Management Support

- Operationally addressing various natural disasters like floods, cyclone, drought, landslide, earthquake and forest fire
- Research and development on early warning systems and decision support tools

Urban Development

- Urban sprawl mapping of major cities

- Master / structure plans
- Comprehensive development plans of selected cities / towns
- Base map generation for towns
- National urban information system

Tele-Education

- 'EDUSAT', India's first thematic satellite dedicated exclusively for educational services, was used extensively to cater to a wide range of interactive educational delivery modes like one-way TV broadcast, video conferencing, computer conferencing, web-based instructions, etc.
- EDUSAT had manifold objectives - to supplement the curriculum-based teaching, imparting effective teacher training, providing access to quality resource persons and new technologies, thus finally resulting in taking education to every nook and corner of India.
- EDUSAT provided connectivity to schools, colleges and higher levels of education and also supported non-formal education including development communication.

Tele-Medicine

- Telemedicine is one of the unique applications of Space Technology for societal benefit. ISRO Telemedicine programme started in 2001 has been connecting remote/rural/medical college hospitals and Mobile Units through the Indian satellites to major specialty hospitals in cities and towns.
- ISRO Telemedicine network covers various states/regions including Jammu & Kashmir, Ladakh, Andaman & Nicobar Islands, Lakshadweep Islands, North Eastern States and other mainland states.
- Many tribal districts of Kerala, Karnataka, Chhattisgarh, Punjab, West Bengal, Orissa, Andhra Pradesh, Maharashtra, Jharkhand and Rajasthan are covered under Telemedicine Programme.

IRNSS

- ISRO has developed its own navigation system providing accurate position and timing signals over Indian region and its neighbourhood. Defence services will benefit immensely out of this.
- Communication network through satellites provide uninterrupted services in business community especially the ATMs and stock exchanges.

Space Exploration

- Our spacecraft Chandrayan and Mars orbiter had been orbited and provided extremely useful data, confirming presence of water on the moon and huge deposits of Helium three which are path breaking findings.
- Medical diagnosis, observation, synthesis of complex molecules etc has been enabled through technological breakthrough in space.

Uniqueness of Indian space programme is that it is able to use the space based platforms for implementing various application programs which touches the day to day life of the common man. A survey shows that the direct and indirect benefits far exceed the investment made by Government in Indian space programs.

Defence Applications for Civilian Sector

Defence and Economic Growth

- Indian Defence R&D, for many years, operated with a financial outlay of less than 6% of the Indian Defence budget, compared to USA at 15%, UK 8%, China 15% and Israel at 9%.
- Under colonial rule, defence S&T became a dead horse. Lack of proper research and infrastructure facilities made India dependent on imports to a larger extent.
- In recent times India has been making strides towards achieving self-reliance in critical areas. There is no dearth of entrepreneurship and policy making initiatives in the country.
- The increased pace of manufacturing sector is very apparent. Many indigenous industries are competing with foreign counterparts.
- A significant part of economic growth of a country is dependent on the country's ability to produce indigenous defence equipment and systems.

Defence Research & Development

- Defence R&D led to the development of Bullet proof jackets, breathing systems, farming in high altitude areas, multi insect repellent and food poison detection kit.
- Bio-digester for human waste management has become a significant part of Swachh Bharat movement.

- Establishing focused research centres at R&D centres and academic institutes with state of the art infrastructure is the first step in that direction. Innovations at small and medium scale industries should be encouraged and supported.
- Futuristic R&D is only possible by engaging the scientific manpower appropriately and a research conducive ecosystem is evolved and put in place

Defence Technologies – Benefits

- Research in defence science bolsters the might of a nation → development on the military and economic spheres.
- Sustainable investments in defence S&T will lead to greater economic benefits

Bright Future Ahead

India should identify the futuristic technologies for the next 10-20 years and take a lead in the R&D of these technologies. The country needs to have innovative manufacturing institutes with public and private partnership

A few points need to be taken into cognizance

- The defence sector is technology intensive. Changes take place at a rapid pace, and with shifting goal posts dictated by perceived and apparent threats.
- R&D in defence science is to a large extent carried out by government agencies, with little R&D in the non-governmental sector.

More than 70% of the supplies for Akash missile system are coming from a conglomerate of private industries.
The new policies of the Government are enabling many overseas enterprises to start operations and set up manufacturing units in India with large investments

Contributions of Agricultural Research & Development

Highlights

- Agricultural R&D has potential to offer long term solutions to the problems of agriculture sector and has the potential to derive the same or even higher benefits at lower cost per unit of output.
- Development in pre and post-harvest management technologies have facilitated reduction in losses and helped in increasing the availability, value addition and contributing to national economy.

- Rice crop is studied as this is one of the major crops covering large cultivated area, and receiving greater attention of the research system.
- Besides, research in horticultural crops making available disease-free planting materials by tissue culture and other modern technology and contributing to rapid adoption of improved varieties and higher crop yields.
- The resource conservation technologies are reducing water use by 5 to 30 per cent in rice-wheat system.
- The development of livestock technologies have increased milk and meat yields and reduced mortality rates in animals.

Role of S&T for communicating to the Masses

Highlights

- Science and development communication has now drawn the attention of policy makers, planners, scientists, and media personnel during the past decade world over and so as in India.
- In fact, print and electronic media have certain limits, but the illiterates or neo-literates can also be enlightened through the use of folk medium.
- In terms of international comparison, in India the efforts, like Vigyan Jatha, Children's science congress, etc are unique and first ever in the world.
- Information Communication Technology (ICT) led science communication has made it simpler to the specially abled segments of the society.
- This new media has given birth to a more instant and global mode of communication in the form of 'Social Media'.
- Perhaps, India is the only country to have a special provision 'to develop the scientific temper, humanism and the spirit of enquiry and reform' as one of the 'Fundamental Duties' of the Constitution.

Role of Science and Technology in Sustainable Development

Highlights

- Availability of potable water for rural India and decimation of urban water bodies disrupting hydrological flows remains a concern.
- For reducing dependence on fossil fuels and emission free energy generation, scientific research needs to be targeted towards alternate sources of energy, algae, nuclear fusion, fast breeder reactors for thorium, advanced fossil fuel extraction

technologies, hydrogen energy, bio-refineries, wireless power transmission, green and net zero buildings.

- Our environment needs safeguards to alternatives to polluting construction materials like sand, artificial lighting by using absorbed energy, bio mimetic constructions.
- With climate change a reality, we need to understand the impacts on vulnerable species and ecosystems. Science will play a stronger role in implementing new approaches to conservation of biodiversity. S&T has great responsibility towards SDGs.
- Solar energy applications would require silicon replacements with grapheme, zinc oxide and organic materials.
- Mining and processing techniques should be more environments friendly.
- We are now in a geological epoch called 'Anthropocene' where humanity is driving possibly an irreversible global change to some of earth's basic processes. Science has to contribute to meeting these global changes.
- Department of S&T (DST) which organises National Children's Science Congress has declared 'Science, Technology and Innovation for Sustainable Development' as the theme for the year 2017. Children in the age group of 10-17 years are gearing up to the challenges of Sustainable Development.
- Scientific research will play an important role in meeting international commitments like CBD (Convention on Biological Diversity), Ramsar Convention, UNCCD (United Nations Convention on Combating Desertification), CMS (Convention on Migratory Species), UN Laws of the Seas amongst others.

Earth System Science for Public Safety: Major Achievements

Highlights

- Doppler Weather Radar network was augmented to strengthen data assimilation efforts and to improve weather forecasts.
- Improvements in track and intensify forecast of the tropical cyclones and heavy rainfall forecasts. Accurate forecasts of the recent cyclones, Phailin and HudhHud saved thousands of human lives.
- A state of the art High Altitude Cloud Physics Observatory was established at Mahabaleshwar near Pune for aerosol and cloud observations.
- A state of the art Tsunami early warning system for the Indian Ocean Rim countries was established at the Indian National Centre for Ocean Information Services (INCOIS).

- Important achievement made by scientists at National Institute for Ocean Technology (NIOT) is installation of desalination plants in three islands of Lakshadweep and at North Chennai Thermal Power station using low temperature thermal technology.
- A research station 'Himansh' was established in Himalayas with several monitoring systems to support field survey and laboratory studies in Himalayas.
- A new research station 'Bharati' – a state of the art facility was commissioned at Larsemann Hills, Antarctica in March 2012.
- Implementation of Storm Surge Prediction system for the Indian coasts and development of systems for ocean state forecasts.