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INNOVATION AND SUSTAINABLE DEVELOPMENT IN INDIA (WITH RESPECT OF EDUCATION, ENERGY AND WATER SECTOR)

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Abstract

Creation and growth of technical knowledge through innovations is fundamental to the process of economic growth. India's growth experience during the last two decades has been highlighted by innovation in the new economy sectors that are mainly urban centric and have benefited only the elite in the high-skilled occupations. The sustainability of this growth momentum is now under threat due to the dualistic development that has created urban-rural divide and bypassed the poor population and the looming environment threats leading to water and energy shortages and lack of education. The future of India will depend on the force with which green and inclusive innovations are unleashed in India to achieve economic, social and environmental sustainability.

The word 'Innovation' used in Joseph Schumpeter's economic development theory. In Joseph Schumpeter's view, fundamental breakthroughs of technology are the essence of the process, and they affect the entire economy. Thus technology and innovation policy can also be linked to the three pillars of sustainable development namely economic growth, social equity and environmental protection. The word 'Sustainable' related with continue or be continued for a long time. In Oxford dictionary 'Sustainable' means, involving the use of natural products and energy in a way that does not harm the environment.

In this paper argues on the innovative ideas, technologies and programmes in Education, Water and Energy sector and identifies the key driver of the innovation process.

Keywords: Innovation, Sustainable development.

Introduction

In the process of growth the scientific and technological breakthroughs. As the key axiom of Joseph Schumpeter's view, innovation as the 'Perennial gale of creative destruction of ideas and structures' is a natural and necessary process for economic growth. This is evident in the growth experience of most developed countries including India. However, India's performance in technology and innovations during the last 50 years of economic planning followed by economic reforms, has been singularly unsuccessful in its policy. India occupies a significant global space in high-end product and service innovations in the 'new economy' sectors of information and communication technologies (ICTs), some tremendous growth also happen, i.e. pharmaceuticals and skill-intensive manufacturing sector with 8% annual average growth rate during the last decade, India's growth is being re-written by innovations. However this growth experience was differences between formal and informal sectors, urban and rural areas and as soon as educated elite and poor masses too.

In this research paper focused on inter relations between innovation and sustainable development in some major sectors i.e. Education, Water and Energy in India.

India traditional education is failing to deliver on its own vision, and falls short of preparing students for the challenges of the modern world. Innovation in the structure of education and the learning environment is needed. The second sector Water, Innovations in the water sector are mainly end-user and community driven experiments at the grassroots level that have been drawn from the traditional knowledge base. There are inspiring examples of institutional innovations aimed at improving the service delivery mechanism and bringing about efficiency, equity and sustainability in water availability. Energy sector innovations comprise

improvements in products, processes, technologies and policy regime changes. Demand side interventions to tackle the growing energy requirements. Policy makers and regulators have been catalysts in driving energy innovations. Innovations of this kind are necessary to bridge the gap between globally competitive India and India of the poor with acute inequalities and inefficiencies and should evolve strategies for those at bottom of the Pyramid.

Being the world's most populous country-as projected for 2025 affords India the political, social and economic capital to influence the entire globe. With half the population under the age of 25, the success of India will be defined by access to education, preservation of its cultures, the health of its children, the quality of its communities, the mobility of its people, and the sustainability of its resources. In India, population growth is a major issue that is putting a major strain on the country's resources and its cities. The rapid urban expansion of Indian cities is happening at a speed quite unlike anything the world has been before. Yet the potential for Indian cities is tremendous. India has become a powerful engine driving and shaping the world's economies, culture, technology and development. The rapid, chaotic growth of Indian cities, however, creates key challenges that will need to be tackled forcefully to ensure that promise.

The current innovation scenario has an urban bias with exclusive focus on segments catering to the elite population and export markets. India's innovations potential has largely bypassed its young population, which is half the population under the age of 25. But the problem is most of India's population living in abject poverty and equipped with low skill sets. The sustainability of the growth momentum itself is under threat due to the looming environmental challenges of water and energy shortages. To sustain longterm growth process, India needs to bring in green and inclusive innovations that are targeted towards economic, social and environmental sustainability. Here as researcher we takes some overview of innovations for environment in India, with specific focus on innovative ideas, technologies and programmes in the water and energy sector as well as argues on innovation in education sector too.

According to the the World Bank, water and energy security for the people is broadly related to their food and livelihood health security, ecological and environmental security and economic growth and development. In the next few decades India's growth trajectory will greatly depend on the adequate provision for its growing water and energy requirements. The water availability per capita per year is reducing from 1800 m³ during 1980s to 1450 m³ at present and is expected to decrease further to 1100 m³ by 2025. Inequalities in water distribution among states will further accentuate these shortages. So that India should care about the availability of water. Similar scenario of energy requirements and availability. The main energy products consumed in India are electricity, oil, coal, gas and biomass, of which, electricity is the single largest energy product used for residential agricultural, industrial and commercial purposes. In the rapid economic growth India should produce adequate energy to society. 40% of energy production in India uses coal and 23% uses oil, which has imminent impacts on environment and global climate change. Even with aggressive renewable energy generation, the consumption would move up to 1033 Mtoe by 2020 and 2097 by 2030. These figures highlight the fact that supply-side alternatives like hydro power, renewable energy sources and nuclear energy will only have a minor impact on future energy consumption levels. Therefore demand side interventions in the form of technology and policy-driven innovations are the need of the hour to meet the ever-growing energy demands in future.

Innovation in the Education sectors in India

Education in India is provided by the public sector as well as private sector, with control and funding coming from three levels i.e. central, state and local. Under various articles of the Indian Constitution, free and compulsory education is provided as a fundamental right to children between the ages of 6 and 14. Therefore in India traditional education is failing to deliver on its own vision, and falls short of preparing students for the challenges of the modern world. Innovation in the structure of education and the learning environment is needed. Changes are not sweeping, countrywide changes, but efforts at individual universities that are bearing fruit and which others can learn from them.

A few noteworthy innovations introduced in the education sector during the last few years are:



Activity-based learning: This is the world of activity-based learning (ABL), an initiative that has transformed elementary education in Tamil Nadu state in India. ABL based on the pedagogical principle of learning through activity, was launched across Tamil Nadu's 37,486 schools in 2008. In the learning system it has no tables, no chairs and no regular classes., teachers sit on the floor, students do likewise, in little circles in some rooms, students from different grades sit together. All of them are busy. Some write on low blackboards, some draw, some use an abacus. In one room, puppet show exposes the pupils to mathematical tables.

One Child One Light: One Child One Light (OCOL) was founded by Dr. Ranganayakulu Bodaval of THRIVE Solar Energy Pvt. Ltd. In 2009. The program addresses the night study needs of children located in rural, semi-urban and off-grid geographies by enhancing access to solar powered LED lights. This approach also improves attendance figures by providing an incentive for children to come to school on a daily basis, and increases the value of education in the community.

Pratham Education Foundation: The Pratham education foundation geared towards providing innovative technology tools to teachers in low-income schools in India. the objective is to enrich the planning and in-class experience for teachers, while also enhancing and diversifying learning activities for students, overall seeking to improve student learning outcomes.

National Skills Development Corporation: The National Skills Development Corporation (NSDC) is a public-private partnership formed under India's Ministry of Finance, with 51% equity held by private sector and the remaining 49% by the Government of India. NSDC's main activities include i.e. supporting vocational training institutions, conducting labour market research, establishing and funding sector skill councils, engaging with other stakeholders and coordinating targeted advocacy campaigns, enabling the ecosystem in education institutions.

Avanti Program: Avanti believes that the exclusion of low-income students from access to a college education due to inadequate preparation is a major contributor to India's ever-widening socio-economic divide. Avanti Program goal is to create a high-quality, affordable and scalable education model that can prepare these students adequately for college and the workforce. This program identifies high potential low-income students and provides them with supplementary science and mathematics education at learning centers in the major metropolitan cities of India.

Right to Education : India implemented Right to Education Bill 2008. Some significant innovations are suggested in this bill i.e. introduction of problem based learning system, students work in small learning teams, bringing together collective skills at acquiring, communication and integrating information, regular assessment and feedback system, involve parents/guardians and classmates too, pace and type of assignments to be adjusted accordingly.

Innovation in the water sector in India

In the water sector innovations are mainly experiments at the grassroots level. These are technologies and practices drawn from the traditional knowledge base and are essentially process innovations. A few noteworthy innovations introduced in the water sector during the last decade are:

Decision-making tool in the water sector:

Integrated Water Resource Management (IWRM) has been recently launched by Government Water Programme (GWP) as an innovative participatory decision-making tool in the water sector. This tool aims at building cross-sectoral linkages for water resource development and management by integrating water-related decision making with other economic, social as well as environmental objectives too.

Community based initiatives in Water sector:

End-user or community based initiatives in collecting and storing rainwater for farming through low-cost methods to supplement the water available through irrigation or supply network of water utilities.



Community owned and managed user fee based safe drinking water systems:

A good example of such system is the Nandi Foundation's innovative public-private partnership between communities and the local government. This approach focuses on awareness building, tackling water contamination through appropriate technologies and covers the cost by charging user fees.

Water harvesting :

Rooftop rainwater harvesting in urban areas as a policy-driven programme to tackle the water shortages in ever-expanding urban areas as a part of the wise water management strategies of the local governments. These programmes also find a place in other innovative ideas such as green buildings wherein the new residential premises need to have build-in rainwater harvesting facilities.

Innovation in the energy sector in India

In the energy sector also innovations are mainly experiments at the grassroots level. Energy sector innovations scenario in India has been quite rich in term of innovative products, processes, technologies and policy regime changes. These innovations are mainly aimed at demand-side interventions to tackle the growing energy requirements. Policy makers and regulators have played a key role in implement these innovations. The major policy instruments pertaining to tariff determinations, development of renewable energy, electricity distribution companies, etc. Energy sector in India has seen many regulator-driven and service delivery innovations as mentioned below.

1. Tariff Setting : Tariff setting process that supports use of electricity in staggered manner i.e. time-of-use and time-of-day tariff.
2. Energy Performance: Standards and labeling program to set minimum energy performance standards and display energy performance standards and display energy consumption levels on the appliances.
3. Implement technical interventions: Advent of energy services companies to implement technical interventions at the customers premises and to share the savings in a pre-contracted manner.
4. Data acquisition: Remote data acquisition by the utilities to understand end-use load profile.
5. Energy Saving: Remote switching on and off for electrical appliances.
6. Energy efficient appliances: Policy instruments and promotional measures for encouraging conscious switch-over to energy efficient electrical appliances like CFLs and LEDs for residential and commercial applications- a good example of this would be the 'Bachat Lamp Yojna' for CFL promotion initiated by the Bureau of Energy Efficiency.
7. Promotion of renewable energy: Mechanism to raise resources for promotion of renewable energy through a state-level 'green power development fund' created out of cess collected from the consumers.

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