Policy Approaches in Planning for the Sustainable Compact City in Maharashtra

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ABSTRACT

Cities of the developing world have become the centre of opportunities. The concentration of resources in the cities has led to a major socio-economic inequality between urban and rural life. It is necessary for city planners to find innovative, hybrid and cohesive policy planning approaches for the development of the urban system. Increasing resource constraints and natural calamities had promoted researchers in various fields to inculcate a sustainability approach in their field of research. Compact city policies predominantly focus on mixed-use, accessible, and high-density urban development. It is one such approach to plan for the futuristic requirements of the city. The policies, which are required for the planning of various components of the sustainable compact city need to be understood. This paper takes into account the policy interventions made by various cities in the Maharashtra state. It provides an insight into the policy mechanisms followed in various cities for turning them as sustainable compact city. It will provide a way forward for the promotion of policies associated with sustainable compact city planning.

Keywords: *Sustainable compact city, urban system, policy, resources*

INTRODUCTION

Cities in India and other developing countries act as a primate growth centres for the region. The lack of primary infrastructure like social, commercial, industrial, physical, and residential is a key

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concern for planners of the developing countries[1]. The trends of urbanisation are irreversible. The rate of urbanisation is manifolds due to the economic resource concentration in the cities of the developing world[2]. Estimates denote that 55.3 per cent of the world population lives in cities. The projections propose that by 2030, one-third of the total world population will habitat in the cities[3]. Urban sprawl is a major challenge encountered in the present and future cities. The increase in the use of energy to sustain life in cities with sprawl, and consequent increase in environmental challenges is a major concern. Researchers also state that sprawl can facilitate the supply of affordable housing, increase in employment opportunities, provide cheap and better public services, etc.,[4]. The biodiversity of an urban system declines in terms of qualitative and quantitative aspects with the increase in urban sprawl. The connectivity between various interlinked ecosystems decreases with the increase in sprawl[5]. The sprawling cities result in jurisdiction related issues in operation and management in the local governance. The provision of infrastructure in the cities with urban sprawl results in the increased cost of infrastructure. The travel time required for commuters increases along with pollution and congestion[6].

Crime is related to urban sprawl, it is observed that leapfrog development and sprawl result in an increase in crime[7]. A number of researchers opine that fear reduces with the increase in the integrity of people, perception of unity as a result of compact development and reduces crime[8]. The commercial centres in the core city decline due to rise in the new commercial centres[9]. Forest is an important asset in an urban system, growth of cities in a haphazard manner and urban sprawl result in a decrease in forest resources[10]. Extensive use of the land resource as a result of sprawl results in a decrease in surface water resource[11]. Urban sprawl affects the industrial fabric, Gross Domestic Product (GDP) per capita and population distribution in the urban system[12]. The increase in vehicular traffic leads to air pollution which impacts the historic monuments negatively[13]. Expansion of urban areas negatively impacts the availability of open spaces in cities[14].

In Indian cities, which are a historic facilitator of the compact city have changed the growth pattern to car-driven urban form, as a result of the market economy. This has innumerable backdrops and limitations, as listed above. It is necessary to formulate suitable policies in order to rejuvenate the accessibility, mix of use and social inclusion by maintaining the social, economic and environmental sustainability in the Indian urban system.

The holistic definition of the compact city as suggested by the founders of the concept, Dantzing and Saaty, in 1973, stated a set of

characteristics which a city should qualify to be compact. The three major characteristics are as follows: (i) with respect to urban morphology, the compact city has high-density residential areas, reduced reliance on motor vehicles, and clear boundaries with neighbouring regions; (ii))spatially, the compact city is characterised by mixed land use and a high diversity of lifestyles; and (iii)) the social functions of the compact city include social equality, self-sufficiency of daily life, and independent regional management[15]. In this work, a critical policy review of the cities in the Indian state of Maharashtra is undertaken and discussions are drawn for further research. In this work, we consider Solapur, Nashik, and Aurangabad for the critical review of the policies related to the planning of the sustainable compact city using statutory provision, i.e. development plans of the respective cities. The profile of the study area is as follows:

Solapur

Solapur is located around 17.68°N and 75.92°E in the Indian state of Maharashtra. It has an average elevation of 458 meters from the mean sea level. It is a multi-linguistic, textile hub and sugar and allied industries centre[16]. The population of the city was 9.51 lakh in 2011. The city is 178.57 sq.km. in the area and density of the city is 5329 person per sq.km[17]. The city is connected by air, rail, and road, it is a district headquarter. It is well known for the manufacturing of Indian cigarettes.

Nashik

Nashik is an ancient pilgrim city located around 20.00°N and 73.78°E on the banks of river Godavari, in the Indian state of Maharashtra[18]. It has an average elevation of 584 metres from the mean sea level[19]. It is the wine capital of India, and also an agro-based centre. The population of the city was 14.86 lakh in 2011. The city is 259 sq.km. in the area and density of the city is 5738 person per sq.km[20]. The city is connected by air, rail, and road, it is a district headquarter.

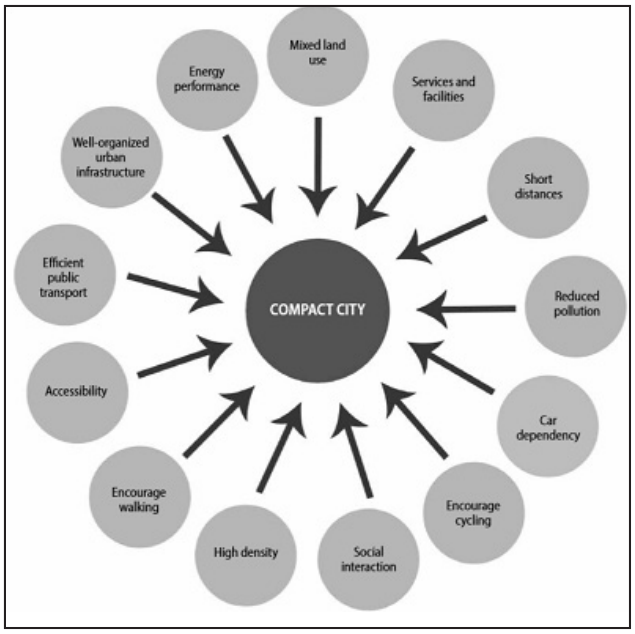
Aurangabad

Aurangabad is a historic city located on the banks of river Kham, around 19.53°N and 75.20°E in the Indian state of Maharashtra. It has an average elevation of 458 metres from the mean sea level. It is a multi-linguistic, multi-culture, mechanical industries centre. The population of the city was 11.75 lakh in 2011[21]. The city is 139 sq. km. in the area and density of the city is 8453 person per sq. km[22]. The city is the capital of the Marathwada region as well as the district headquarter and connected by air, rail, and road. It is well known for the world famous historical monuments in and around the city.

Literature Review

Planning policies in India are primarily influenced by Europe and especially the English, Dutch, French, Portuguese, who had their colonial presence in the past. In Europe, mixed-use and dense urban development are promoted by European Communities[23]. The Commission of the European Communities in 1999, promoted the policies related to the increase in residential densities in its member countries[24]. National Urban Development Policy is a guiding document for the strategic development of the urban system. The National Urban Policy framework by the United Nations promotes cities which are integrated, connected and compact. The planning in this pattern can promote sustainable and climate resilient cities[25]. In the city of Copenhagen, compact development was promoted to ensure the safety of the green belt and limit the sprawling growth by promoting integration land-use and transport modes[26]. The German solar city of Freiburg developed a vertical mix of uses including medical offices, schools, churches, children's play area, and encompass shops[27]. HafenCity in Hamburg used a mix of use as a principal development objective and promoted it as a structural concept for development. It also used density as a planning consideration to promote social inclusion, which is one of the important determinants of the compact city[28].

Fig. 1: Major Elements of Compact City

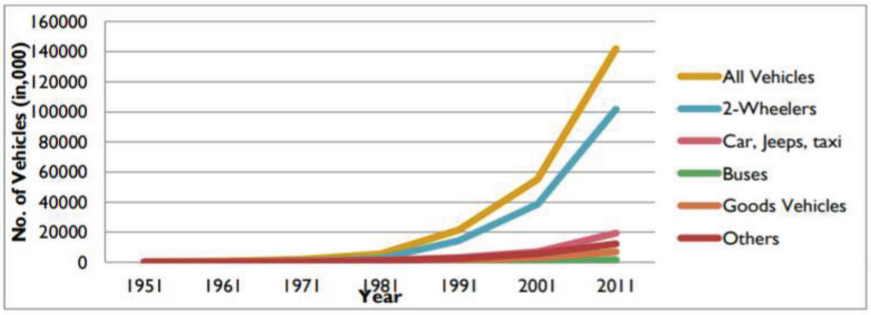


Source: ROGATKA, 2015.

In the post-1991, economic reforms, car-driven settlement planning was promoted in the cities of India, Fig. 2 shows the increase in car ownership after the 1991 economic reforms. Gatos in the name of developing elite apartments promoted car ownership in cities. This phenomenon was also observed in Ireland, as declining residential densities in the core city and increase in the densities in the urban fringe is the determinant of the world's advanced capitalist societies[29]. This indirectly facilitated sprawl, leapfrog development and decreased the possibility of developing public transport in the Indian cities[30]. Research is conducted in various elements indicated in Fig. 2, it shows that the use of compact city policy can promote a reduction in vehicular ownership and thereby results in the development of climate-resilient and sustainable cities by a reduction in Greenhouse Gas (GHG) emissions primarily in the transport sector.

The optimal urban size determination should be given more emphasis on the promotion of energy efficient cities[31]. The research in compact city policy primarily emphasises on cities which are less car-dependent and reduction of losses of valuable land resource in the urban system[32,33]. Social inclusion is possible by making the cities compact, with the effective formulation of sustainable policies.[34]

Fig. 2: Category-wise registered vehicle ownership in India



Source: Centre for Study of Science, Technology and Policy, New Delhi

Policies in the planning of Sustainable Compact cities in Maharashtra

The compact city is a broadly defined set of objectives rather than a single outcome. High density, mix of use and social inclusion are the objectives[15]. We have analysed the statutory policy documents of the cities with similar size and characteristics, in the Indian state of Maharashtra . The policies related to the planning of sustainable compact city are accounted for this work.

Sustainable Compact City Policy in Solapur

In the Solapur city, high-density squatter settlements are growing. The city is characterised by medium rise and high-density housing in the core city and low rise sparse housing in the extended areas. The unplanned density increase is related to the increase in noise pollution in the city, as per studies conducted by Maharashtra Pollution Control Board, Solapur subdivision. The heat island effect is observed in the high-density core city areas and is relatively low in the city peripheries. Transit-oriented Development(TOD) is proposed in order to promote the smooth flow of traffic in the city.

Solapur is among a few cities in the Indian state of Maharashtra, which promote and harvest the potential of mix use development by employing TOD in the city. In 1994, the area under mix use was 0.65 per cent of the total city area, which was proposed to be increased to 6.67 per cent in the year 2017. In the core city, a mixed development existing in the form of residential and commercial use is observed. In the eastern part of city mixed development is developed in the form of small scale industry like cigarette or *Beedi* factory and residential use. Density pattern in the city varies, due to changes in the city limit from time- to- time, as shown in Table 1.

TABLE 1: TEMPORAL CHANGE IN URBAN DENSITY IN SOLAPUR

Year	*Population*	*Area (sq. km)*	*Gross Density (persons / sq. km)*	*Persons per hectare*
1971	3,98,361	23.23	17149	171
1981	5,14,660	25.53	20159	202
1991	6,04,215	33.03	18293	182
2001	8,72,424	178.57	4886	49
2011	9,51,558	178.57	5329	53

Source: Census of India and Solapur Municipal Corporation.

The city has a long tradition of religious harmony and is reflected through various activities organised by different religions, with the involvement of people from diverse religions in the celebrations organised in the city. Solapur is a multi-linguistic city. People speak various languages including Marathi, Hindi, Telugu, Kannada, Sindhi, and Gujarati. The culture of people in Solapur is influenced by the two states predominantly, Kannada and Marathi. In the recent past, the city was affected by communal riots and raised serious questions on the inclusive way of living of the people[35].

The environment quality of the city is getting deteriorated. Studies

conducted by the Municipal Corporation and Maharashtra Pollution Control Board (MPCB) show that there is an increase in the pollution due to lack of treatment of water[36], increase in traffic congestion, noise generated during festivals, etc. The Environment Sector Plan is proposed in the Development Plan of the city. The goals like making the major lakes in the city as places of recreation, increasing the green cover of the city, maintaining the Respirable Suspended Particulate Matter (RSPM) level within the prescribed standards. These goals can help in making the recreational facilities accessible and keeping the city compact.

Sustainable Compact City Policy in Nashik

In the city of Nashik, the zoning proposed in the Development Plan is effective to promote compact city development. It is also projected to have effective mass transportation system by promoting Transit-Oriented Development (TOD). In the plan, the industrial zones are extended by adding the adjacent land as per the consent of landowners in order to promote compact city development in the city.

One of the major objectives of the plan is to increase the density of population along the transport corridors. The plan aims in creating an integration of urban density and transport by means of TODin the city but the Development Plan resists the promotion of mix use development in the city. The Plan expresses concern about social welfare in the goal formulation stage but ultimately lacks in promotion of social inclusion in the plan preparation stage. It is important to note that the social infrastructure proposed in the city, can be a medium to promote social upliftment.

The city is rich in biodiversity due to the presence of four rivers namely Godavari, Darna, Nasardi, and Valdevi. One of the main objectives of the city Development Plan is to redevelop the core city areas which are important for the city. In order to protect the environment, green belt of 18 m for Godavari river and 15m for Nasardi, Valdevi and Darna river are provided along the banks. The green spaces are proposed to have recreation features like cycle tracks, tree plantation in order to maintain the environment of the area. The issue of social inclusion is unaddressed in the City Development Plan.

Sustainable Compact City Policy in Aurangabad

In the case of Aurangabad Development Plan optimising the land resource is one of the main objectives. The density of 230 pph is proposed. The Plan promotes the involvement of various NGO's to promote environmental conservation in the city. Town Planning (TP)

Schemes are proposed to maintain desired density in the city and a desirable quality of life.

The city is an important primate city in the Marathwada region of the Indian state of Maharashtra. It is observed that the city possesses a possibility to develop as a compact city due to following characteristics: a) Social Exclusion is observed and documented by various researchers in the case of Aurangabad[37]. The exclusion in terms of economic status and religious basis is expected to be a prime concern for city planners and policymakers. In the city, the areas dominated by one religion is resulting in a ghetto culture, facilitating the social exclusion in the city. Social inclusion is one of the prime determinants for the creation of a compact city. It is important for city planners to work and formulate in a way that social inclusion is promoted in the city of Aurangabad. b) High Density: Aurangabad is a comparatively high-density urban settlement, the reason behind this is the ghetto which is created in the city. The density is higher but that fails to assure the sustainability feature in the planning of the sustainable compact city. It is important for the city, to formulate a plan which can assure sustainability along with an adequate degree of city compaction. The ribbon development along the road transit routes in the city is a major threat for the promotion of sustainable compact city in the city of Aurangabad. c) Mix use: This is another feature of compact city planning but is absent in the Development Plan (DP) in the city of Aurangabad. The mix of use is proven to promote security in the neighbourhoods of the city. In the case of Aurangabad, the DP does not include mix use as a land use category, which is a challenge the city needs to take in order to create a sustainable compact city.

Indicators of Measuring Compact City

In this section, the indicators related to the measuring of the compact in the developing countries are discussed. In the case of developed countries like the United Kingdom, researchers used three types of indicators namely, density indicators, mix use indicators, intensification indicators. The density indicator was measured using variables of the density of population, the density of built form, the density of subcentres, and density of housing. The mix-of-use indicators were measured using variables of the provision of facilities, a horizontal mix of uses, and vertical mix of uses. The intensification indicator was measured using variables of increase in population, increase in development, increase in density of new development, and increase in density of subcentres[38].

In Indonesia, the compact city is measured by accounting the influence of Information and Communications Technology (ICT). In this approach, Yogyakarta city is considered as a case. The compact city attributes employed in this work are population densification, activity concentration, public transport intensification, city size and access consideration, and social economic welfare target. In the case of population densification attribute ICT related indicators like mobile internet users, and computer users in the city were considered. Activity concentration was measured using indicators like Information Technology (IT) related industry located in the city, and online shopping activities in the city were considered. Public transport intensification attribute was measured by using the indicator rate of a resident using internet-based transport service per total population and rate of residents using GPS or geo-location. The city size and access consideration were measured using the indicators like the number of telecommunication antenna in the area, and the number of hotspot or wi-fi in the city. The socio-economic target attribute was measured using the indicators like rate of elderly persons using gadgets per total population, and the rate of facilities which were served online or phone per total population[39].

In the case of Iraq, the researchers have used various indices to measure the compactness and sprawl relation in the case of Nasiriyah city. Development clustering is measured using Global Moran's coefficient, Centrality was measured using Gini and Lorenz co-efficient, proximity by using compactness index, diversity by Simpson Index and fishnet 1 km., and percentage of blocks to space using porosity index[40].

Researchers in India employed and developed a set of indicators to measure a compact city. Density, density distribution or dispersion, transportation network, accessibility, shape, and mix use land composition were some of the key urban form characteristics employed for measuring the compact city. The indicators used for density characteristics are gross population density, average (built-up area) density, land use spilled up, and average land consumption per person. Density profile, density gradient, and population by distance to the centre of gravity or CBD were employed for measuring density distribution. Mode share, average trip length, road network density, congestion index, and walkability index were used to understand the transportation network in the city. Accessibility was measured by using service accessibility and public transport accessibility. Dispersion index was used for understanding the shape of the city. Mixed use land composition was measured by land use split up, the ratio of residential to non-residential use, and the ratio of built to open area.

Discussion and Conclusion

In this work, we reviewed the cities in Maharashtra, namely Solapur, Nashik, and Aurangabad. It is observed that the development plans of these cities are approaching towards the planning of a sustainable compact city. The aspects like making green spaces, making social infrastructure available, creating economic units like industrial areas for employment can lead to social, economic and environmental sustainability. Increase in density and implementation of transit-oriented development strategies are used to make these cities compact. It is important to note and understand the social exclusion which exists in Indian cities, due to language, religion, culture and the caste system. The development plans fail to address social exclusion in the cities of Aurangabad, Nashik, and Solapur. Social inclusion is one of the important components of a compact city which is absent in the plans. It interesting to learn from the study that the accessibility is given lesser importance and availability of infrastructure is given more importance in the plan.

The latter part of the paper discussed the various approaches adopted in developed and developing countries to measure a compact city. It is observed that density and urban form related indicators are given more importance than the parameters related to mix use and social inclusion in the studies conducted. In the Indian context, the social inclusion and mix use which are major prospects of planning compact cities would have to be given more importance.

It could be concluded that the holistic consideration of compact city characteristics is required to make Indian cities compact and sustainable. In the cities under consideration, social inclusion should be given more importance along with accessibility rather than purely developing compact city concept with high-density development.

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