

SUSTAINABLE URBAN DEVELOPMENT IN INDIA: SOME ISSUES

by

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INTRODUCTION

Sustainable development means attaining a balance between environmental protection and human economic development and between the present and future needs. It means equity in development and sectoral actions across space and time.¹ It requires an integration of economic, social and environmental approaches towards development. Sustainable urban development refers to attaining social equity and environmental protection in urbanization while minimizing the costs of urbanization. This paper aims at discussing some of the important issues relating to sustainable urban form that would lead to sustainable urban development with possible references to India. The paper is based on available literature and secondary data. The paper is divided in two parts. The first part deals with the concept of sustainable development and its implications for urban areas. First section of this part of the paper explains the concept of sustainable development with special mention of sustainable urban development. This is followed by the second section of this part with a discussion of the role of environment and climate change in sustainable urban development. The second part of the paper discusses sustainable urban development with special reference to India. This part is divided in four sections. The first section deals with urban basic services and sustainable urban development in India. The second section notes the inefficiencies in the land policy of India and its implications for sustainable urban development in India. The third section leads to possible options of sustainable city form, which may be relevant for India. Here first the study discusses the **compact city** debate and next it explains the concept and possibilities of **multi-modal urban region** as a city form. The last and fourth section summarises the discussion and ends with way forward.

¹ See Cruz et al (2007).

PART A

CONCEPT OF SUSTAINABLE URBAN DEVELOPMENT

UN General Assembly convened a conference on the “human environment” at Stockholm in June 1972, which came out with guiding principles on “human environment”. It emphasized that man has the fundamental right to environment of quality and also that he has a responsibility towards protecting the environment for present and future generations. It also maintained that natural resources of the earth must be safeguarded for the benefit of present and future generations. About a decade later, to address the issues concerning continuing depletion of natural resources and unsustainable development, the World Commission on Environment and Development was created in 1983. Popularly known as Brundtland Commission (1983)², it described sustainable development as “*development that meets the needs of the present without compromising the ability of future generations to meet their own needs*”. After twenty years of Stockholm Declaration, the UN Conference on ‘Environment and Development’ (also known as ‘Earth Summit’) was held at Rio-de Janeiro in 1992 that adopted an action plan, popularly known as ‘Agenda 21’. The agenda 21 promised to reduce poverty, provide clean water and health care, and protect the natural resources and so on. Also to be noted that some of the Millennium Development Goals³ (see UNDP) have urged for ensuring environmental sustainability and reduction of the percentage of the population under extreme poverty. Similarly, explaining implications of climate change for sustainable development the Intergovernmental Panel on Climate Change notes (IPCC)⁴ the importance of social and environmental equity in development. Thus all the major world conferences and initiatives taken so far on environment and development have stressed on economically viable development, socially equitable development and protection of the environment for attaining sustainable development.

Sustainable **urban** development specifically means achieving a balance between the development of the urban areas and protection of the environment with an eye to equity in employment, shelter, basic services, social infrastructure and transportation in the urban areas. With rapid expansion of urban population around the world there has arisen a wide

² World Commission on Environment and Development (WCED) known by the name of its Chair Gro Harlem Brundtland was convened by the United Nations in 1983.

³ Millennium Development Goals (MDGs) are eight goals to be achieved by 2015 that responds to the world’s main development challenges. These are drawn from the targets and actions contained in the Millennium Declarations in the UN Millennium Summit in September 2000.

⁴ For detailed discussion on climate change see the report of Intergovernmental Panel on Climate Change, the source can be found under Cruz et al. (2007) in the reference.

awareness about minimizing the environmental costs of urbanization. Concerns are raised at environmental damages and depletion of nonrenewable resources and rising levels of pollution in urban areas. In recent times cities have become places of urban environmental degradation and wasteful use of resources, which is proving to be costly to generations present and future. In order to mitigate the problem we require to minimizing the depletion of non-renewable resources and resort to environmentally sustainable economic development. But this has to be done in ways that are socially, economically and politically acceptable. While planning for sustainable development of the towns, we should also take into account the factor of climate change. According to this, ensuring environmental sustainability means taking steps, which include a) integration of the principles of sustainable development in the policies and programmes of the country, b) reversal of loss of environmental resources, c) reduction of the proportion of people without sustainable access to safe drinking water, d) improving the lives of slum dwellers. Before discussing the different aspects of sustainable urban development and city form we explain the relation of climate change with sustainable urban development and city form in the next section.

ROLE OF ENVIRONMENT AND CLIMATE CHANGE IN SUSTAINABLE URBAN DEVELOPMENT

While planning for sustainable development of the towns, we should also take into account the factor of climate change. Explaining implications of climate change for sustainable development the Intergovernmental Panel on Climate Change notes⁵ “*Sustainable development represents a balance between the goals of environmental protection and human economic development and between the present and future needs. It implies equity in meeting the needs of people and integration of sectoral actions across space and time.*” (Cruz et al, 2007). One of the greatest challenges that the world is facing today is climate change. Climate change is the variation in the earth’s global climates over time. It involves changes in the variability or average state of the atmosphere over durations ranging from decades to millions of years. These changes can be caused by dynamic process on earth, external forces including variations in sunlight intensity and more recently by human activities. Human influences can be by increase in CO₂ levels due to combustion of fossil fuels, aerosols, cement manufacture etc. Other factors like ozone depletion, animal agriculture and

⁵ For detailed discussion on climate change see the report of Intergovernmental Panel on Climate Change, the source can be found under Cruz et al. (2007) in the reference.

deforestation also change climate. The effect of climate change can be found on among other things, on rising sea level that may accelerate coastal erosion, on increasing temperature, on increase in intensity of natural disaster, and very importantly on vector borne diseases. There has been an increasing trend in the annual mean temperature in India. In recent decades the east coast has been experiencing fewer rainy days while the northwest has been experiencing heavy summer monsoon. There have also been some extreme climatic events like heat wave, intense rain, floods and droughts in India. Researchers have documented the increase in frequency of hot days and multiple-day heat waves in the past century. There has been record rainfall in Mumbai, India on 26 to 27 July 2005, which led to loss of large numbers of lives. Consecutive droughts between 2000 and 2002 caused crop failures, mass starvation and affected millions of people in Orissa. Also, increased water stress poses to be a major problem for India. Accelerated glacier melt is likely to cause increase in the number and severity of glacial melt-related floods, slope destabilisation and a decrease in river flows as glaciers recede. The researchers have predicted that with the current trend in the melt of glaciers, the Ganga, Indus, Brahmaputra and other rivers could likely become seasonal rivers in the near future and affect the lives of people residing around them (Cruz et al, 2007).

Thus, it is likely that climate change will hamper sustainable development of India as it increases the pressures on natural resources and the environment associated with rapid urbanisation, industrialisation and economic development. In order to reduce the effect of climate change, we need to include climate-proofing concepts in national development initiatives. Urban areas mostly face problems of air quality pollution, green house gases, unsustainable consumption and of inadequate sanitation and water supply. Thus translated into policy initiatives, environmental sustainability of urban form should aim at energy efficiency in transport and buildings, optimal planning solutions in terms of locations, distances and spaces, which will reduce air and noise pollution. It should also aim at sustainable management of sanitation and water supply, promote equity in provision of services and of course reduce deforestation. The recently announced National Action Plan on Climate Change by the Prime Minister in June 2008 visualises to make economic development of India energy efficient. All these concerns, questions and initiatives about sustainable environment and climate change have resulted in experiments and debates over city forms that are sustainable. Before discussing the relevant city forms it would be pertinent to discuss the sustainable management of urban basic services and the inefficiency

in the land policy in India and its implications for sustainable city form and development in India, which is done in the next part.

PART B

SUSTAINABLE URBAN DEVELOPMENT AND CITY FORM

URBAN BASIC SERVICES IN INDIA: DEFICIENCY AND OPTIONS FOR SUSTAINABLE MANAGEMENT

Deficiencies

Sustainable city planning should aim at achieving social and environmental equity while improving the lives of the people. For that to happen we need to have a sustainable city form as well as provision and proper management of the services. Thus, in order for a city or urban area to be sustainable it needs to produce and manage basic services like water, waste, energy, and transportation in a way that it conforms to the principles of sustainable development. In other words, the city should be able to produce and distribute the services in an economic, environment friendly and equitable way. Cities in the developing countries are deficient in the provision of basic services that pollute the environment. It is to be noted that though there are some differences between cities and between rich and poor nations, in general urban infrastructure systems are designed without much attention to environmental and social impacts. Mostly the delivery of the services like water, energy, waste, transportation, are based on non-renewable energy sources (Pinderhughes, 2008). Moreover, the inequality in the provision of these services is very high. Indian cities are characterized by high density of population, deficiency in services and air pollution. Let us see the status regarding these in India. In urban India in 2001, 69⁶ per cent of the households had safe drinking water, 61⁷ per cent of the households had their latrine facilities within their houses and only 35 per cent of the households had closed drainage facilities (Census 2001).⁸ Eighty-eight per cent (88%) of the urban households had electricity and only 0.2 per cent had solar energy in 2001(Census, 2001).⁹ In Delhi, the capital city of India, 77¹⁰ per cent of the urban

⁶ 68.7 per cent had tap water, 16.2 per cent had hand pump and 5.1 per cent had tube well.

⁷ 14.6 percent had pit latrine and 46.1 per cent had water closet.

⁸ See Census of India 2001, Series-1 India, Analytical Reports on Housing Amenities.

⁹ See Census of India 2001, Series- 1 India, Analytical Reports on Housing Amenities.

households had tap as source of drinking water, 63¹¹ per cent had their latrine facilities within their premises and 52 per cent of the households had closed drainage facilities.¹² Delhi generated 5922 tonnes of solid waste per day in 2004-05.¹³ Air pollution has become a major problem in Indian cities. Taking the case of Delhi, we find that there are around 54 lakh vehicles in Delhi. Around 70 per cent of the air pollution in Delhi happens to be due to vehicles.¹⁴ It has been found in a World Bank study based on 1994-95 air quality data that around 10,000 people die every year prematurely due to air pollution in Delhi alone. According to Delhi Medical Association the incidence of asthma in Delhi is ten times the national average (Centre for Science and Environment). Densities of Indian cities are very high. Management of the basic services should be done keeping in mind the deficiency in the services, the environmental impacts and the inequality in the provision of the services. Thus we have two issues here, the first one is covering the deficiencies in services and the second one involves how to provide the services in an environment friendly way. We discuss some of the options for alternative and environmental management of the services.

Sustainable management of urban basic services

Management of water supply

The effect of climate change on water supply will be negative in almost all the countries. Thus care should be taken that energy efficient alternative systems are innovated. As for efficient practices, water consumption can be limited by using raw water, recycled water for gardening and landscaping. In the state of Vermont, U.S.A., a wastewater treatment system uses a series of tanks containing plants and other organisms to naturally clean wastewater that serves 500,000 people per year (Pinderhughes, 2008). There have been other scattered evidences of use of wastewater but the example of a city doing it on large scale is rare. In India the water from Sewage Treatment Plants (STP) in factories are used for landscaping and gardening. However, in developing countries the main challenge is to provide clean drinking water to all the urban residents adopting sustainable water management practices. Rainwater harvesting has its possibilities for partially managing water supply. Conservation of old water bodies like lakes, ponds can be made for increased and sustainable water supply.

¹⁰ See Statement 1.1 of Census of India 2001, Series-1 India, Analytical Reports on Housing Amenities.

¹¹ 15.2 per cent had pit latrine and 47.4 per cent had water closet, See Statement 3.1 of Census of India 2001, Series-1 India, Analytical Reports on Housing Amenities.

¹² See Statement 3.2 of Census of India 2001, Series-1 India, Analytical Reports on Housing Amenities.

¹³ Source: Central Pollution Control Board of India.

¹⁴ See White Paper on Pollution in Delhi with an Action Plan

It has been considered as an optional reform under Jawaharlal Nehru National Urban Renewal Mission (JNNURM) in India. In Delhi itself, one after another marshlands and water bodies are being converted in residential areas, garbage dumps, petrol pumps and so on, the latest victim being the Jahangirpuri marshland (Hindusthan Times, 2008). Marshlands recharge ground water substantially. Much is yet to be done regarding this in India. Other environmentally sustainable methods can be explored.

Management of waste

Waste management practices should be started from the production and distribution stages of economic activities through reuse and recycling. Reuse of things like metals, glass, paper, plastic, textiles, organic waste and water will reduce demand for energy, raw materials, fertilizers and fresh water sources (Pinderhughes, 2008). However, care should be taken that hazardous wastes do not go for recycling. Plastic should be used less.

In Delhi more than 5000 tonnes of municipal solid waste is generated everyday, which is disposed of in landfills. Too much land is being consumed for disposal and is creating danger of ground water contamination. As such the department of environment of the government of India recommended that other 'best practices' in waste management should be adopted in a large scale. The practices include, vermiculture, pelletisation, aerobic composting and so on. A research study by NEERI has recommended mechanical composting as the viable option for such a huge amount of waste.¹⁵ The Supreme Court of India, hearing public interest litigation on solid waste management of Delhi directed the Municipal Corporation of Delhi to improve the system.

Management of energy

Energy management practices should be encouraged in the planning of buildings and the city form. Buildings and city forms that are energy efficient and use sustainable energies like solar and wind energies should be considered. There are fragments of evidences in India of settlements using solar power, water recycling techniques and waste management practices. But in general the environment friendly techniques are yet to be practiced in urban areas, especially in large cities where the differences would be felt. City forms should be such that it uses energy efficient transport. Coming to the financing part, it can be said that the policies

¹⁵ See White Paper on Pollution in Delhi with an Action Plan.

should help energy efficient practices. The loans should be easily available and tax benefits provided for such practices.

Reduction in inequality

Management of basic services in the cities should reduce inequality in services between rich and poor. The concept of commercial viability does not hold for social services always. City form should take into account social conditions also. The ability of urban poor to pay for the full cost of water supply would remain low in India. Thus reduction in grant of the government and introduction of private sector in this sector is likely to make the situation worse. It is also well known that much of the subsidized schemes in the past have gone to the middle and high-income areas (Kundu and Thakur, 2006). Apart from deficient, non-environment friendly and unequal basic services, the other major problem in developing a sustainable city form in India is inefficient land policy of the country, which we discuss next.

INEFFICIENCY IN LAND POLICY OF INDIA

Since this paper has reference to India, it would be pertinent to mention the inefficiencies of land policy of India in this context. This is because land is an important input for producing goods and services for urban development. Under the conventional analysis, factors of production i.e. land, labour and capital flow to make goods and services but the social and environmental consequences are not reflected in such analysis. Sustainable urban development does take account of social and environmental effects and means balance between the development of the areas and protection of the environment with an eye to equity in employment, shelter, basic services, social infrastructure and transportation in the urban areas. For this to happen, one has to ensure that land is properly used to meet these objectives. Urban India is plagued by shortage of housing facilities and scarcity of land for social overheads like roads, footpaths, parks, schools and so on. The roots of these problems can be found in the inadequate, inefficient, iniquitous land policy of the country. This is why it is important to have an effective and appropriate land policy that would promote sustainable development.

National Commission on Urbanisation of India (NCU, 1988) recognized the need for adequate supply of land, efficiency and equity in allocation of land and promotion of flexibility in land use. Thus it mentioned that the objectives of urban land policy should be a) to achieve an optimum social use of urban land, b) to make land available in adequate

quantity to both public authorities and individuals at reasonable prices c) to encourage cooperative community effort as well as individual builders to develop land and construct houses, d) to prevent concentration of land in few hands, e) to use land to finance urban development, f) to encourage socially and economically efficient allocation of land so that land development conserves resources and land utilization is optimal, g) to promote flexibility in land use in response to a growing city.¹⁶

Also, the Eleventh Five Year Plan (2007-12) of India emphasizes, “governments at appropriate levels including local authorities, have to strive to remove all possible obstacles that may hamper equitable access to land”.¹⁷ It identifies failure to adopt appropriate urban land policies and land management practices as the primary cause of inequity and poverty. Thus the Eleventh Five year Plan calls for a flexible land policy which will make conversion from one use to another, cost efficient and promote equity. It judges that urban planning tools like master planning, zoning and regulations are not enough for the requirement of land supply for rapid urbanization. The problem has also been addressed somewhat by Jawaharlal Nehru Urban Renewal Mission in India. This section discussed the role of land in sustainable urban development with particular reference to land policy of India. The next section discusses options for the right city form for sustainable urban development in India.

SUSTAINABLE CITY FORM

The idea of compact city: How far is it applicable?

Thus one side of the problem is inefficient land policy, which blocks supply of land for efficient and equitable housing, social infrastructure, basic services and transportation. The other side of the problem is how best or optimal the urban areas can be planned so that the **urban form** can be sustainable. In recent times cities have been found to pollute the environment and deplete the natural resources (Breheney, 1992). This has prompted the need for finding an urban form that will be sustainable. Various ideas have come up with solutions. One such idea for sustainable urban form is **compact city**. This necessarily means a high density, mixed land use and efficient public transport planning, which encourages pedestrian oriented habitation. It may be high-rise like Hong Kong or low rise as suggested by National Commission on Urbanisation (NCU) of India and so on. It should be

¹⁶ See NCU Report (1988) vol. II, pp 226.

¹⁷ See pg. 411 of chapter 11 of Eleventh Five Year Plan Volume III.

remembered that “high density” is a relative term depending on the culture and the environment of the country (Jenks and Dempsey, 2005).

The two important issues about high-density cities are 1) the costs and benefits of the form and 2) how dense should it be and “higher than what”?¹⁸ The two main benefits of compact city are reduced dependency on private cars and preservation of greenery while the main costs are more air pollution, noise, crime and overcrowding (Chen, Jia & Lau, 2008). A literature review (see Chen, Jia & Lau, 2008) of the various studies finds social and environmental benefits of compactness of a city. The benefits can be summarized as 1) protection of the countryside, green space and biodiversity; 2) reduction of travel distance, emission, greenhouse gases and thus global warming; 3) reduction of materials for construction of infrastructure; 4) have economies of scale in providing social institutional services like hospitals, banks and 5) in having a better interactive community life. The various costs have been found as 1) exploiting open and green urban spaces; 2) overcrowding; 3) traffic congestion; 4) ill health; 5) crime and 6) high-energy demand in compact high-rise buildings. But the relationship is not so simple. The concept has been developed in relation to developed economies with sprawling areas but it has not been tested adequately on high-density developing countries. However, a study conducted in China measures the urban compactness of the city (Chen, Jia, Lau, 2008). This study may be somewhat relevant for Indian cities because both have high population densities and both are developing countries. The study measures compactness by the non-agricultural population density in built-up area of the city. It tests the argument that urban compactness exploits the economies of scale for public services (e.g. schools, public buses, public utilities) and environmental resources (e.g. land, petrol and water). It also examines that too much compactness may cause negative environmental externalities. To examine the arguments in Chinese context 16 representative variables on environmental aspects were taken. To implement compact city form policy, it is necessary to maximize the advantage and minimize the disadvantage. It finds that urban compactness of the 45 core Chinese cities will improve accessibility of services, reduce per capita domestic energy consumption and more or less promote infrastructure efficiency and use of public transport. But compactness i.e. high population density¹⁹ aggravates negative externalities, like, air pollution, noise and loss of

¹⁸ See Jenks and Dempsey, (2005) Language and Meaning of Density for a wider discussion on this.

¹⁹ There have been different measurements of compactness like persons per hectare, dwellings per hectare, habitable rooms per hectare and so on. However net densities expressed in terms of dwellings per hectare and persons per hectare are mostly used (Jenks and Dempsey, 2005).

green space. It also finds that environment efficiency is positive up to a level of approximately 168 persons per hectare (Chen, Jia, Lau, 2008).

National Commission on Urbanisation (NCU) of India (1988) recommended low-rise high density (LRHD) built-form for Indian cities. It explains that such form is less expensive to maintain and has the advantages of security of neighbourhood protection. Most important of all is that it satisfies the criteria of **equity**. It says “income profile and affordability considerations suggest that a range of small and medium plot sizes, between 25 sq m to 100 sq m (with some plots perhaps up to 200 sq m) can satisfy the needs of over 95 per cent of the urban population”.²⁰ The Commission explains that this typology is more economical than apartments because no space is required for public circulation and lifts and also it provides much better living conditions. It would also reduce the disparities in our urban areas. According to this form, a 50 sq m plot per family with five members will generate a net density of 1000 persons per hectare (i.e. a gross residential density of 500 persons per hectare). Similarly, a 100 sq m plot would generate a gross residential density of 250 persons per hectare. It also states that high gross densities found in inner city can be tackled by interventions in city structure and by adjusting land use allocation in within the city itself to create spaces for social overheads. Its recommendations for built form specifies that residential sites should be provided so that 1) 50 per cent of the lands are in plots between 25 to 100 sq m, 2) 25 per cent of the land are in the plots between 100 to 200 sq m and 3) 25 per cent of the land are in these or any other sizes. The Commission also recommended that, “these plots should be leased out not to individuals buyers, but to co-operative societies. Should the members of a cooperative society decide to pool their land and build group housing or apartments, they should be free to do so, provided the total number of dwelling units remains the same. This maintains the principle of urban equity and, at the same time, allows the construction of apartment buildings at higher FARs.”²¹ The report also says that, “as long as our cities remain within density thresholds (i.e. neighbourhood densities of 250 to 1,000 persons /ha) there are efficient and cost effective solutions within our resources.”²² Talking about densities, it points out that the densification can be increased at selected nodal points depending on the holding capacity of the area. It should be related to the mass transport network. Though the net densities recommended by NCU seems to be on higher side, it would be worth mentioning that cities in India are rather densely populated. The

²⁰ See NCU Report vol. II pp. 187

²¹ See NCU Report Vol. II, pg. 203.

²² See NCU Report Vol. II, pg 187,188.

cities of India are already compact if seen by the standard of densities. As concluded in the case of Chinese cities (see above) the negative externalities of high population density may be relevant for the cities of India as well. For example, high population density aggravates negative externalities, like, air pollution, noise and loss of green space. But like the high density Chinese cities high population density may improve accessibility of services, reduce per capita domestic energy consumption and more or less promote infrastructure efficiency and use of public transport. However, there is dearth of study to support this in the Indian context. Other options like **multi-modal urban region** may provide some solution with the help of transport, which can be environmentally sustainable. This will be discussed next.

Multi-modal urban region: Is it the solution?

Transport has an important role in meeting the goals of urban sustainability. One of the challenges of a sustainable urban form is to meet the economic performance objectives and environmental sustainability of a city at the same time. It may be useful to build multi modal urban region²³ and supply transport to take care of the different urban and economic activities. For this to happen the land use and transport policies will have to match the demand of different activities. The idea is to create a city that performs well economically and conforms to the objectives of environmental sustainability. In order to be economically efficient a city needs to reduce production costs, e.g. costs of receiving inputs and distributing outputs. It also needs to reduce travel time between the different related companies, between the company and the workers' homes. At the same time the enlargement of the space of the urban labour market enables the companies to choose from a large pool of workers and also gives the workers a variety of jobs to choose from. An economically efficient city also creates economies of scale for services and housing markets (Bertolini, 2005). It has been argued by Prud'homme and Lee (1999) that actual extent of the spatial markets engaged in economic functioning rather than the city size is what matters. Also the jobs those are accessible rather than those showed in statistics that are significant. Two more factors namely, the speed of its transport system and the geographical spread of activities affect economic performance (Bertolini, 2005). The combination of speed, size and spread determines the effective labour market according to Prud'homme and Lee. Kenworthy and Laube (1999) comparing the data on speed and spread of 46 cities of the world found that, American cities use cars, have higher speed and travel distance and low land use density. On

²³ See Bertolini (2005) for a comprehensive discussion on this. This portion is based on the said article.

the other extreme, rich Asian cities like Hong Kong, Tokyo and Singapore use slow speed public transport, travel less distances and have concentrated land use density. European cities use public transport as well as cars and have moderate densities of land use. Thus the challenge is to find an urban form, which gives an effective size of urban market by combining land use policies and transport alternatives. Two factors are important in this regard which are accessibility i.e. acceptable time and environmental sustainability i.e. reducing costs like CO₂ emissions, air pollution, traffic noise. One solution that has been offered in the literature is multi modal urban region.

The idea is to create an environment friendly transport system and create activity places that are reachable within acceptable time limits. For this to happen, activity locations should be created which can be reached 1) without moving, by walking, by cycling, 2) by public transport, 3) by energy efficient cars. Land-use and transportation implications of this is to create 1) multi-functional homes/workplaces which does not need travel, 2) develop multi-functional neighbourhoods, which can be accessed by walking, cycling, 3) develop nodes having functional concentrations that can be reached by public transport and 4) develop multifunctional urban regions which can be reached by energy efficient cars. In Randstad, the highly urbanized west of the Netherlands, modal specialisations are found to hold for relationships between different areas. In 1997, it was found that within the large city bicycle dominates the mode, the train is used considerably between the large cities while car is the dominant mode for other middle and long destinations (Bertolini, 2005). This also gives an indication of the possibility of polycentric developments in sustainable city form. However, much needs to be researched on to get an optimal solution and may be for different conditions.

National transport policy of India, 2006, advocated public transport and recommended to promote road transport, which are energy efficient, conserves environment and meets social demand. It noted that it is needed to promote public transport to reduce negative externalities, like air pollution and congestion. It also advised to promote Non-Motorised transport. The national policy recommended, "Transit Oriented Development" with high-density areas and urged for developing new satellite towns along major transport corridors. It also discourages sprawl through taxes and fees.

Like most of the developing countries, in India a large percentage of people travel by cycling and walking by compulsion as they are poor and cannot afford motorized transport. Walking and cycling has an inverse relation with city size in India. But then it varies among the large

cities. For example, in Delhi walking and cycling is more common than in Mumbai and Kolkata (Pucher et al, 2005). Perhaps Mumbai and Kolkata's better public transport explains the difference. Lack of good public transport in Delhi has resulted in use of private cars. It may be mentioned here that Delhi Transport Corporation (DTC) has recently introduced air-conditioned bus services in some routes and is making profits. More such options in other routes may reduce use of private cars. One should keep in mind that low density sprawled development makes it difficult for public transport system to survive. This makes a case for high-density polycentric development with multi modal region. It would look after equity also.

Dempsey and Jenks (2005) conclude that future urban forms for cities may include: "polycentric urban forms, closely linked to good public transportation systems; development that is directly related to transport; culturally appropriate increases in the density of development, that is responsive to the urban context; urban forms and buildings that take advantage of solar energy, and that take account of the life cycle of the development; forms that interact with new technology; developments which enable accessibility and sustainable behaviour and involve the people who live there."²⁴

SUMMARY AND WAY FORWARD

We have dealt in this paper with some issues relating to sustainable urban development and sustainable city form with special reference to India. The paper first discussed the concept and importance of sustainable development and especially that of sustainable urban development. All the major conferences on world environment have stressed on need of development of the economy with social equity and protection and conservation of the environmental resources. In recent times, cities have become places of wasteful use of nonrenewable resources and urban environmental degradation. Apart from that, Climate change is posing a challenge to the world and it has the potential to affect the economies, rich and poor both. This is likely to affect the water supply and ecosystems among other things. Climate change would affect the poor of the world more because they are more vulnerable and does not have the means to protect themselves against the vagaries of extreme climatic conditions. Manmade pollution of water, air and environment seriously affect the climates. Sustainable urban development and sustainable city form should take account of all this and

²⁴ See Dempsey and Jenks (2005). Conclusion: Future forms for city living? In *Future Forms and Design for Sustainable Cities*, pp.417.

try to reduce the ill effects of climate change, depletion of nonrenewable resources and degradation of the urban environment.

Next the paper discusses the deficiency in urban basic services in India and its management for sustainable urban development. It also mentions the role of land in sustainable urban development and inefficiencies in the land policy of India. Urban form is important for sustainable urban development but equally important are the environmental friendly management of basic services like water-supply, sanitation and also of energy. The issue of equity in delivery of services is one important requirement of sustainable urban development, which should be kept in mind while planning for them. There are three main issues here, which are meeting the deficiencies in services, how to manage the services in an environment friendly way and the need to make them more equitable.

There are many city forms that have been suggested in the literature to solve the problem and make sustainable cities. This paper discusses two of them, the first one being that of the idea of **compact city** and the second one is that of **multi-modal urban region**. It explains the pros and cons of the compact city form and applicability in different countries with different densities. The two main benefits of compact city are reduced dependency on private cars and preservation of greenery while the main costs are more air pollution, noise and crime and overcrowding. It also refers to the recommendations of National Commission of Urbanization of India, which makes a case for **low-rise high density** built form for Indian cities. The two important issues about high-density cities are 1) the costs and benefits of the form and 2) how dense should it be and “higher than what”? Then the study discusses the concept of **multi-modal urban region**. The idea here is to create an environment friendly transport system and create activity places reachable within reasonable time. In order for this to happen, activity locations need to be created which can be reached 1) without moving, by walking, by cycling, 2) by public transport, 3) by energy efficient cars. There are important implications of this on transport and land-use policies.

One general idea about sustainable urban form is that density needs to be “high”. But how much high should density be differs by countries, cultures. A density that is suitable for U.S.A. or cities of Europe may not be feasible for already dense cities like Hong Kong or Chinese and Indian cities. The degree of densification would depend on the culture and the environment of the existing communities living in the particular area. (Jenks and Dempsey, 2005).

It should also be noted that sustainable buildings are important elements for dense cities. Buildings should be planned in such a way that sunlight penetrates the buildings. However, the right sustainable urban form and buildings are necessary but not sufficient conditions for sustainable city form. It is “behaviour, lifestyles and people’s aspirations”²⁵ that make an environment sustainable. (Dempsey and Jenks, 2005).

The issues can be numerous and varied for attaining sustainable urban development and city form. But all of them should consider economic, social and environmental aspects of development. In the end it can be said that economic growth does not mean economic development. True economic development should contribute to increase in efficiency and quality of life of a community (Opp, 2008). It is to be seen that positive externalities (such as more employment) of economic growth of a city does not give rise to negative externalities like air pollution, traffic congestion and so on. It is also to be remembered that such an effort should be made at local, regional and global level. Above all the solutions should take account of the local characteristics, acceptability and indigenous practices.

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²⁵ See Dempsey and Jenks (2005). Conclusion: Future forms for city living? In *Future Forms and Design for Sustainable Cities*, pp.417.

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