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Sustainable Urbanisation: An integrated approach towards future India

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ABSTRACT: Cities and towns have become the primary human living space. Since 2007, more than half of the world's population has been living in urban areas and the figure is estimated to exceed by 70% by 2050. This is characteristic of the transformation of humans' economic base and social structure, in as much as, previously, populations lived and worked primarily in rural areas. Cities can provide many socio-economic benefits. By concentrating people, investment and resources through agglomeration, cities heighten the possibilities for economic development, innovation and social interaction. All these in turn result in reduction of the city's ecological footprint and financial fragility, and the building of resilience against the adverse impact of natural hazards. The evolution of the concept of urban sustainability is described and a framework is proposed based on four pillars: economic development, social development, environmental management and effective urban governance. India is such a country which has been pushed down quite heavily by environmental degradation, jeopardizing the survival of its economic engines.

Environmental degradation on one hand and inevitable urbanisation on the other is resulting in degraded human settlements. Without giving up, India continues to climb higher on the environmental scale every decade, stepping high on the strong foothold built by the various initiatives of the Indian government and its citizen over time. The paper explores the various aspects of sustainable urbanisation and the possibilities that India is exploring currently to emerge as a smart, self-sustaining and environ-friendly nation.

Keywords: Environment, Development, Sustainable Cities, Smart Planning, Initiatives

I. INTRODUCTION

Cities and towns have become the primary human living space. Since 2007, more than 50% of the world's population has been living in urban areas and the figure is estimated to exceed 70% by 2050. This is characteristic of the transformation of humans' economic base and social structure, in as much as, previously, populations lived and worked primarily in rural areas. Cities can provide many socio-economic benefits. By concentrating people, investment and resources through agglomeration, cities heighten the possibilities for economic development, innovation and social interaction. Cities also make it possible to lower unit costs so as to provide public services such as water and sanitation, health care, education, electricity, emergency services and public recreational areas (Polèse, 2009; Satterthwaite, 2010). However, this requires a functioning city government which is able to ensure that such benefits are realized, and to adopt a sustainable framework that encourages the city's growth within ecological limits. Along these lines, cities also face challenges that threaten their efforts to achieve sustainability, for example, through improvement of access to, and efficiency in the use of, public services, as well as reduction of their ecological footprint and financial fragility, and the building of resilience against the adverse impact of natural hazards. The present scenario recommends an integrated strategy for making cities thriving centres of sustainable development and innovation. It starts by assessing what a city is, the scale and speed of urbanization in recent decades, and the main trends and projections of urban growth across regions. The trends and projections analysed serve as an introduction to the conception of future urbanization as a process that can enhance the benefits of cities, while reducing the threats to a more balanced and sustainable development. The evolution of the concept of urban sustainability is described and a framework is proposed based on four pillars: economic development, social development, environmental management and effective urban governance.

India is such a country which has been pushed down quite heavily by environmental degradation, jeopardizing the survival of its economic engines. Without giving up, India continues to climb higher on the environmental scale every decade, stepping high on the strong foothold built by the various initiatives of the Indian government and its citizen over time. It is in this past two decades that we have answered that call with conclusive steps forward. In this paper we will analyse the basic models of sustainability and put forth an integrated set of initiatives taken by India for sustainable urbanisation at the sectoral level (e.g., disaster risk reduction, housing and green infrastructure) as well as a policy framework for a sustainable financing of cities.

II. WHAT IS SUSTAINABLE DEVELOPMENT?

Everything that we need for our survival and well-being depends, either directly or indirectly, on our natural environment. Sustainability creates and maintains the conditions under which humans and nature can exist in productive harmony, fulfilling the requirements of present and future generations. This concept has emerged as a result of significant concerns about the unintended social, environmental, and economic consequences of rapid population explosion, economic growth and over-consumption of our natural resources. Sustainable development can be described as a development which combines economic growth, social progress and environmental protection - the 3 pillars of sustainability. Hence, in this paper, 'sustainable development' of an urban area which is the process of continually improving our socio-economic-cultural and environmental aspects are explored which in turn lead to an increase in our quality of life.

Sustainable Development implies economic growth together with the protection of environmental quality, each reinforcing the other. Sustainable Development, thus, is maintaining a balance between the human need to improve lifestyles and feeling of well-being on one hand, and preserving natural resources and ecosystems, on which we and future generations depend. Sustainable Development may also be defined as "To improve the quality of life while living within the carrying capacity of ecosystems" IUCN (The World Conservation Union), 1991. Thus, Sustainable development does not focus solely on environmental issues. More broadly, it encompasses the three general policy areas namely economy, environment and society. The Swiss 'Monitoring of Sustainable Development Project' MONET in 2001, proposed the following definition: 'Sustainable development means ensuring dignified living conditions with regard to human rights by creating and maintaining the widest possible range of options for freely defining life plans. The principle of fairness among and between present and future generations should be taken into account in the use of environmental, economic and social resources. Putting these needs into practice bring about comprehensive protection of bio-diversity in terms of ecosystem, species and genetic diversity, all of which are the vital foundations of life.'

III. MODELS FOR SUSTAINABLE DEVELOPMENT

Moving towards sustainable development presents tremendous challenges. Man has all the tools necessary for achieving it. However, we tend to forget that in order to survive, we need to adapt to nature and not vice-versa. We need to develop the ability to make a choice which respects the relationship between the three "Es" – economy, ecology and equality. If all the three "e's" are incorporated in the national goals of countries then it would be possible to develop a sustainable society. Models help us understanding the concepts of Sustainability better. Achieving SD thus, requires more effective, open, and productive association among the people themselves. Models help us gather, share, and analyse information; they help coordinating work; and educate and train professionals, policymakers, and the public in general. The following are some of the constructive models for understanding Sustainable Development:

A. Three Pillar Basic Model

This is one of the most well-known models created using the three dimensions -Economy, Environment and Society. The diagram shows three interlocking circles with environmental (conservation), economic (growth), and social (equity) dimensions. Sustainable Development is modeled on these three pillars. This model is called 'three pillars' or 'three circles model'. It is based considering the society, but does not explicitly take into account 'human quality of life'.

However, an improvement to this three circles model has been made and a fourth dimension is incorporated along with social, economy and environment. This fourth dimension is institutional dimension that is playing a crucial role in sustainable urbanisation, whether it is either government institution or private institution or alliance.

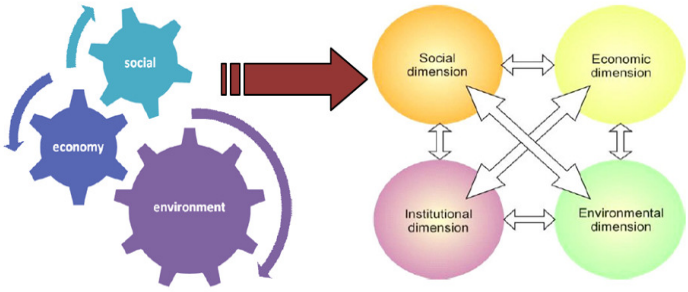

Fig. 1. Transition of Three Pillar Basic Model.

B. Egg of Sustainability

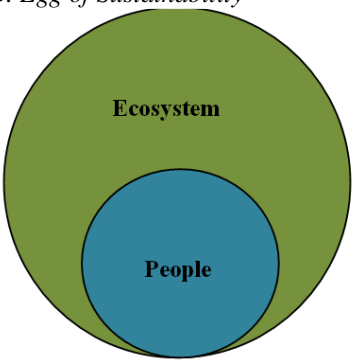

Fig. 2. IUCN's Egg of Sustainability.

The 'Egg of Sustainability' model was designed in 1994 by the International Union for the Conservation of Nature, IUCN (cf. Guijt & Moiseev 2001). It illustrates the relationship between people and ecosystem as one circle inside another, like the yolk of an egg. This implies that people are within the ecosystem, and that ultimately one is entirely dependent upon the other. Just as an egg is good only if both the white and yolk are good, so a society is sustainable only if both, people and the ecosystem, are functioning well. Social and economical development can only take place if the environment offers the necessary resources: raw materials, space for new production sites and jobs, recreation, health etc. Ecosystem is, therefore, to be regarded as a super coordinated system to the other dimensions of the triangle or prism models: social, economical, and institutional. The latter can only prosper if they adapt themselves to the limits of environmental carrying capacity. Thus according to this model: sustainable development = human well-being + ecosystem well-being. (Source: IDRC 1997).

C. Atkisson's Pyramid Model

Atkisson Pyramid process supports and accelerates the progress from identifying the vision of sustainability, through analysis and brainstorming and agreements on a credible plan of action. The Structure of the Pyramid guides through the process of first building a firm base of understanding, searching for and collecting relevant information and ideas, and then focusing and narrowing down to what is important, effective, doable, and something that everyone can agree in. The Atkisson's Pyramid is a blue print for the process of sustainable development.

This model is designed to help groups of 20-40 people move quickly up the sustainability learning curve, from basic principles and frameworks, to systems analysis, to innovative strategies for action. Along the way, groups practice cross-sectoral teamwork, make linkages, generate dozens of new ideas, and work toward an "Agreement" which is a set of actions they agree to follow through within the real world.

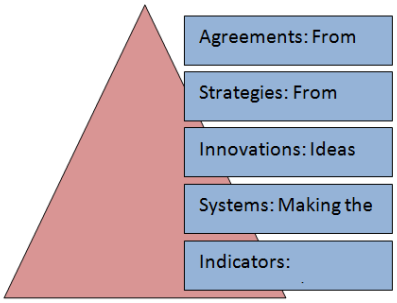

Fig. 3. Atkisson's Pyramid.

IV. INDIA'S COMMITMENT TOWARDS ENVIRONMENT

The idea of sustainable development was never new to India. Studying the remains of the cities of ancient Indus Valley, Harappa, Mohenjo-daro, and the different Indian *sastras*, it can be concluded that ancient Indian planning had its roots in sustainable development. But it was not conceptualised or focussed upon clearly in the Indian constitution. The adaptation of western concepts lead and subsequent changes in our lifestyle forced us to forget our past and our principles of development. It was only in 1976 that the Indian Government thought it necessary to get the Indian Constitution amended to expressly provide for the protection of environment by incorporating a few specific provisions.

The result was the enactment of the Constitution, 42nd Amendment, Act 1976, providing for an expressed constitutional commitment to safeguard environment in the country. Also, the introduction of Article 48-A and 51-A (g), i.e., the Directive Principles of State Policy and the Fundamental Duties respectively, decisive environmental legislations, all formed a part of the major step for holistic and integrated development - Sustainable Development.

The judiciary also took on the role of protection, prevention and conservation of the environment, impact assessment (though EIA & SIA), scrutinising policies of development from environmental perspective etc. (Venkat, 2011).

The decade from 1997 to 2007, covering two plan periods of the 9th and 10th Five-Year Plans, was clearly guided by the motto of inclusive growth with social justice and equity. The 10th Five-Year Plan (2002-2007) was committed to emphasise on incorporating ecological issues into the development strategy and the need for robust governance to achieve the same. The 11th Five-Year Plan (2007-2012) further strengthened the country's commitments towards sustainable development which talked about "inclusive growth" and for the first time the concept of "sustainability" was added. The 12th Five Year Plan aims to achieve the objective of 'Faster, More Inclusive, Sustainable Growth' where it mentions the need of "National Action Plan for Climate Change" to promote and ensure the environmental sustainability of urban development through different sectors like sustainable transportation, energy-efficient buildings, and sustainable waste management in cities under National Mission on Sustainable Habitat. (Planning Commission, 2011; Venkat, 2011)

V. SUSTAINABLE CITIES IN URBAN INDIA

The speed at which India is currently urbanising poses an unprecedented managerial and policy challenge with the present legal, political, policy-level and institutional framework. Nonetheless, urbanisation is critical to India's development as economic growth and urbanisation have gone hand in hand till date. Thus, the need for the day is urbanisation which is sustainable – a city designed with consideration of environmental impacts, inhabited by people dedicated to minimisation of required inputs of energy, water and food, and waste output of heat, air and water pollution.

Then the question arises why sustainable cities and not regions or districts? The answer lies in the fact that cities can be a cost effective vehicle to expand access to basic services. Research indicates that the cost of delivering basic services is 30-50% cheaper in concentrated population centres than in sparsely populated areas. Given finite public such potential savings could be vital if the government is to meet its aspiration for improving quality of living at affordable prices. There is a clear evidence of agglomeration benefits in basic sectors including water distribution and roads. Hence, as a first step, we should strive for sustainable cities. The trickling down benefits will make the surrounding regions sustainable over time.

VI. INITIATIVES FOR SUSTAINABLE URBANISATION IN INDIAN CITIES

India has many times engaged in national discussion about how to handle this seismic shift in the make-up of the nation but not at a comprehensive scale integrating all aspects. As a result of this, we have many successful yet discrete best practices in our country. Some such initiatives – the provisions for future development of India - have been briefly highlighted in the following:

A. Renewable Energy Initiatives - Solar City Programme

The solar city programme was envisaged by the Ministry of New and Renewable Energy to encourage the ULBs to shift to renewable sources of energy, specifically solar energy, to meet the energy crunch by drafting and designing the "Development of Solar Cities" programme. A total of 60 cities were proposed as Solar Cities during the 11th Plan period. The Solar City aims at minimum 10% reduction in projected demand of conventional energy at the end of five years, through a combination of enhancing supply from renewable energy sources in the city and energy efficiency measures. The basic aim is to motivate the local Governments for adopting renewable energy technologies and energy efficiency measures.

In a Solar City all types of renewable energy based projects like solar, wind, biomass, small hydro, waste to energy etc. may be installed along with possible energy efficiency measures depending on the need and resource availability in the city. As a first step towards this, the Ministry initiated various programmes in the Urban Sector like promoting solar water heating systems; deployment of Solar Photovoltaic (SPV) systems/devices; establishment of 'Akshya Urja Shops'; design of Solar Buildings, promoting urban and industrial waste/ biomass to energy Projects etc. 8 cities are proposed to be developed as 'Model Solar Cities' and 15 are identified to be 'Pilot Solar Cities'(MNRE, 2014; Thomas, 2012). Also, on November 2014, the MNRE announced that India will formulate a 'Renewable Energy Act' which will be ready by February 2016.

B. Climate Change Agenda for Delhi

NAPCC -The National Action Plan for Climate Change promotes sustainable city development through the introduction of sustainable transport, energy-efficient buildings, and sustainable waste management in cities under National Mission on Sustainable Habitat. The Climate Change Agenda for Delhi 2009-2010 is a set of 65 action points (under various heads) that each department of the administration has to adhere to and carry out so as to achieve the objective. Various sectors identified under Climate Change Agenda are: Water conservation, Forestry, Buildings, Lighting, Transportation, Renewable energy generation, Energy conservation, Clean Power Generation, Municipal Solid Waste management etc.

C. *Okhla Waste to Energy (WtE)*

With the "Zero Waste Concept" the Okhla Waste to Energy (WtE) plant is India's first large scale WtE facility that aims to dispose and process 1/3rd of the Delhi's garbage and convert it into the much-needed Clean Renewable Energy. It is a Clean Development Mechanism, registered with UNFCCC for earning carbon credits. Currently, the New Delhi Municipal Council is generating power at this 'Waste to Energy' plant on NDMC land in Okhla, daily contributing 16MW of electricity generated from solid waste to 8,000 households in the city. (NDMC, 2014)

D. National Urban Sanitation Policy

The Ministry of Urban Development, Government of India, announced the National Urban Sanitation Policy (NUSP) in December 2008, seeking to address the gap in sanitation infrastructure and move Indian cities towards 'Total Sanitation' through a 'systems driven' approach. In the NUSP, the GoI called all State Governments to prepare State Level Sanitation Strategies and Urban Local Bodies (ULB) to prepare City Sanitation Plans (CSP). So far, more than 10 states have developed state sanitation strategies, rating completed for 500+ cities. CSPs are prepared for a handful of cities and national campaigns are also organized, and the most recent addition being the Swachh Bharat Abhiyan.

The Swachh Bharat Abhiyan is more or less a restructured and modified version of other similar initiatives in the past like Central Rural Sanitation Programme (CRSP) (1986), Total Sanitation Campaign (1999) etc. and it aims to accomplish the vision of 'Clean India' and attain 100% Open Defecation Free India by 2nd October 2019.

E. Rajiv Awas Yojana (RAY, 2013-2022)

Rajiv Awas Yojana envisages a "Slum Free India" with inclusive and equitable cities in which every citizen has access to basic civic infrastructure and social amenities and decent shelter. It aims to bring all existing slums, notified or non-notified within the formal system and enabling them to avail the basic amenities that is available for the rest of the city. This scheme envisages delivery of 70-80 lakh housing units on PPP model by way of viability gap funding. Nearly 166 towns have come under this initiative.

F. Rain Water Harvesting: Chennai

The severe water scarcity in Chennai during 2001-02 period acted as a stimulus for Rain Water Harvesting (RWH) at city level, thereby launching special campaigns (through mass media, seminars, exhibitions, mobile publicity vans) making it a people's movement. The Tamil Nadu Government promulgated an ordinance during July 2003, Tamil Nadu Municipal Laws (Second Amendment) Ordinance, 2003 Inserted Sec. 255A in the Chennai City Municipal Corporation Act, 1919 made RWH mandatory. All the citizens were directed through this ordinance to provide RWH structures in all the buildings built before 31 August 2003.

The Chennai Metropolitan Water Supply and Sewerage Board (CMWSSB), Tamil Nadu popularized the RWH techniques among the residents of Chennai city by constituting a fully dedicated "Rainwater Harvesting Cell", opening an Information Centre on RWH to spread awareness, conducting Regular training programme, constructing a number of check and injection wells (at macro-level) and implementing RWH in the public buildings (at micro-level). Today Chennai city is a rainwater friendly city, helping in improving the ground water table as well as in improving the quality of ground water. Moreover, during rainy season the dependence on the municipal water agency has come down. (AUICK, 2009; CMWSSB, 2006)

G. Transport Initiatives: DMRTS, JANMARG, Mumbai Monorail

Among the transport initiatives in India, the Delhi Metro has been instrumental in ushering in a new era in the sphere of mass urban transportation in India. It has also been certified by the United Nations (UN) as the first Metro Rail and Rail based system in the world to get carbon credits for reducing greenhouse gas emissions as it has helped to reduce pollution levels in the city by 6.3 lakh tons every year thus helping in reducing global warming. According to a study conducted by the Central Road Research Institute (CRRI) in the year 2011, Delhi Metro has helped in removing about 1.17 lakh vehicles from the streets of Delhi.

Ahmedabad BRTS, Mumbai Monorail, BRTS of Pimpri-Chinchwad, Visakhapatnam, Jaipur etc. are other such bold initiatives or best practices taken up by the various state governments in India. The Ahmedabad BRTS (JANMARG) was showcased at 2012 United Nations Climate Change Conference as a 'lighthouse project', as part of the United Nations Secretary General Ban Ki-moon's Momentum for Change Initiative. (Goswami, 2012; NIUA)

H. Greater Hyderabad City Biodiversity Index (CBI)

The City Biodiversity Index (CBI), also known as the Singapore Index on Cities` Biodiversity, is meant to be used as a self-assessment and monitoring tool in matters relating to biodiversity in urban areas. The historic city of Hyderabad was the first in India to use this index. This initiative has led the State government of Andhra Pradesh (undivided) to come up with the Andhra Pradesh Biodiversity rules. In addition, at the local level, the State has established over 590 biodiversity management committees and the Hyderabad City Biodiversity Management Committee is one among them. Following this, many more Indian cities have now come forward in assessing and monitoring their urban biodiversity and taking necessary measures.

I. Green Ratings & Green Buildings: GRIHA & IGBC ratings

Green practices in the building industry, for new constructions and existing building, can help to address national issues like water efficiency, energy efficiency, reduction in fossil fuel use in commuting, handling of waste and conserving natural resources. Most importantly, these concepts can enhance occupant health, happiness and well-being and thereby contributing to the overall development of any region.

GRIHA (Green Rating for Integrated Habitat Assessment) is India's National Rating System for Green buildings conceived by TERI and developed jointly by the Ministry of New and Renewable Energy, Government of India, based on nationally accepted energy and environmental principles. CII-Sohrabji Godrej Green Business Centre through Indian Green Building Council (IGBC) has brought out the IGBC-LEED rating systems for new and existing buildings, factories, SEZs and townships, MRTS etc. IGBC ratings are voluntary, consensus based and market-driven building programmes.

VII. WAY FORWARD

A smart sustainable city is a holistic city with multiple themes or components to ensure easy service delivery and quality life for citizens. With recent announcement of 98 smart city aspirants by the government, India has taken concrete steps towards the smart city urbanisation. As per the mission guidelines for smart cities released by Ministry of Urban Development, a clean and sustainable environment will be a significant feature for upcoming smart cities. The sustainability aspect is not just in terms of environment but also economic, social and governance. The three pillars of sustainable economic advancement, political participation and social emancipation are the core foundations of a smart sustainable city.

We have listed the key themes that contribute in making sustainable urbanisation of cities. Engaging citizens for governance has played a key role in evolution of Governance from autocracy and anarchy to democracy. Citizens are the pillars of a nation, for they choose a government and all governance policies, laws and regulations are focussed on them. However, very often, inputs and ideas are not sought from citizens, and decisions are made by few elected representatives. Those decisions may or may not reflect the pulse of the people. With the advent of the smartphone revolution, social media proliferation, a dynamic media industry and instant connectivity, people are becoming increasingly aware as well as keen to voice their opinions and do their bit for society by sharing their inputs with policy-makers. Gone are the days of closed-door policy-making and imposition of laws and regulations without any consultation with citizens.

Participatory governance focuses on the democratic engagement of citizens to improve citizen participation in governmental policies. It also involves seeking ideas from people for the betterment of cities. Similarly, it gives citizens the opportunity to showcase their talents, creativity and intelligence. Participatory governance provides a platform for citizen-government interaction that bolsters the concept of democracy as well as improves service delivery and inculcates social inclusiveness. Many countries have robust platforms for citizen-government engagement for political inclusion, addressing governance problems by involving citizens in decision-making. As defined by the Open Knowledge Foundation, data is open if it is free for use, reuse and redistribution without any legal, technological or social restrictions. Major features of data openness are access and availability, universal participation as well as redistribution and reuse. Management of data has become considerably important, particularly from the purview of governance.

The data can be related to the environment, transport, weather, transport and traffic, statistics and finance. Open data helps in ensuring transparency across systems, driving the participation of citizens in governance and improving service delivery by virtue of leveraging data for the welfare of people at large. Active involvement of the private sector in the form of innovation and efficiency will prove to be crucial in bringing any smart sustainable city's vision to life.

Public-private partnership (PPP) has been hailed as the preferred route for developing smart and sustainable city projects around the world. Substantial evidence establishes that the strategic role played by the private sector is assisting cities in realising their smart and sustainable objectives. The World Business Council for Sustainable Development (WBCSD) Urban Infrastructure Initiative (UII) conducted an innovative global project between 2010 and 2014, wherein 14 leading global companies worked with 10 cities around the world.

The initiatives that we discussed in this paper are discrete and disconnected projects in different Indian cities. But for achieving a sustainable city, the approach should be integrated and holistic, so that sustainability is there in every city element. More importantly for sustainable cities to be developed there ought to be appropriate policies, incentives and delivery mechanisms in place. Our environment is a national issue requiring national leadership and action at all levels. Government should intelligibly vocalize policies and ensure implementation of these to create a right ecosystem for sustainable cities, unlike the present day scenario. The intended developments or transformations to retrofit an existing city should be in synchronization with the need of the city. So a strategy employed for Gaya in Bihar may not apply for Calicut in Kerala or Hoshiarpur in Punjab or even Sopore in Jammu and Kashmir. Lastly, support and co-operation from the public – i.e. citizen support – is the most important factor to achieve a sustainable city.

Looking at the current sustainability levels of our Indian cities, the smart city idea which has caught up the Indian minds – smart environment, smart people, smart governance. The present emphasis should not be on smartness from the technological point of view but on retrofitting the various sectors of our existing cities to make city functions efficient and daily life of its citizens tranquil. Our cities will have hiccups in the early years on their road to sustainability. But we are sure that our cities will become sustainable in our own unique Indian way.

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