



Presidential Address by



99th

INDIAN
SCIENCE
CONGRESS

KIIT University & NISER



99th Session of Indian Science Congress

**Kalinga Institute of Industrial Technology,
Bhubaneswar, Odisha**

January 3, 2012



Prof. Geetha Bali

General President
Indian Science
Congress Association



Presidential Address by

Prof. Geetha Bali

General President
Indian Science Congress Association



99th **INDIAN
SCIENCE
CONGRESS**

INDIAN SCIENCE CONGRESS 2012

Presidential Address

99th Session, Bhubaneswar

*Science and Technology for
Inclusive Innovation-Role of Women*

Prof. Geetha Bali

I am greatly honored to address this august gathering of the 99th and the pre-centenary session of the Indian Science congress. At the outset, I wish to thank Hon'ble Prime Minister for his august presence which is symbolic of his strong belief in science as an instrument of development and growth of India. Our beloved Prime Minister is very special for us because of the visionary zeal with which he has guided and supported science programmes in the country, apart from his own original thinking and invention of Economic Reforms for rapid development of India. I extend most respectful and cordial welcome to you Sir. It is my privilege to extend a respectful welcome to His Excellency, the Governor of Odisha. I extend a warm welcome to Hon'ble Minister of Science & Technology and Earth Sciences. I extend a cordial welcome to Hon'ble Chief Minister of Odisha, and Hon'ble Minister of State for Science and Technology and Earth Sciences. I extend a hearty welcome to the Hon'ble Minister of Science & Technology, State of Odisha and the galaxy of distinguished personalities on the dais,

distinguished delegates, all the invitees and students.

It is a red lettered day for the historic city of Bhubaneswar which is also the hub of information technology in eastern India, that Science Congress is held here once again after a gap of 35 years. This event is also coinciding with the diamond jubilee celebration of the UNESCO- Kalinga prize for popularization of Science, a prestigious programme that started with generous support of the great visionary and statesman, Odisha has given to the country. Shri Biju Patnaik was the founder of Kalinga Foundation. This Science Congress is very special in many more ways. Hon'ble Prime Minister, while inaugurating the 98th Science Congress declared the year 2012 as the 'Year of Science'. This 99th session is historical in ushering in the 'Year of Science' in India and ushering in the centenary year of Science Congress which the whole country is poised to welcome and celebrate. This is also a very happy and proud moment for us since Koraput tribal communities of Odisha are being recognized globally under FAO's Globally Important Agricultural Heritage Systems (GIAHS). This is the first such recognition that has come to our country which emphasizes the importance of traditional knowledge and traditional ecological prudence. I take this opportunity to thank the Kalinga Institute of

Industrial Technology and the National Institute of science Education and Research for all their cooperation in organizing this mega event.

Science and Technology for Inclusive Innovation – Role of Women

Three centuries ago, science emerged as quest for knowledge and to counter superstition and establish rationality. But the focus has shifted during the last century, viewing science and technology as tools for promoting the wellbeing of humanity and welfare of the planet on which we live. All branches of science converge on this objective of seeking what brings health, wealth and prosperity to human beings. The new millennium has created both an opportunity and the necessity to bridge the entire spectrum of humanity's pursuit of knowledge and integrate it with the welfare of society. Now the need for the confluence of science and technology with social sciences is felt much more than ever before and the developments in science and technology has empowered us to realize this confluence. What is now needed is our dedication for this cause. In this sense, it is significant that this session which is focusing on science and technology for inclusive innovation is held in the idyllic setting of Kalinga Institute of Industrial Technology (KIIT) where we see two institutions, one dedicated for science and technology (KIIT) sharing portals with Kalinga Institute of Social Sciences (KISS) exclusively dedicated for education and empowerment of the

tribal and marginalized people, thus, creating an environment for inclusive development.

India has the third largest scientific and technical manpower in the world and represents one of the world's largest systems for generation of creative Science & Technologies. With six major science departments, 400 national R&D centers, more than 500 universities churning out graduates and doctorates and nearly 2000 in house R&D units in Industry, India has one of the finest R & D infrastructures in the world. These institutions have weaved a number of success stories. India undoubtedly has the ability to develop new and need based technologies. Scientists and technocrats with sound background in basic sciences, have the ability to adopt technologies developed within the country and outside. India has done outstandingly well in several frontiers of science. But the biggest and the most important challenge that lies in front of us today is ensuring that the benefits of developments in science and technology reach people across India unhindered by the geographical barriers and to people of all classes despite social, cultural, linguistic and a multitude of differences including gender.

With rapid advances in science and technology, the divide within the population that already exists will further increase due to differences in the capacity of people to afford or access new technologies. Hence, there is a strong need to focus more than ever before, on bridging the divide. Science and

Technology when employed for the purpose, has tremendous capacity to bridge the divide. There is a need for scientists to re-dedicate themselves to achieve transformation of the country through inclusive development and address the challenge on a mission mode. Most importantly, women who constitute nearly 50% of the population cannot be left out of this process. Transforming into a developed nation will remain a myth unless the educational, social and economic status of women is improved and the potential of women is utilized for the betterment of society and growth of India.

It is also very significant that the 99th session also ushers in the 12th Five-year plan (2012-2017). Hon'ble Prime Minister of India has declared the 12th Five-year plan as "A Health Plan". Health care is assuming increasing importance due to a multitude of reasons and during this session of the science congress, special emphasis is given to health issues.

The Government of India has declared the year 2010-2020 as the 'Decade of Innovation' with a focus on inclusive growth. Hon'ble Prime Minister has set up a National Innovation Council (NInC) to provide policies, methodologies and recommendations to boost innovation performance in the country with a focus on Indian model of innovation. This Science Congress is providing the platform for scientists coming from widely different background, widely different interests and widely different technical skills to visualize ways

and means of taking this forward and achieving inclusive development by 2020.

What is India Today?

Food and Agriculture

For two decades after Independence, India's main concern was food production. Today, having achieved green revolution in 1965, India is the second-largest producer of food in the world and holds the potential of being number one. Agriculture and allied activities contribute 33 percent of the Gross Domestic Product making it, the single largest contributor. Agriculture is the means of livelihood of about two-thirds of the workforce in the country.

This increase in agricultural production has been brought about by bringing additional area under cultivation, extension of irrigation facilities, use of improved high yielding variety of seeds, better techniques evolved through agricultural research, water management and plant protection through judicious use of fertilizers, pesticides and cropping practices.

India stands second in the world in wheat production and second in rice production. Food grain production during 2010-11 was estimated to be 235.88 million tones which is the highest record. There has been an all time record production of wheat at 84.27 million tones, all time record production of pulses at 17.29 million tones, all time

record production of oil seeds at 30.25 million tones, all time highest production of 33.93 million bales of cotton of 170 kg each. India is now in a position to export rice to Bangladesh and other countries. India is among the 15 leading exporters of agricultural products in the world.

An area of 21 million hectares is under horticulture in India and contributes over 230 MT to the food basket of the country. Fruits and vegetables together constitute about 92.3 per cent of the total horticultural production in the country. India is the second largest producer of vegetables and is a leader in the production of peas and okra. Besides, India occupies the second position in the production of brinjal, cabbage, cauliflower and onion and the third position in potato and tomato in the world. There was an increase in potato production from 36 MT to more than 40 MT in 2010-11 recording 13% increase. India is Burma's fifth largest trading partner, and it exports more than 1 MT of beans annually.

India is the second largest producer of fruits in the world. It is the largest producer of fruits like mango, banana, papaya, sapota, and pomegranate. About 40 per cent of the world's mangoes and 30 per cent of the world's bananas and papayas are produced in India. In terms of productivity of grapes, India ranks first in the world. India's coffee exports rose by 42 per cent to record 360,540 tonnes in the 2010-11, according to a report by the International Coffee Organization (ICO). With an increase of 10.5% in production since 1991, India is

the world's fastest growing poultry market. With an estimated broiler production of 2.55 million tons and 55.6 billion eggs, India is the 6th largest producer of broiler meat and the 4th largest of eggs. India ranks as the world's largest milk producer with an annual output of 108.5 million tonnes. With an annual growth rate of 4%, India's milk production accounts for 15% of the total global output.

The food processing industry is one of the largest in India – ranking fifth in terms of production, consumption, export. The Indian food industry is projected to reach US\$ 300 billion by 2015. India targets to achieve 9.5 per cent average economic growth in the 12th Five Year Plan (2012-17), based on an estimated agriculture growth rate of 4.2 percent.

Nuclear Energy

In the field of nuclear energy India has become self reliant right from prospecting of raw materials to design, construction and operation of power reactors. India expects to have 20,000 MWe nuclear capacity on line by 2020 and 63,000 MWe by 2032. It aims to supply 25% of electricity from nuclear power by 2050. Following the Fukushima accident in March 2011, four NPCIL taskforces have thoroughly evaluated the situation in India and up gradation of boiling water reactors in Tarapur have been already carried ensuring continuous cooling. Highest safety measures are being taken with respect to the existing nuclear plants and those under construction.

Space Technology

With respect to space Technology, India ranks among the top six nations of the world in terms of technological capabilities. The Indian Space research organization has built world class Remote Sensing & Communication Satellites and also is one of the few countries of the world with capabilities to launch these Satellites. India's first Moon mission, Chandrayaan taking a step beyond Earth orbit into deep space, added a golden chapter to India's space endeavor. The successful launch of India's maiden unmanned moon mission Chandrayaan-1 has catapulted the country into the league of a select group of nations which already have sojourn with the mystical satellite of Earth - the Moon.

Electronics

India has become one of the favored destinations for electronics and hardware and has the potential to become the most important electronics and hardware destination in the world. Chip design and other complex components are made available at low cost. Sustaining this growth is the rapid growth in market demand. India is the fastest growing market in terms of semiconductor consumption. India's semiconductor consumption which was 7.1 billion in 2010 is now \$8.2 billion in 2011, a 15.5% increase. It is projected that the production of electronics hardware would be worth US\$ 155 billion by 2015.

Biotechnology

India has been the forerunner among the developing countries in promoting multi-disciplinary activities in biotechnology. India has embarked upon a very ambitious program in biotechnology with a view to harness its available human and unlimited biodiversity resources. Biotechnology has practically unlimited possibilities of its applications in increasing agricultural and industrial production and in improving human and animal life. The Indian biotechnology industry has witnessed a remarkable drive and several initiatives taken have spread a fresh aura of wellbeing, prosperity and sustainability. The Indian Biotechnology sector has played a strategic role in the economic development of the country by offering affordable healthcare services such as medicines and therapies while meeting the challenges of food and energy security. As per the Biospectrum-ABLE industry survey (2010-2011), the Indian Biotechnology industry posted revenues of US\$ 2.9 billion, despite the global recession during 2009 and measured recovery during 2010. The sector has shown consistent development since the last decade with average revenue growth figures rising to more than 20 per cent. It has been estimated that the industry is poised to target a total turnover of US\$ 8.6 billion by the end of 2015 which would only be possible if there will be a growth rate of about 30 per cent year on year basis. Biotechnology industry has vast reach with at least 5 different sectors –agri-biotech,

bio-industrial, bio-informatics, bio-services and finally bio-pharma which occupies the first position. The bio-industrial segment has registered the fastest growing rate within the sector, surging from less than 5 per cent market share five years ago to over 14 per cent.

Ticel Biopark is a 1.5 lakh sq ft facility dedicated for biotechnology companies, and has been set up as a joint venture between Tidco (Tamil Nadu Industrial Development Corporation) and Tidel Park. Another joint venture between Tidco and the Electronics Corporation of Tamil Nadu, Ticel will be the largest biotechnology specific infrastructure facility in Asia with the completion of its expansion programme by another 6 lakh sq ft at a cost of US\$ 28.7 million.

Healthcare

India is perched to witness additional growth in its economy as a result of positive trends within the healthcare sector. As per the report of the AIMA, BCG and CII, healthcare sector in India will be one of the major sectors that would fuel the economic growth and will contribute to the increased revenues, along with IT Services and Education sectors in the country. Over 40 million new jobs and 200 billion increased revenues are expected to be generated by the Indian healthcare sector by 2020,

The Indian healthcare sector is poised to reach US\$ 280 billion by the year 2020, thereby increasing the GDP spend which was 5.5 percent in 2009 to 8 per

cent by 2012. A US\$ 36 billion industry today and growing at 15 per cent compound annual growth rate (CAGR), the Indian healthcare industry is expected to reach the market value of US\$ 280 billion by 2022.

Increasing population, higher expenditure on lifestyles, rising market of health insurance, government initiatives for better medical infrastructure, and focus on Public Private Partnership (PPP) models are some of the driving factors for the growth of healthcare sector in India.

Information Technology and IT Enabled Services

Over the past few years, the Indian information technology and IT enabled Services industry has been steadily growing. The IT industry alone, has played a pivotal role in placing India on the world map as a major knowledge-based economy and outsourcing hub. IT has transformed every facet of human life ushering India into the knowledge base society in the current century. As one of the fastest growing industries, it has richly contributed to our high technology exports. Indian e-commerce market estimated at US\$ 10 billion is expanding exponentially and grew 47 per cent in 2011

Indian businesses and government agencies are expected to create huge demand for guidance in the usage of cloud computing services. There are already more than 50 cloud computing service providers in the Indian market. Many internet service providers are investing applications and

bandwidth to support new cloud service offerings. The number of internet users in India crossed the 100-million mark in September 2011, growing 13 per cent over last year's figure of 87 million, according to latest studies. About 40 percent of them are said to be using internet via mobile phones and 12.69 million are subscribers of broadband. India has made a mark in this field in the global arena.

Information technology applications extend over several fields such as agriculture, health, education, human resources development, industrial systems for production and marketing, management of natural environment and a variety of other services that serve society. For India, major challenges are in sustaining its growing performance in this area while averting digital divide in the society.

Science for Bridging the Divide in India

ICT

Science has eliminated all barriers to free and fast movement. It has eliminated all barriers for free and fast communication. This in turn has accelerated the pace of scientific research. Science has bridged populations and it continues to expand the possibilities and the necessity for the human race to work together and in harmony. One area of science that has bridged populations is Information Technology. India is a mini world. We have 1.2 billion population speaking 398 languages, more

than 3000 ethnic groups, 8 religions, several castes, diverse cultural practices. This diversity which is the fabric of the country has tremendous impact on achieving prosperity. Further complexity is lent by the great variation that occurs across this population on socio-economic parameters such as income and education as well as the urban-rural and gender divide. India is considered only next to the continent of Africa in diversity, economic, social, cultural and genetic. It is science that has created the sense of oneness in India. We have 890.28 million mobile phone subscribers which means about 74% of the population are equipped with the facility. It is expected to reach 1.59 billion by 2013.

ICT has played a strategic role in development strategies in developing as well as developed countries. ICT for development are actively promoted universally, for economic development, job-creation, rural development and poverty-alleviation. ICT has development applications in education, governance, environmental monitoring, health, human rights promotion and economic growth. Thus, it has great potential to bring in the desired social transformations by enhancing access to people, services, information and other technologies. India has done its best in employing ICT to enhance opportunities for poor, the rural and the marginalized by improving their access to markets, health, and education. Studies show that transaction costs have substantially reduced by adopting automated supply chain management models for selling agriculture produce.

The e-government projects have been quite successful in rural India acting as an intermediary between government and recipients, while pursuing commercially sustainable objectives. E-Governance has been employed successfully for improving government processes such as public information grievance redressal mechanisms, utility payments and billing services. Secondly e-Governance has helped by encouraging civil society participation in the governing process. E-Governance is a powerful medium for realizing development through good governance. It empowers communities to determine their own future by developing self-efficacy and collective efficacy.

One such success story is Bhoomi - a Rural Digital Service an initiative of Karnataka where farmers and villagers are provided land records. About 20 million land records of 7 million farmers in all of its 30,000 villages has been computerized.

Space Technology

Space technology is a far reaching technology that has potential to provide solutions to many problems on the ground in a way that cannot be duplicated by any other technology. The uniqueness of India's space mission is its commitment to use it for common man. Dr. Vikram Sarabhai, the father of space technology in India said "we must be second to none in the applications of advanced technologies to the real problems of man and

society ...”. Even to this day India's Space Technology is primarily committed for the welfare of common man. Space technology has been largely responsible for the success of ICT. Space Technology has today brought about revolutionary changes in the lives of people in India through its multifarious applications that has pervaded almost all sectors of society including agriculture, disaster management, education, health, communication, management of energy resources, environmental protection, management of terrestrial, coastal and marine resources including fisheries, water management etc. It has been a boon to the people especially in coastal and other disaster prone areas due to the support it extends to the Disaster Management system, reducing and moderating the impact of such calamities in amplifying poverty, hunger and suffering.

Village Resource Centre (VRC) is a single window agency providing a variety of services directly to rural population, in the areas of Agriculture, horticulture, Fisheries, Live stock, Water resources, Tele health care, Awareness programmes, Women empowerment, Tele-education, Computer literacy, Micro credit, Micro finance, Skill development / vocational training for livelihood support with the support of INSAT and IRS satellites. 473 such VRCs have been established in 22 States/Union Territories of India. So far more than 6500 programmes have been conducted and over 0.5 million people have availed VRC services.

The most important contribution of space technology for inclusive development has been in the areas of education and medicine. Tele-education and Tele-medicine have remarkable potential in bridging the urban and rural divide in access to quality education and health care. Children from remote and inaccessible areas can now receive education through satellite-based television programmes. 34,000 EDUSAT classrooms have been established benefitting more than 1million students. Thanks to computer technology, the teacher-student relationship can be more and more interactive. Indeed, one can now say that the science fiction concept of children receiving education in their home (rather than in the school classroom) is close to becoming a reality. IGNOU, the largest university in the world with 3.5 million students in India and 40 countries abroad offers 175 academic programs comprising 1100 courses at certificate, diploma and degree levels in addition to a number of non-accredited extension and skill-oriented programmes. IGNOU has very successfully employed tele-education and is in the process of establishing Indo-African Virtual University with head quarters in Ethiopia or Kenya.

In the health sphere, remote areas can get medical guidance and help through satellite-based communication. India is one of the BRIC countries offering Tele-medicine especially Tele-Consultation, Tele-Cardiology and Tele-Radiology. Tele-Surgery and Home Tele-Health are other emerging areas. This has made quality health care accessible across the country, cutting the time

needed and at costs affordable by the poor. Over 280 remote hospitals in India are connected to 43 specialty hospitals.

It is the opinion of experts that ICT integrated with space technology has the potential to fuel the global economy and successfully combat global poverty. This combination has given an impetus to the economic development in India which has taken great strides in both these technologies and more so for human welfare in the country

Many initiatives have also been taken by the Department of Electronics for promoting the use of electronics for socio-economic development and a balanced growth of electronics industry with special emphasis on result-oriented R & D in micro-electronics, telematics, and high performance computing and software development. Special attention has been given to application of electronics in areas such as agriculture, health and service sectors. After personal computers and laptops, now tablets are mushrooming as a major competitive avenue wherein vendors are striving hard to launch more affordable devices for the Indian market. Second quarter of 2011 experienced the release of the iPad2 in India in less than 50 days after its US launch while Samsung is scouting for 40 per cent share of the Indian tablet market in 2011.

Biotechnology

Biotechnology and advancement made in Biosciences over the past four decades,

technologies built around bio-sciences have revolutionized applications related to food, health and environmental security. This is another branch of science with far reaching influence on mankind for the betterment of society. Driven by chemistry but increasingly guided by pharmacology and the clinical sciences, drug research has contributed more to the progress of medicine during the past century than any other scientific factor. Indian pharmaceutical industry which emerged only during the post-independence era, has become one of the most competitive producers of therapeutics in the world. It has contributed greatly to improving the standards of healthcare in the country and making modern medicine available to the people at an affordable price. India is a net exporter of pharmaceuticals, meeting more than three quarters of its requirements of bulk drugs and almost its entire requirement of formulations. The advent of molecular biology and, in particular, of genomic sciences is having a deep impact on drug discovery. Recombinant proteins and monoclonal antibodies have greatly enriched our therapeutic armamentarium. Genome sciences, combined with bioinformatics tools, allow us to dissect the genetic basis of multifactorial diseases and to determine the most suitable points of attack for future medicines, thereby increasing the number of treatment options. The dramatic increase in the complexity of drug research is enforcing changes in the institutional basis of this interdisciplinary endeavor. The biotech industry is establishing itself as the discovery arm of the pharmaceutical industry. In bridging the gap

between academia and large pharmaceutical companies, the biotech firms have been effective instruments of technology transfer. Biotechnology has as an additional dimension of empowerment of women in rural areas.

Bio-Fuel as Alternate Energy Source and Meeting the Energy Needs of the Rural India:

There is a major disparity in the sharing of energy by the rural and urban India. Shortage of energy in rural India is hampering rural development and the quality of life of people in rural areas. The threat of increased oil prices and challenges of importing has made it important to focus on alternate and sustainable energy sources. The National Biofuel policy adopted in 2009 is addressing this issue. The global experience shows that adopting biofuel and nurturing this sector serves in two ways – decreasing dependence on fossil fuels and thus environmental degradation as well as pollution and secondly by creating rural employment.

Karnataka has taken great initiative in promoting production and use of biofuel. The state has established a Biofuel Board. The Biofuel programme of Karnataka is highly community based. In a village called Madenur near Hassan district which is about 150 km from Mysore, the whole village community is involved in growing biofuel plants such as Pongamia, Neem, Simaruba and Jatropa, harvesting and supplying seeds for oil production. The state has implemented two programmes called “Hasiru Honnu” meaning green

gold and “Baradu Bangara” meaning gold from barren land. Farmers are encouraged by way of providing free saplings added with incentives to grow biofuel plants along the borders of their farms and in barren uncultivable lands. Such initiatives towards establishing ensured and decentralized alternate sources of energy will go a long way in bridging urban-rural divide.

The divide that still persists and the need for inclusive development

Digital Divide

As seen from some examples given above, India has made rapid advancement in science and technology. The major challenge for India now is reaching the benefits of these developments to all people and achieving inclusive development. The wide gap that exists within the population is also the root cause of unrest in a number of forms. There is a wide gap between the rural and the urban. People living in hilly and remote areas are isolated and the benefits of developments in science and technology percolate much slower with respect to this population. As per the 2001 census, 72.2% of the population lives in about 638,000 villages and the remaining 27.8% lives in more than 5,100 towns and over 380 urban agglomerations. Although over population is a contributing factor, uneven distribution of resources by the state through rural-urban divide in resource allocation is an important cause of poverty. It is estimated that 60 million landless reside in villages while 250 million own less than 0.2 ha.

The first important divide is that which exists within every nation, developed or developing, between those who are rich, educated, and powerful, and those who are not. A second divide, less often noted, is linguistic and cultural. A divide exists between those who speak English and those who do not. Around 50 million Indians speak fluent English and are well connected with outside world and are able to greatly benefit from ICT and the other knowledge-based sectors of the economy such as biotechnology and pharmacology. They generally tend to be prosperous, urban, highly educated, concentrated in technical fields. Their privileges are based on a combination of education, brainpower, special entrepreneurial skills and ability to stay on the "cutting edge" of knowledge. Their life styles are different. On the outskirts of metropolitan cities, luxury apartments are rising to house this new group. Although initially concentrated in information technology, this new class is found, to varying degrees, in the biotech, pharmaceutical and other high-tech areas. Their salaries are much higher than their equally gifted counterparts. Annual salary growth rate is estimated to be 20% while thirty-five percent of India's population lives below the dollar-a-day poverty line.

India has experienced revolution in communication technology. We have 890.28 mn mobile phone subscribers. But mobiles do not mean much in villages without electricity. The wealthier, more affluent segment of the population, primarily based in urban areas, has embraced the use of modern

communications technology. The growth of the middle classes in the country, which now sits at around 30% of the population, has driven demand for consumer goods, including ICTs. The vast majority of the population has, however, been excluded from this process. Most cannot afford ICTs and only 3% of households own PCs. With secondary school enrolment rates of 55% and adult literacy rates of just under 63%, substantial percentage of the population lack the education required to use it effectively and are located in geographical areas that have little or no connectivity to ICT services.

According to the Digital Inclusion Index, released by risk analysis firm, Maplecroft, using 10 indicators (numbers of mobile cellular and broadband subscriptions; fixed telephone lines; households with a PC and television; internet users and secure internet servers; internet bandwidth; secondary education enrolment; and adult literacy), to calculate the level of digital inclusion, India stands at 39 and is classified as at “extreme risk” meaning that the country's population suffers from a severe lack of digital inclusion.

Rural-Urban Divide

There is a heavy concentration of infrastructure, amenities including, doctors, hospitals, teaching and research institutions in urban areas. 70 percent of the country's population mainly in rural areas lack access to primary health care the worst affected is the elderly, young women and children.

Major environmental issues in rural areas are deforestation, soil erosion, overgrazing, desertification, and water pollution from runoff of agricultural pesticides. These problems are further compounded by natural disasters such as droughts, flash floods etc. In urban areas there are issues of water pollution from sewage and air pollution from industrial effluents and vehicle emissions. Although India boasts more than 200 universities, they are mainly in urban areas, and illiteracy is looming large.

The Indian road network of 3.3 million Kilometers is second largest in the world. Indian Railways is one of the largest systems in the world. It is also one of the very few railway systems in the world generating operating surpluses. Indian Railways has 114,500 kilometres of total track over a route of 65,000 kilometers and 7,500 stations. It has the world's fourth largest railway network after those of the United States, Russia and China. The railways carry over 30 million passengers and 2.8 million tons of freight daily. Indian Railways is the world's second largest commercial or utility employer, with more than 1.36 million employees. But many villages continue to be poorly connected. This geographical isolation is a major factor contributing for the rural-urban divide. All the parameters employed as indicators of HDI such as maternal mortality rate, child mortality, immunization, number of children, early marriage, atrocities against women etc. are significantly poorer in rural India.

The Millennium poverty target set by Millenium Development Goals cannot be met unless we address rural poverty. Achieving rural development through sustainable improvement in the quality of life of rural people, especially poor takes top priority. Sustainable Rural Development can make a powerful contribution in realizing critical goals of poverty reduction, wider shared growth, food security and sustainable natural resource management. Any improvement, in the social or economic status of rural areas would not just directly benefit rural poor but would also bring down the migration-pressures on cities and contribute by positive ripple effect in global stride towards development.

India's post 1990's economic growth has made it one of the world's fast growing economies in the world. Indian economy is expected to reach US\$ 6 trillion by the year 2020 and US\$ 9 to 10 trillion by the year 2025. Per capita GDP is expected to reach US\$ 4500 by the year 2020 and about US\$ 6000 by 2025. Accompanying this is a sharp and growing regional variation among India's different states and territories in terms of per capita income, poverty, availability of infrastructure and socio-economic development. India's per capita income of US\$ 1219 is ranked 142nd in the world while its per capita purchasing power parity (PPP) of US\$ 3,608 is ranked 129th. Despite significant economic progress, a quarter of the nation's population earns less than the government-specified poverty threshold of \$0.40/day. About 37.2% of the overall population and 41.8% of the

rural population is said to be living below the national poverty line according to the recent standards. About 80% of the rural poor belong to the marginalized caste and tribal communities. More than 90% of the overall workforce is employed in the informal economy.

The Gini coefficient, a measure of income inequality, indicates that income inequality in India is increasing in general and also in almost all states both for urban and rural areas. Towns and cities make more than two thirds of the Indian GDP, while more than 70 percent of the population live in villages. Thus, wealth distribution in India is fairly uneven, with the top 10% of income groups earning 33% of the income. Economic growth during the last two decades has been uneven when comparing different social groups, economic groups, geographic regions, and rural and urban areas. Poverty rates in some of the rural areas of India are among the world's most extreme. It is estimated that a substantial percentage of children in India suffer from malnutrition and are underweight. There is a need to ensure that the economic growth translates into superior nutritional status of the population especially women and children.

Differently Abled

India is estimated to have over 21 million differently abled persons with 12.6 million men and about 9.3 million women. More than 77% of them live in rural areas. Of the disabled, visually impaired constitute more than 50%, movement

disability constituting nearly 28% followed by speech and hearing. Thus, the number of people with disabilities in India is substantial and especially higher in rural areas. The numbers are expected to increase in the years to come with increase in age related disabilities, occupation related and traffic accidents, natural disasters, conflict, diet and substance abuse, increase in chronic health conditions such as diabetes, cardiovascular disease, cancer and mental health disorders etc. Low awareness and consanguinous marriages more prevalent in rural areas and amongst people from poor socio-economic background is another contributory factor. Exposure to toxic substances resulting in disabilities is not uncommon and endosulphan is one such example.

Disability results in exclusion from education employment, health services and influences livelihood opportunities in many ways leading to poverty which in turn increases the risk of becoming impaired thus trapping people in a chronic poverty cycle. As much as 50% of them in India are said to be extremely poor. This cycle can be and has to be broken by prevention and treatment of diseases that lead to impairments in order to achieve inclusive development. The difficulties are further exacerbated in less advantaged communities and in women. This population is more vulnerable to disaster impacts including natural calamities.

In many settings, medical care and rehabilitation

services for people with disabilities are less than optimal or simply do not exist or costs are prohibitive. Only 5%-15% of people in low-income and middle-income have access to assistive devices. Production is low and often of limited quality. There is a scarcity of personnel trained to manage the provision of such devices and technologies, especially at provincial and district levels. Professional courses whether medicine or engineering do not give much importance to providing training in rehabilitation of the disabled or developing equipment or machinery for the disabled in their curricula of professional schools which are training architects, urban planners, engineers public health or medical personnel. There is a pressing need to develop the capacities of a variety of trained health professionals and training institutions in this area.

While Preventive care both for mothers and infants through both nutrition and basic immunization coverage, early identification and early intervention are some important measures, making available telecommunication devices with special features at affordable costs, making public transport system, buildings etc. more accessible to improve mobility, specialized computer software and hardware to make them more disabled-friendly and improving ICT accessibility, assistive devices with dynamic features are other approaches that deserve more serious attention.

To achieve the long-lasting and vastly better development prospects that lie at the heart of the

2015 Millennium Development Goals and beyond, we must empower people living with disabilities and make them an integral part of the society. Improving the status and social and economic participation of people with disabilities, removing the barriers which prevent them from participating in their communities, encouraging them to pursue education and profession, become more independent, more productive will have positive effects not only on the disabled but the family and more importantly, the society at large.

Gender Divide and Role of Women in National Development

The Millennium Development Goals (MDGs) adopted by world leaders in 2000 to eliminate extreme poverty in its many dimensions is especially of importance to India where a third of the world's poor are believed to reside. The 2011 Global Hunger Index (GHI) Report ranked India 15th amongst leading countries with hunger situation and also placed India amongst the three countries where the GHI between 1996 and 2011 went up from 22.9 to 23.7. It is expected that if these goals are achieved, world poverty will be cut by half, tens of millions of lives will be saved, and billions more people will have the opportunity to benefit from the global economy. Of the eight millennium goals namely "Eradicate extreme poverty and hunger, Achieve universal primary education, Promote gender equality and empower women, Reduce child mortality, Improve maternal health, Combat HIV / AIDS, malaria and other

diseases, Ensure environmental sustainability, Develop a global partnership for development” six directly address women and all the eight underscore the importance of involving women directly or indirectly. This translates into the fact that achieving MDGs is tagged to bridging the gender divide.

The MDGs provide a framework for international community to work together towards a common end – making sure that human development reaches everyone everywhere. It provides concrete, numerical benchmarks for tackling extreme poverty in its many dimensions. The eight MDGs break down into 21 quantifiable targets that are measured by 60 indicators and several of the indicators refer to improvement in the status of women. Thus, in most developing countries, gender inequality is a major obstacle to meeting the MDG targets. In fact, achieving these goals will be impossible without closing the gaps between women and men in terms of capacities, access to resources and opportunities, health services, access to assets and employment and vulnerability to violence and conflict.

India has produced many number of women achievers who have provided leadership as Prime minister, President, diplomats, bureaucrats, educationists, scientists, social scientists, management Gurus, Industrialists, social workers and so on. Yet they constitute a miniscule of the female population of the country. Women bear almost all responsibilities for meeting basic needs

of the family, yet are systematically denied the resources, information and freedom of action they need to fulfill these responsibilities.

The vast majority of the world's poor are women. More than 120 million women in India are said to live in poverty. About 96% of the women work in the informal economy. Women perform two thirds of the work but earn one tenth of income. Also, poverty hits women the hardest.

There is a wide gender disparity in the literacy rate in India and effective literacy rates (age 7 and above) in 2011 was estimated to be 82.14% for men and 65.46% for women. Seventy per cent of poor women in India cannot read or write. Of the millions of school age children not in school, the majority are girls. One of the major factors affecting fertility rates in India is the illiteracy of women. India has a total fertility rate of 2.98 children born per woman. The infant mortality rate is 61.47 deaths per 1000 live births. 254 women per 100,000 births die due to maternity-related causes. Atrocities on women and girl children are on the increase.

Women with disabilities bear a double burden: that of gender and that of disability and the burden of disability is much more profound for women than men. Up to 20 million women a year are affected by disabling impairments associated with pregnancy and childbirth. The lack of access to good healthcare and the lack of knowledge of Traditional

Birth Attendants (TBAs) contribute to this paradox. Barriers prevent them from accessing health care.

Rural Women

Rural women in India are even more disadvantaged segment of Indian society. Rural women who constitute nearly 36% of the total population are yet to have access to basic facilities. Women outnumber men wherever labour intensive work is involved. Statistics show that percentage of women to men engaged in agriculture is 86.1 : 74. Number of women vs men engaged in dairying in India is 75 million : 15 million. In animal husbandry there are 25 million women against 1.5 million men. Women constitute 66% of total labour in farm production. At all India level, 62 percent workers in cardamom, 50 percent workers in tea and coffee plantations, 45 percent in cinchona, 38 percent workers in palm oil and 34 percent workers in rubber are women. With respect to live stock rearing, studies show that women are responsible for 85.5% of management, 79 to 100% feeding and watering, 68.66% in health care and 61.32% in breeding. But they have low participation in marketing, selection of live stock, availing credit, record maintenance etc. For example they have only 56% participation in selection of food concentrate but are 100% responsible for mixing of the concentrate. Market economy trends in the new era of globalization have further widened the gap between education and technology opportunities for men and women.

Need for Public Policy Support

Women farmers do not enjoy the same right as their husbands. The land records are in the name of male members of the family. Therefore, the women farmers do not have access to credit and insurance facilities. Public policy support is needed for women farmers if the status and living conditions in rural India should improve. India is a party to the Convention on the Elimination of All Forms of Discrimination against Women (CEDAW), 1979, and has the commitment to ensure women equal access to agricultural services and technologies. The Fourth World Conference on Women in September, 1995, in which India participated, called for legislative and administrative reforms to give women equal rights with men to economic resources. The “Women Farmers Entitlement Bill 2011” of Prof. Swaminathan before Rajya Sabha addresses this important issue and is laudable. Under the provisions of the Bill which advocates feminisation of agriculture, women will enjoy land rights, water rights in terms of equal right as men to water, water resources, and irrigation facilities for farming, legal access to Kisan Credit cards and other forms of institutional credit, technology and other agricultural inputs and funds for support services. Women must be ensured equal returns for equal work, access to adequate, timely and gender-specific work in food-for-work programmes and support services such as creches and day care centres which could be institutionalized rather than leaving it for private enterprise. It is the opinion of

this visionary that a Gram Panchayat Mahila Fund should be set up in every panchayat for essential gender-specific activities and a National Board for New Deal for Women in Agriculture, under the leadership of the Union Minister for Food and Agriculture should be formed. While fixing wages, there is a need to assess the percent effort in relation to capacity rather than the actual quantum of work. The Union government has recognized the special needs of women farmers by initiating the Mahila Kisan Sashaktikaran Pariyojana programme under the National Rural Livelihoods Mission. Prof. Swaminathan stresses the need to implement the provisions under Article 253 of the Constitution in so far as they relate to the women farmers' entitlements.

Training and Promotion of Skills

Despite the fact that women share greater burden in agriculture, there are hardly any special programmes for enhancing women's agricultural skills. While 7.1 per cent rural females are engaged in manufacturing, the percentage for rural males is 7 i.e. less than that of females. But most of the training programmes have hardly any female participation. While rural males have opportunities in construction, trade, transport, storage, and services, these are mostly denied to rural females. Obviously, opportunities must be created to enable them to acquire the skills necessary for entering these newly emerging occupations. At the 55th session of the UN Commission on the Status of Women (CSW) held at New York, FAO urged

world leaders to ensure that rural women are fully included in the design, testing and use of agricultural technologies and innovations. Dr. Swaminathan opines that agriculture curriculum should be restructured in such a way that every researcher becomes an entrepreneur

Maternal Morbidity, Maternal Nutrition and Anaemia

According to the latest report by UNICEF on maternal health in India, every five minutes an Indian dies from complications related to pregnancy and childbirth, adding up to approximately 1,30,000 women deaths per year. India's Maternal Mortality Ratio (MMR) has been seen to be as high as 407 maternal deaths per 1,00,000 live births, about four times higher than the National Population Policy (NPP) 2010 goal of 100 per 1,00,000 live births. There has been a decline in MMR during the last decade but not at the rate desirable.

Improving maternal health is one of the eight Millennium Development Goals. Conditions related to child birth including pregnancy, delivery and obstetric complications are among the five leading causes of morbidity. Maternal health also impacts child health, with depression following childbirth associated with poor child growth in developing countries. A study undertaken in India showed that maternal psychological morbidity has an adverse impact on fetal growth and a strong association has been found between psychological

morbidity during pregnancy and low birth weight of less than 2.5 kg

A very important component of maternal health is proper nutrition, as this determines fetal nutrition. Augmenting maternal nutrition and hygiene are important strategies for prevention of obstetric complications. Nutritional deficiencies in antenatal women can cause structural and functional changes in utero that may permanently increase susceptibility of the child to chronic diseases. The role of micronutrients is important and a critical need in developing countries is meeting the requirements of calories and iron. The current world food price crisis is having a severe impact on women who ensure the rest of the family is fed on priority. This further exacerbates already existing malnutrition amongst women which has tell tale effects on children in the form of disabilities and malnutrition and the impact of this crisis will be with us for many years.

Anaemia is a major killer in India. Statistics reveal that every second Indian woman is anaemic and one in every five maternal deaths is directly due to anaemia. Anaemia affects both adults and children of both sexes but pregnant women and adolescent girls are most susceptible and most affected by this disease. A study summarizes the current situation as follows:

- One in every two Indian women (56%) suffers from some form of anaemia

- 4 out of every 5 children in the age of 6-35 months suffer from anaemia
- 20% of the maternal deaths are due to anaemia and anaemia indirectly contributes to another 40% of maternal deaths²
- Maternal mortality staggeringly high at 454 per every 100,000 live births
- Results not commensurate with the 30 years of efforts by the Indian government

Hypertensive disorders in pregnancy, stillbirth, pre-term delivery, induced abortion and haemorrhage are other causes of maternal mortality. Marriage and child birth at early age is another contributory factor and about 50 per cent of the women in India marry before they are 18 and by 19 years of age half of them have their first child born. Low awareness especially amongst those belonging to lower socio-economic class poses challenge in bringing about transformation.

The Hidden Burden of Disease

A hidden burden exists for each morbidity condition, and some of this hidden burden is currently unquantifiable. The hidden burden of morbidity is very high when women are sick. While costs borne by families, particularly in areas lacking specialized health services is a major impact, low performance of those employed affecting growth and productivity, the economic

cost to industry through higher health coverage of employees is yet another impact. Most importantly, maternal health directly translates to the health of the child and of the family and the performance of the family which makes addressing maternal health most important.

Studies show that when women are supported and empowered, all of the society benefits. Their families are healthier, more children go to school, agricultural productivity improves and incomes increase. In short, communities become more resilient. Women are a great human resource in all countries and the role of women in society is critical for development. Arguably, to empower women is to increase their control over the decisions that affect their lives both within and outside the household. Given proper own space, they can play an increasingly important role in social, industrial and economic development of the country. The state of Kerala has achieved 100% literacy and the female literacy is the highest amongst all states in the country. The state has achieved equal rights among men and women and has a higher standard of living. Despite being one of the poor states in the country, it has, through greater and equal access to healthcare and increased literacy, achieved better standards of living than richer states in India showing it is not affluence but balanced distribution of power and equal opportunities that matter in improving lives of people and achieving inclusive development.

Women in Science

Gender has also figured in important ways in shaping the careers of scientists for centuries. Ideologies of gender, nature and science developed over different eras have resulted in the exclusion of women from science for a long time all over the world. Women, in fact, were barred from education itself earlier on. Later on they were allowed education but were barred entry to universities. The idea prevailed that education would distract women from their natural roles as mothers. Science and especially, technology, has been considered 'masculine' for a long time and gender gap in science is observed in most societies. Studies indicate that the proportion of women in national laboratories and prestigious universities is less than 15%, with some exceptions. Women are under-represented in all science academies. The mode of selection criteria used and the current trend of training in cracking entrance examinations at exorbitant costs which are more accessible for boys has made it more challenging for women to gain entry into premier institutions that employ all India entrance examinations.

The number of females becomes lesser with higher positions in the academic hierarchy. The social norms, societal structure, relationship between family and work, and the organizational processes of scientific institutions, have created a series of interrelated problems for women in science. To address these problems, changes in the society at

large are, thus, absolutely essential. Science and society are closely linked and there is need for changes within the social processes and institution of science. Even today, it is felt that it is inappropriate for women to pursue science especially in but not limited to rural areas and amongst socio-economically poorer population. Of the 80 women's colleges affiliated to Karnataka State Women's University located in backward area of North Karnataka, only 14 offer limited science courses which is a testimony to the fact that even now the myth that women are not suited for science education persists.

Women's empowerment cannot be complete without their equitable participation in science and technology. The importance of the role of women as educators, as protectors of the natural resources and environment has been underestimated and neglected. Better education in science for a girl child means enhancing the ability of citizens to build a stronger economy. IT contributes to a healthier environment, and bring about a brighter future for everyone. Women have special role to play in the area of science and technology. They can bring a wave of creative and generative energy in the field of science and technology. Today their participation is restricted and limited to very less numbers because of widespread discrimination at the basic education levels and lack of opportunities for pursuing higher studies. When given equal opportunities, women have excelled. All over the country, in all schools and colleges girls are higher

ranking every year. But this does not translate into higher performance beyond schools and colleges. Scores of women have proved time again their ability to excel in science and technology against all odds if provided opportunities ranging from Marie Curie, Barbara McClintock, Rosalind Franklin of yester years to Kalpana Chawla and Sunita Williams of space age. While India can take partial pride of the Indian origin of the two women astronauts, the first all women team of three senior women scientists including Project Director T.K. Anuradha, Mission Director Pramodha Hegde and Operations Director K.S. Anuradaha which carried crucial manoeuvres (womanoevres) of the communication satellite GSAT -12 this year has made India more proud. There is also a woman scientist heading an ISRO centre as the Director. It makes me wonder whether this attitude of space scientists in encouraging participation of women is the secret behind the success in their mission.

There is a need for global capacity building in science and technology, particularly the creation of a critical mass of well-educated scientists and engineers among women. This would make the greatest possible use of humanity's brainpower by giving women and men equal opportunities to excel and this indeed would be the right thing to do. The involvement and engagement of women in science on an equal footing with men would directly contribute to improving the livelihood of people, making it more sustainable and thereby promoting the social and economic advancement of societies.

There is a need to improve public understanding of science and technology so that citizens may be knowledgeably involved in modern S&T related policy issues and would better appreciate the need for everyone including women to have basic education in science. There is a need to enable millions of women across the country to apply and benefit from the fruits of science and technology, such as useful products and services, for growing the country's economy while improving their own lives. Governments must design and implement national policies and programmes that promote science and technology education for women and girls and which encourage women to enter into high value added career in science and technology.

Science for Women

Science and technology can be powerful tools in bridging the gender divide and achieving inclusive development if effectively and universally adopted. Science and technology offer solutions to many challenges faced by rural women: they can contribute to food security by boosting crop yields, increase women's performance by introducing labour-saving technologies and increase their participation in the rural labour market through better communications. Women can greatly benefit from a combination of ICT and space technology. Tele-education and virtual class rooms can be a boon for improving literacy and even higher education for women who have restrictions on their mobility and whose services are expected at home

by the family even at the age of seven thus preventing them to adopt to rigid school hours in addition to reluctance in investing on women's education. Tele-medicine can be even more beneficial for women than men for the same reasons. Biotechnology has vast potential in creating job opportunities and improving lives of women. The Women's Biotechnology Park established by MSSRF with support from DBT, Government of India, located in the knowledge corridor of Chennai which is designed to provide opportunities for self employment to educated women in the field of biotechnological enterprises and biological software for sustainable agriculture is a model worth multiplication all over the country.

Technologies to ensure providing nutritional requirements at an affordable price and making it accessible can have tremendous impact on women's health as well as public health which leads to having a healthier future generation and preventing malnutrition dependent ill health in children. Innovations in technologies for diagnosis of deficiencies and diseases for preventive care and early intervention for the benefit of maternal health, fetal health, for through put screening at affordable cost can be invaluable for public health especially in rural areas. Fortification of food with iron and micronutrients and technologies to enhance iron intake can be invaluable in addressing the widespread problem of anaemia in women.

Bridging Rural-Urban Digital Divide for Bridging Gender Divide

Bridging the urban-rural digital divide is a powerful method of bridging the gender divide in rural India. Experience shows that rural women are adept in mastering digital technologies. Many of the village knowledge centres and village resource centres set up with support from ISRO are being efficiently managed by womenfolk. Jamsheji Tata National Virtual academy established by the MSSRF is another experiment in ushering in a knowledge revolution in rural India which can lead to enhancement of human productivity and creativity in every area of human endeavor.

Need for Innovation

The purpose of innovation is to create a new value. New values could be in the form of breakthrough products or services, new strategies, new processes and new methods for organization. Value addition to the existing technologies to make them appropriate for each class of people in this country of diversity, to make them more affordable and more accessible opens the door for inclusive development. There is a need to improve the linkage between technology development and technology application by strengthening the ties between basic research and business. Time is ripe to convert knowledge into wealth and welfare of people through the process of innovation more effectively. The time is ripe for integrating the

entire spectrum of knowledge available and we cannot ignore indigenous and traditional knowledge. There needs to be established, a strong linkage between the indigenous knowledge holders and scientists and link various knowledge systems. There are many success stories resulting from such experimentation with traditional medicine. Apart from the strength of technology and viability factor driven by economics, socio-economic and socio-cultural aspects are key players in innovation.

Inclusive development is one of the most important goals of socio economic development in most of the developing countries as well as in countries where a divide reigns. Inclusion can take place by treating economically poor and disadvantaged people as consumers of public policy of assistance and aid for basic needs wherein their cooperation is needed for the success of the mission. They can be considered as consumers of products at low cost made by large corporations or the government or other enterprises in which case their acceptability factor will determine the success of the product which in turn may facilitate betterment of their lives. Since communities are the closest to grassroots' problems, they are the best judges to evaluate technology alternatives and provide innovative solutions for the problems of their respective areas. This "from inside out" and "bottom up" perspective to technology has been supported by several social scientists.

To achieve Inclusion by people's participation it

would be important to also build the capacity of the marginalized to convert their traditional knowledge into value added products or technologies that would be most acceptable to them. Any amount of intervention by the government or other agencies cannot match the impact people's participation has in transforming society and achieving inclusive development. The innovative abilities of a large section of the society in the form of underprivileged has been ignored and constrained because of the failure to impart them with necessary education, skills and knowledge and also creating an ecosystem that promotes their participation.

The need of the hour is to strengthen the capabilities of those ignored so far and tap their potential in nation building activities. Describing the Rural Poverty Report 2011, released recently by the UN International Fund for Agricultural Development (IFAD), the IFAD President Kanayo F. Nwanze said “The report makes clear that it is time to look at poor smallholder farmers and rural entrepreneurs in a completely new way – not as charity cases but as people whose innovation, dynamism and hard work will bring prosperity to their communities and greater food”. While many companies try to deepen the market and reach the unreached, very few consider socio-economically disadvantaged people as potential supplier of innovative solutions. Innovations are not confined to four walls of sophisticated R & D laboratories. Outstanding innovations can emerge at grassroots level. There

are several examples of outstanding innovations coming from students, from rural people and the poor. Indeed the poor are said to be more innovation driven necessitated by the challenges of accessibility and affordability. Partnering with socially disadvantaged and out of the mainstream people may yield unexpected results in this context. There are some encouraging examples such as “Honey Bee Network” which is a database of grass root innovations and technologies and serves as an effective solution to problems of local development

India's 60% population depends on agriculture, but income levels are low because productivity is low and is marred by low inputs, pests, diseases and losses. India has massive food requirement and has variety of crops, fruits, flowers and vegetables but food sector is handicapped due to inefficiencies in production, processing, storage and packaging. India gets excellent solar radiation, every roof top can become a power house, but solar energy is not harnessed maximally because right and affordable technology is not in place. India gets excellent rains. Many parts experience floods. But still drinking and irrigation water is not available in many parts because water storage and purification techniques need improvement. Average Indians do not lead a long and healthy life because they have limited or no access to good health care or cannot afford. India's Industrial and infrastructure sectors are growing very fast, but the materials used in both are not as durable and precise as they could be. India is urbanizing fast but still faster is the level of

pollution because of urban waste, untreated water etc. Most of the processing and packaging in industry and agriculture leaves behind a trail of environmental hazards, which if not tackled at this juncture, will lead and add to long term ecological problems including global warming

Hence there is an imminent need to take up innovation driven research and evolve technologies with new dimensions. In this context, nanotechnology has a huge potential. Nanotechnology for example can revolutionize solar energy sector. It has the potential of making solar energy cheaper, cleaner and promote decentralized and sustainable energy production. The applications of nanotechnology can make India the hub of non renewable energy, particularly the solar energy. There is scope to improve the technological and managerial skills to reduce the T & D losses since energy saved is equal to energy produced. Thus, India is a market where there is huge potential for energy producing and saving technologies and equipments. There is a need to develop and strengthen technologies that give the required guarantee of energy availability without polluting the environment. Nanotechnology finds application in purification of water and waste water treatment, in food testing and food processing as chemical catalysts and in packaging. Nanotechnology finds application in ICT and novel electronic devices, heavy industries and aerospace. Nanotechnology has the potential to make construction faster, cheaper, safer and more varied.

Automation of nanotechnology construction can allow for the creation of structures from advanced homes to massive skyscrapers much more quickly and at much lower cost. It can add new dimensions to the properties of the materials used in construction such as glass and steel.

The biological and medical research communities have exploited the unique properties of nanomaterials for various applications. Nanotechnology-on-a-chip is one more dimension of lab-on-a-chip technology. Nanotechnology finds invaluable application in disease diagnostics through labeling of specific molecules, drug delivery reducing overall drug consumption and side-effects and more importantly reducing costs and making treatment more affordable. Nanotechnology finds application in “Tissue Engineering” another important frontier area.

There are several ways and means of capacity building of the marginalized people whether those belonging to socio-economically poor, minorities, the differently-abled or women. The numbers of Indian websites are small and the number of sites in Indian languages is a miniscule though sites are beginning to appear in regional languages. ICT interventions deployed in rural areas, should be customized and the content duly localized to deliver the intended benefits to the rural beneficiaries. Technologies that improve the quality of life and performance efficiency of the rural who constitute more than 70 percent of the

population, of women who constitute nearly 50 percent of the population, of the differently-abled who constitute more than 2 percent of the 1.2 billion population, of socio-economically poor who constitute more than 40% of the population can bring revolution in the socio-economic life of people in India and help achieve inclusive development and make India take a qualitative leap.

Spirit of Innovation

India has more than 50% of its population below the age of 25 and more than 65% lies below the age of 35. It is expected that, in 2020, the average age of an Indian will be 29 years, compared to 37 for China and 48 for Japan. India's dependency ratio (number of people younger than 15 and older than 64 per every hundred people between 15 and 64) is expected to be just over 0.4 by 2030. With almost half of its population in the younger age group the spirit of innovation is strong. This is the age group which is inclined to experiment with unknown but exciting fields. Companies of the future are more likely to adopt exciting and emerging technologies. Thus India is poised to achieve unprecedented transformation and scientists have the most important role to play.

Every R & D institution, private or government, every educational institution and every organization in the country needs to dedicate itself in achieving inclusive development if India has to emerge as a developed country. No institution can

be divorced from the happenings of the society and needs of the society. Karnataka State Women's University, Bijapur., (KSWUB), established in 2003 is one of the few universities exclusively dedicated for women's education, has adopted a number of policies and implemented a number of programmes for promoting higher education of rural women. Most of the students who study in this institution are children of labourers and daily wage workers. Other than making education more accessible and affordable with the lowest fee structure in the state, the university has adopted a number of initiatives such as making tele-education an integral part of teaching, teaching through mobile phones are few of the many such other initiatives. The students and faculty work closely with the rural people of an adopted village Atalatti in a variety of ways – a programme that has brought the state award as the best university for implementation of National Service Scheme (NSS). The most cherished programme of the university is the establishment of the Koushalya Women's Technology Park, one of its kind in the country offering skill training to students and local women. Training is offered in Food processing, Bio-diesel production, Dress designing (Fashion Technology), Computer training and software technology, Vermicomposting, Tissue culture, training in Biotechnology and Bioinformatics and Paper recycling. If it is the Departments of Science which are providing the training, it is the Departments of Social Sciences which are implementing these programmes. All these

facilities serve as information dissemination, training and research centres as well as business incubators. The university is recognized as Centre of Excellence for HIV/AIDS prevention programme and participates in the global programme in fighting against AIDS. Other than establishing close links with the local population, the university is fostering international friendship attracting women from various countries. KSWUB has been contributing in its own way for inclusive development of rural population.

Conclusion:

The above theme of achieving inclusive development through innovations and unfettered involvement of women in the development process in the country is in focus during the 99th Indian Science Congress. Other than panel discussions on key topics such as Science policy making, sustainability education, teaching science in rural areas, Climate change and food security under the leadership of eminent scientists and policy makers of the country, there are plenary sessions on topics many of which have found place in science congress as thematic topics for the first time such as preventive maternal and child care, Green technologies and alternate building materials, Rural livelihood and live stock management, Nanotechnology and diagnostics, Drug use disorders and Neurological disorders to mention a few. It is hoped that these deliberations will lead to important recommendations guiding our efforts for

achieving vision 2020 channelizing the talent we already have, technologies we already have with the help of innovations. This being the year of science, as scientists, let us rededicate ourselves for the cause of the nation connecting all paths of pursuit of knowledge and take an oath that anything and everything we do will be for the betterment of people of India, for the betterment of society and the mankind.

Jai Hind

99th

Indian Science Congress

3-7 January, 2012 - Bhubaneswar



Hosted by
KIIT UNIVERSITY
Bhubaneswar, Orissa, India



NATIONAL INSTITUTE OF
SCIENCE EDUCATION
AND RESEARCH (NISER)
Bhubaneswar



The Indian Science Congress Association
Kolkata