0TITLE:

TOWARDS A PROSPEROUS INDIA THROUGH EE AND CC BASED DEVELOPMENT PLANNING AND MANAGEMENT OF CITIES AND METROPOLITAN REGIONS

Dr MAY MATHEW

B.Sc Engg, M. Planning, MIE (AR), AITP

TOWN PLANNER

GREATER COCHIN DEVELOPMENT AUTHORITY

KOCHI-682020

Mob.9447957102

Email: maykatticaran@gmail.com

ABSTRACT

Cities are the engines of economic growth and the hub of human development where innovation occurs. Also cities are the major consumption centres of natural resources /energy and centres of green house gas (GHG) emissions. If managed efficiently they are the hope of the nations and thus the situation warrants the innovative development management systems wherein environmental protection and economic development goes hand in hand by taking the confidence of the society.

Environmental Efficiency (EE) and Carrying Capacity(CC) based development planning and management of cities and metropolitan regions in India give a promising future towards the prosperity of the nation if not for the entire globe. Environmental Efficiency is the new term introduced and it is the efficiency of the total environment around man while carrying capacity is the capacity of the supporting region to sustain the total consumption of the city including the waste assimilation. EE and CC are two

effective indicators of sustainability and prosperity and it can be calculated at local level, state level and national level with reliable data.

EE and CC of different nations have been calculated based on UN published data which demonstrate its' effectiveness and where India stands on sustainability and prosperity considerations. Improvement of EE and CC values of the nation is inevitable to attain sustainability and prosperity. Effective policies can be evolved at the national and state level aiming at a better EE and CC values which contributes to the total prosperity of the nation.

FULL PAPER

1. INTRODUCTION

World urbanisation trajectory is going high decade after decade. Presently countries across the world are having an urban population of over 50% of the total population. As per the UN population estimates[1] by the year 2030 nearly 60% of the world population will be urban. World urbanisation is mostly happening at two extreme ways. In less developed countries there is tendency of big cities becoming bigger day by day. This often causes overcrowding and overload to the existing infrastructure, resulting in urban decay, chaos and miseries and thus environmentally less efficient. Also there are urbanised regions in countries which are under-populated and affected by urban sprawl creating spare capacity of infrastructure, fossil fuel wastage and under-performing ecosystems resulting in less environmental efficiency. The morphology of urbanisation in India indicates that the above two extreme cases mostly exist. Innovative development management solutions are the need of the hour to enable India to accommodate optimum

number of people in cities, with high quality of life supported by prosperous metropolitan regions.

2. WORLD URBANISATION TREND AND CLIMATE CHANGE SCENARIO

As per the United Nations population estimates 2009 revision[1] the population living in urban areas is projected to increase from 3.4 billion in 2009 to 6.3 billion in 2050. Urbanisation is on the upward trend and projections show that by 2050 69% of the people are urban with 86% of inhabitants from more developed countries and 66% from less developed countries as indicated in Table 1. Also it is noticed that today's 3.4 billion urban dwellers are distributed unevenly among different size urban settlements with a bias on large cities. Presently there are 21 urban agglomerations in the world which are having population of over 10 million.

Table 1 WORLD URBAN POPULATION IN BILLIONS AND PERCENTAGE

Year	1950		1975		2009		2025		2050	
	pop	%	pop	%	pop	%	pop	%	pop	%
World	0.73	28.8	1.51	37.2	3.42	50.1	4.54	56.6	6.29	68.7
More developed regions	0.43	52.6	0.7	66.7	0.92	74.9	1.01	79.4	1.1	86.2
Less developed regions	0.3	17.6	0.81	27	2.5	44.6	3.52	52.3	5.19	65.9

Source: United Nations Population Division, 2010

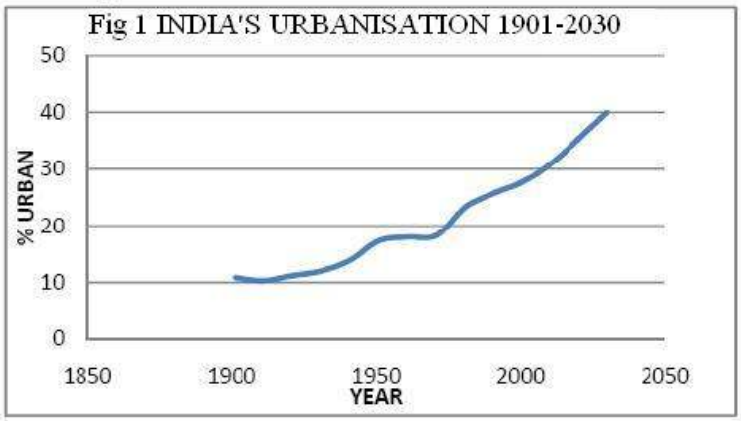
There is a strong relationship between urbanisation and economic development of the countries. Urbanisation has often been driven by concentration of investment, profitability and employment opportunities supplemented with quality and variety of

services for the inhabitants. It is estimated that lion's share of the world gross product is generated by the people living in urban areas.

However, bad products are also produced in cities. Earth's climate is warming day by day alongwith the rate of urbanisation of people. It is reported by UN-Habitat[2] the observations made by Intergovernmental Panel on Climate Change (IPCC) there was an increase of 0.74^{O} C between 1906 and 2005. Emissions due to large scale industrial production, fossil fuel consumption and reduction in carbon sequestration capacity of the earth due to deforestation, landuse changes etc have caused carbon dioxide equivalent (CO_2e) of atmosphere exceeding the threshold limit. As per the UN-Habitat estimates[2] if consumption based figures are taken 60- 70% of global GHG emissions are from urban residents.

3. URBANISATION IN INDIA

Urban population of India has grown from 286 million to 377 million between 2001 and 2011 as per the provisional population figures[3] published by Census of India. The percentage of urban population of India has increased from mere 10.84% in 1901 to 31.16% in 2011. As per the McKinsey Global Institutes Econometric Model[4] formulated for India, it is expected that an urbanisation level of 40% would be attained by India by the year 2030. But this urbanisation level is far behind the world urbanisation level of 60% estimated for the year 2030.



Source: Census of India and *McKinsey Global Institutes Econometric Model

Urbanisation is an invariable requirement for the nations to attain prosperity. The morphology of urbanisation in India is skewed towards large cities. The graduation of number of urban centers from lower population size categories to class 1 cities has resulted top heavy structure[5] of urban population India.

Table 2: URBAN AGGLOMERATIONS / CITIES IN INDIA

category	population in millions	2001			2011		
		number	population in millions	Mean population load	number	population in millions	Mean population load
tier 1	> 4	7	65.05	9.3	9	89.77	10.0
tier 2 & 3	0.1-4	387	131.29	0.3	459	175.117	0.4

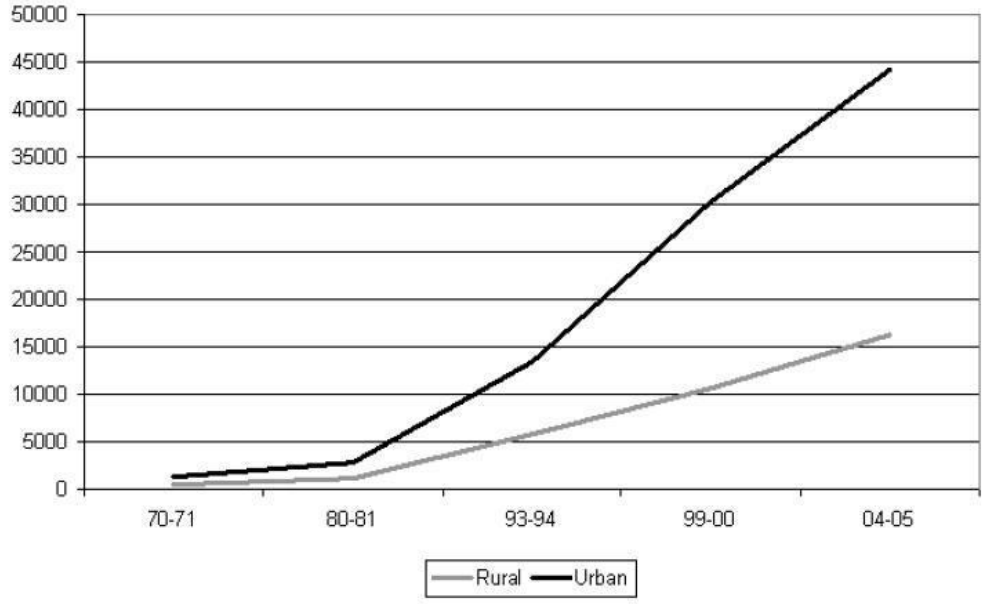
Source: Census of India 2001 and 2011 provisional Figures

The mean population load of a tier 1 city has increased from 9.3 million in 2001 to 10 million in 2011 while tier 2 and 3 cities shows only marginal increase as per calculations in Table 2. Innovative development Management Solutions are the need of the time to ensure balanced development, contained urbanisation and productive supporting systems to deal the present scenario.

4. URBAN - RURAL PRODUCTIVITY SCENARIO IN INDIA

In India, urban -rural productivity gap is increasing as indicated by the calculations of Central Statistical Organisation(CSO) for different years from 1970-71 to 2004-05 and as indicated by the Figure 2[6].For a sustainable and prosperous India urban-rual productivity gap should be reduced while aiming for a high percapita income through strategic interventions and prudent urban and regional planning measures.

Fig 2 ALL INDIA AVERAGE RURAL-URBAN PERCAPITA INCOME 1970-71 TO 2004-05



5. INTRODUCTION TO EE AND CC BASED DEVELOPMENT PLANNING AND MANAGEMENT

The terms Environmental Efficiency (EE) and Carrying Capacity (CC) are two powerful terms which has got symbiotic existence. Attainment of environmental efficiency at metropolitan city contributes to the carrying capacity of the metropolitan region and vice versa. While environmental efficiency can be quantified by adopting an

output/input approach, carrying capacity can be quantified by taking the ratio of the total percapita ecological capacity of the supporting region to the percapita consumption.

5.1 HUMAN SETTLEMENT OUTPUT AND INPUT INDICATORS

Human Development Report of UNDP

Human Development Report is published by United Nations Development Program (UNDP) giving the world's state of development and is published yearly basis from the year 1975 onwards. Human Development Indices of nations across the world are calculated on a five yearly basis from the year 1975 to 2005. Human Development Report 1990[7] defines Human Development as the process of enlarging peoples' choices. Human Development Report 2008[8] bring forth 'Human Development Approach' for a sustainable globe.

Human Development, the intended output—Human Development Index

Human Development Index (HDI) is a composite index that measures the average achievements in a country in three basic dimensions of human development: a long and healthy life, access to knowledge and a decent standard of living. These basic dimensions are measured by life expectancy at birth, adult literacy alongwith combined gross enrolment in primary, secondary and tertiary level education and gross domestic product per capita in purchasing power parity in US Dollars (PPP US$) respectively. The index is constructed from indicators that are available globally using a methodology that is simple and transparent.

Living Planet Report-WWF

Living Planet Report is published by WWF from the year 1998 onwards. Two indicators of consumption and their consequent effect on the physical environment is included in the report. They are as follows:

1. Biocapacity
2. Ecological Footprint

Biocapacity of bio-sphere is the carrying capacity of the bio-sphere in terms of productivity and waste-absorbing capability to produce what is required for consumption and to absorb the waste generated by human activities. As per the Living Planet Report 2008[9] biocapacity of the earth is estimated as 2.1 global hectares per person.

Ecological Footprint measures the humanity's demand on the bio-sphere in terms of the area of biologically productive land and sea required to provide the resources we use and absorb our waste. In 2005 global ecological footprint was 2.7 global hectares per person. A global hectare is a hectare with world average ability to produce resources and absorb waste.

Ecological Footprint—the Comprehensive Input Indicator

Ecological Footprint calculations provide compelling evidence of impacts of consumption. Ecological Footprint compares the natural resources and energy consumption with the nature's biologically productive and assimilative capacity.

Going through the available literature and research works across the world no other indicator is so comprehensive and highly exhaustive to accommodate the total input

of a human settlement system. Various inputs of a human settlement system are built-up land, energy, fishing ground, forest, grazing and cropland, assimilation required for CO_2 from fossil fuels etc. All kinds of consumption are brought to a common platform in units of global hectares.

5.2 DERIVATION OF ENVIRONMENTAL EFFICIENCY (EE) AND CARRYING CAPACITY (CC)

The ratio of the output to the input of any human settlement system is considered as environmental efficiency and it determines the total quality of the system.

Efficiency of the total environment of a human settlement system

EE = Output/Input

= human development achievements / percapita Ecological Footprint

= HD/EFp

Similarly the ratio of the supportive capacity with respect to total percapita consumption can be christened as carrying capacity.

CC = percapita supportive capacity/ per capita consumption

= biocapacity/ecological footprint

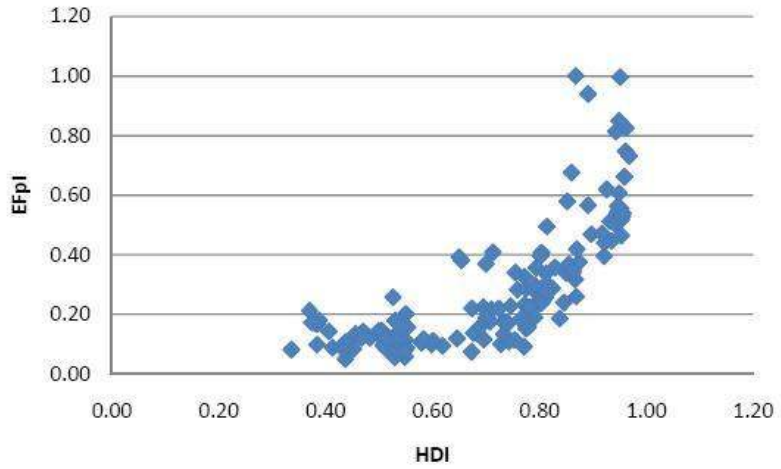
= Bc/EFp

5.3 HD, EE AND CC EVALUATION OF NATIONS ACROSS THE WORLD

HDI and EFp achievements of world countries are downloaded from UN agencies websites of WWF and UNDP and country-wise analysis are carried out are as below:

The countries which have both HDI data and EFp data for the year 2005 are taken. Scatter diagram of HDI and EFpI* for 135 countries are as per Fig 3.

Fig 3 SCATTER DIAGRAM HDI AND EFpI



Going through the scatter diagram it is found that for less developed countries (HDI less than 0.5) EFpI increase is very meagre compared to HDI achievements. However, for medium developed countries (HDI value between 0.5 and 0.7) HDI achievements and EFpI are getting correlated. For highly developed countries (HDI value is greater than 0.7) EFpI increase is far greater than HDI increase.

This may be attributed to the following reasons[10]:

- Inadequacy of human development quantification in the case of developed countries as it is felt that basic human development only is evaluated in UNDP's HDI calculations. Educational achievement index is to be modified to suit the overall human skills achievements. Also health index is to be modified to accommodate the wellness of the people.

* *EFpI is calculated by dividing EFp of a particular country by maximum EFp of all the countries.*

- Human development deviated and wasteful consumption patterns of developed countries.

Based on HD, EE and CC values different types of countries are identified as indicated in table 3[10]. Some of the high HD countries are having very low EE and CC values. Those countries should introspect themselves to improve their EE and CC values on sustainability considerations. Also there are countries with very low HD values but having very good EE and CC values. India is having medium HD values with high EE and low CC values.

Table 3 DIFFERENT TYPES OF COUNTRIES BASED ON HD, EE AND CC

NAME	HDI	EE	CC	TYPE
Georgia	0.75	6.63	1.63	High HD, EE and CC values
Indonesia	0.73	7.26	1.47	
India	0.62	6.55	0.46	Medium HD, High EE and Less CC
Kuwait	0.89	0.95	0.06	High HD, Less EE and CC values
UAE	0.87	0.87	0.11	
US	0.95	0.95	0.53	
Angola	0.45	4.65	3.57	Low HD High EE and CC values
Central African Republic	0.38	2.29	5.92	

5.4 EE AND CC EVALUATION OF HUMAN SETTLEMENTS

Urban Environmental Efficiency—HD/EFp

The methodology introduced by UNDP and WWF for human development index and ecological footprint can be applied at national, sub-national, district and human settlement level. UN-Habitat, in its Urban Indicators Tool Kit[11], explains the methodology of finding out the 'city product' (indicator 21) which would be useful for the calculation of Human Development Index at city level.

Health achievements and educational achievements can be calculated at city level, if not in a modified way, by incorporating wellness of the society and overall human skills achievements. EFp calculations at city level are also possible. City of Santa Monica calculated its Ecological Footprint from 1990 to 2000 and reduced the footprint from 2914 sq. miles to 2747 sq. miles through policy initiatives, energy conservation and alternate energy measures[12].

Regional Carrying Capacity—Bc/EFp

All metropolitan areas are supported by a region to provide natural resources and energy for city input. Regional Carrying Capacity Bc/EFp is also very important for attaining environmental efficiency HD/EFp. Carrying Capacity of the region can be expressed by the carrying capacity index.

CCI= Bc/EFp

Carrying capacity enhancement is possible through reduction of ecological footprint or by increasing the biocapacity. Biocapacity can be enhanced by increasing

the agriculture and forest productivity, through ecosystem conservation measures and carbon capturing methods.

5.5 EE AND CC EVALUATION AND MONITORING IN INDIA

EE and CC evaluation and monitoring in India can be implemented through NUIS (National Urban Information System) programme of Government of India which is spearheaded by Global Urban Observatory Programme of UN HABITAT. In India NUIS programme is taken up by Town and Country Planning Organisation under the Ministry of Urban Development and Poverty Alleviation, Government of India.Policy formulation and investment prioritisation can be done based on the EE and CC performance of different states in India.

6.0 CONCLUSIONS

EE and CC based development planning and management of metropolitan areas definitely reduces the gap between output and input of a human settlement system. The gap is either hidden as spare capacity of infrastructure / resources or losses like fossil fuel wastage, distribution losses of power transmission etc. Reduction of this gap increases the profitability of the business establishments and enable efficient administration of the governments. As the profitability increases job opportunities also increase. This enables balanced urban and regional development and urbanisation of a higher percentage of people. A fewer percentage of people will be depending on primary sector activities causing bulk production with high mechanisation and automation so that percapita productivity of primary sector activities also multiplies.

LIST OF TABLES

LIST OF FIGURES

REFERENCES

1. United Nations.2010. *World Urbanisation Prospects The 2009 Revision*. Department of Economic and Social Affairs. New York.
2. UN Habitat. 2011. *Cities and Climate Change: Policy Directions. Global Report on Human Settlements 2011. Abridged Edition*. Earthscan. London.
3. Census of India. 2011. *Provisional Population Totals Cities and Urban Agglomerations* www.censusindia.gov.in accessed on 1/12/2011
4. Mckinsey Global Institute. 2010. *India's urban awakening: Building inclusive cities, sustaining economic growth.* Mckinsey &Company, India.
5. Pranathi Datta. 2006. *Urbanisation in India*. European Population Conference, 21-24 June 2006.
6. Amitabh Kundu. 2010. *Rural Urban Economic Disparities in India: Database and Trends* www.indiapolicyforum.org/node/21 accessed on 1/12/2011
7. United Nations Development Program (UNDP). 1990. *Human Development Report.* www.undp.org
8. United Nations Development Program (UNDP). 2008. *Human Development Report.* www.undp.org
9. World Wide Fund for Nature (WWF). *Living Planet Report* 2003, 2006, 2008. www.panda.org
10. May Mathew. 2009. *Environmentally-Efficient development management system for Greater Kochi in Kerala State.* The Thesis Report, School of Management Studies, Cochin University of Science and Technology, Kochi.

11. UN Habitat. *Urban Indicators Toolkit Guide*. ww2.unhabitat.org/programmes/guo/guo_guide-asp

12. Redefining Progress. Sustainable Indicators Program. 2004. *Reducing a City's Ecological Footprint: The case of Santha Monica (1990-2000).* www.rprogress.org/publications/2004/santha_monica2004.pdf