Chapter 4
Are New Towns in Developing Nations Designed for Sustainable Living? Investigating the Perception of the Residents from Navi Mumbai, India

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1 Introduction

'Cities are where the battle for sustainable development will be won—or lost if we fail.'

— Former UN Deputy Secretary General Jan Eliasson.

Cities serve as the home and provider to billions of people in the world. People are attracted to the urban areas due to the opportunities they provide and resource concentration. History has shown evidence of the human tendency to migrate towards urban areas from rural areas for a better living. Better living depends on several aspects such as job opportunities, access to basic infrastructure and services, and housing and transport conditions. The phenomenon of the urban population continuing to stay in urban areas and the rural population continuing to migrate to the urban areas has led to more than half of the human population living in the urban areas. About eighty percent of the population lives in urban areas in developed countries (UNCTAD 2020). In this race of urbanization, fast urbanization has been observed in the Global South (primarily African countries) in these recent decades, with a large number of these countries having annual population growth of more than one percent. The urban population of developing countries has risen from 45.34% in 2009 to 51.11% of the total population in 2019, and it is expected to reach 68.4% by 2050 (UNCTAD 2021). Nevertheless, the rapid urbanization and large population living in the urban areas result in the overburdened physical infrastructure and services, exploitation of

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the ecology, and an increase in the number of slum dwellers. The global urbanization trend demonstrates that the demand for urban areas will continue to grow, and the urban authorities will continuously have to work for the smooth functioning of the urban system and promptly respond to the changes and emerging issues.

So, how is our world tackling the issue of excess demand for urban areas considering its limited land and infrastructural capacity? We all have to accept the truth that the urban areas in the world will exist for the foreseeable future. Moreover, several of these urban areas in developing countries are over-populated, unable to provide adequate, affordable, decent quality housing and infrastructure to all their population, losing their ecological share and balance, and deteriorating air, water, and land quality. Several of these issues have been attempted to solve through new policies, urban planning, and urban design strategies; however, the approach selected for the urban areas with a population above their carrying capacity must be different. The carrying capacity of an urban area is the maximum number of individuals that an urban area can sustain over time without destroying or degrading the environment, and it is determined by factors such as food availability, water, and space (Hartvigsen 2013). Conventionally, the new town development is identified as a planning opportunity and solution for large-scale urban issues. While the planning objective and approach of the new town development may be unalike by different developing authorities of the countries, typically in developing nations, new town development adjoining to a large city is considered as a sole solution for decongesting the existing city and providing affordable housing and access to basic amenities to all sections of the population. While we do not see the migration of the urban population to rural areas at large, we have seen the migration of the urban population to other urban areas. Human beings are attracted to a new place that can provide a better living. The new towns are expected to be modal towns which will provide better living and higher satisfaction to its future residents. Residents from large urban areas and urban agglomeration are shifted to the newly developed towns for living in better conditions such as affordable housing, good quality air and water, neighbourhood open spaces, infrastructures, and services.

The urban area covers just about 3% of the planet's area; however, it contributes to more than seventy percent of the global Greenhouse Gas (GHGs) emissions and two-thirds of the world's energy consumption (World Bank 2021). In addition to the urbanizations process leaving the urban system overburdened and ecology degraded, the safety and inclusivity of the urban space and infrastructure are rising concerns for several developing cities. Moreover, urban areas are the place that exhibits more social dualism due to the increasing informal settlements. While the new town development can be considered an apposite approach for urban demand requirements, will these new towns be part of the problems? New town development has an opportunity to be part of the solution by building a sustainable urban space for the current and future generations. Accounting for all the kinds of urban issues, the 11th Sustainable Development Goal (SDG 11) set up by United Nations General Assembly targets to achieve 'Sustainable cities and communities' by 2030. With the increasing awareness about urban sustainability and target to meet Sustainable Development Goals (SDG), several recent new town developments follow sustainable city concepts from

the initial planning stages. However, for conventional new town development, the determinants of sustainable planning remain elusive. The conceptual shortcomings include ineffectiveness in integrating sustainable planning principles to new towns and lack of people-centred development as recommended in SDG 11.

While the sustainability of the new towns developed with sustainability concepts can be evaluated even in the early development stage through their master plan, which provides development information (Fu and Zhang 2017), the conventionally developed new towns are difficult to be evaluated. However, the resident perception-based evaluation can provide information on satisfaction and sustainable living in the conventional new towns. Residents' satisfaction has been considered as an indicator for better living. The chapter explains the determinants of sustainable new town development and assesses 'Are new towns in developing nations designed for sustainable living? through the perception of the residents.'

The study elaborates on a case study of Navi Mumbai ('Navi' means 'New' in Marathi and Hindi), one of the largest planned cities in India. Navi Mumbai is described as a 'City of the twenty-first century' by the City and Industrial Development Corporation of Maharashtra (CIDCO), the development authority of Navi Mumbai. The planning of Navi Mumbai commenced in 1971.[1] Navi Mumbai was planned to decongest the Greater Mumbai, absorb the immigrants, and contain about two million population (Shaw 2004); however, the new town took decades to populate itself. The objective of the research is to conduct an empirical analysis that investigates the sustainability assessment of the new town 'Navi Mumbai' by elucidating inhabitants' perception towards their living, transport, and community well-being. This research would pave the way to identify determinants for sustainable new town planning and formulate environment-sensitive policies through the perspective of residents of the new towns. The following section discusses the determinants for developing sustainable urban areas in developing countries.

2 Determinants of Sustainable New Town Development

Sixty percent of the global population will live in the urban systems in the next two decades (John et al. 2019). As a result, urban expansion is happening in the existing urban systems subsequently increasing megacities (cities with more than 10 million inhabitants) worldwide (Kennedy et al. 2014). Rapid growth is observed in low-to middle-income countries of Africa and South Asia, putting massive pressure on infrastructure and resource consumption (Angel et al. 2012) and the formation of urban agglomerations. These countries have developed several new towns to attract people to new urban areas, thus reducing the burden of existing cities. However, some of these new towns have failed to attract the population and remain as ghost towns

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[1] Several leading architects, civil engineers, and urban planners such as Charles Correa (Chief Architect), R. K. Jha (Chief Planner), Shirish Patel, and Pravina Mehta were involved in the initial planning of the new town (Perulli 2016).

(Jin et al. 2017; Williams et al. 2019). Ghost towns are a new urban development that is significantly under capacity, that is, space with fewer people and businesses than its capacity (Shepard 2015). Such effects have serious consequences ranging from social (such as significant social inequality), ecological (wasted land) to economic dimension (wasted investment) (Jin et al. 2017).

On the contrary, some of the new towns are getting populated fast and facing similar urban issues, such as carbon emission and social inequality, as in the old urban areas. The new towns are found to be big contributors to urban carbon emissions (Liu et al. 2018; Papa et al. 2016). Therefore, the new town development authority must have sustainable development approaches that attract people in present times and prevent the new town from being the hotspot of urban issues in the future.

A new town can be defined as a self-sustained planned urban space that is developed on unoccupied land or land with minimal human density to accommodate a large population by providing housing, infrastructure, and services. While the primary motive of the new town development is either to decongest the old city or to control ad-hoc settlement formation around the old city (Osborn 1942; Osborn and Whittick 1977), it is more important to build the new town sustainable. Several recent new town developments are built/building on the concept of the sustainable city or eco-city (e.g., Tianfu New Area in China, Amaravati in India, and Songdo IBD in South Korea). The concept of developing sustainable urban areas obtained global attention in the twenty-first century, especially due to the 2030 Agenda for Sustainable Development, adopted by all United Nations Member States in 2015 (United Nations 2015).

Although researchers, policymakers, and public administrations agree that sustainable development is a key objective that must be considered, there is no particular definition of 'sustainability' when applied to urban systems. The current concept of sustainable development is derived from the Brundtland Report (also known as Our Common Future). As per the report, Sustainable development is 'Development that meets the needs of the present without compromising the ability of future generations to meet their own needs' (World Commission on Environment and Development 1987). The report highlights three key aspects of sustainable development: social equity, economic growth, and environmental security. Since then, researchers and policymakers have evolved the concept of sustainable development either to build the places sustainable or to evaluate the sustainability level of the existing places and compare the sustainability levels of the different places. As a result, several sustainable development determinants or indicators were formed.

Similarly, new approaches to sustainable development and evaluation were introduced. For example, according to Kennedy et al. (2007), a sustainable urban system is an urban region that does not exceed the capacity of its hinterlands due to its inflows of materials and energy and the disposal of wastes. Here, the concept of urban metabolism is incorporated as a tool to assess the sustainable development of urban areas. All the advancements in recent years indicate the world has recognized the need for sustainable development in all kinds of countries, and therefore, they are working together towards developing a sustainable world. However, the sustainable
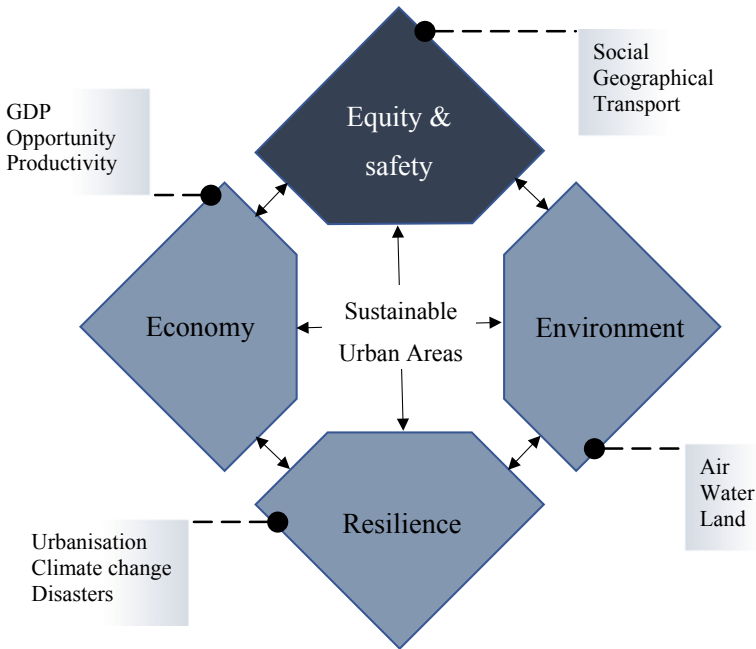
Fig. 1 Prime determinants of sustainability for new towns in developing countries

development determinants need not be identical for every urban area. The sustainability of an urban area depends on its population and its activities. The sustainable development determinants for an urban area should be determined considering the general urban issues faced by the urban areas in the region or country. Moreover, the policymakers and public administrations will have to act promptly to the changing behavior of the urban area and potential threats towards achieving sustainability. The following sub-sections discuss the details of the prime determinants of sustainability for developing countries (see Fig. 1) and suggestions for new town development in the twenty-first century.

2.1 Social, Geographical, and Transport Equity and Safety

The new town can become a place with large inequality as other old urban areas if the urban area has an unsystematic approach to development. The people from rural areas migrate to large urban spaces for economic growth and better access to services; however, they fail to obtain high-income jobs due to the lesser education or different skillset, thus increasing inequality in the income distribution, unemployment rates, poverty, cost of living, and/or social equity (Rama et al. 2021; Feleki et al. 2018). As a result, the urban areas showcase social dualism in their physical space (in the

Fig. 2 Social and
geographical inequity
measure from Mumbai,
India. *Source* Adopted from
Thomas et al. (2019)
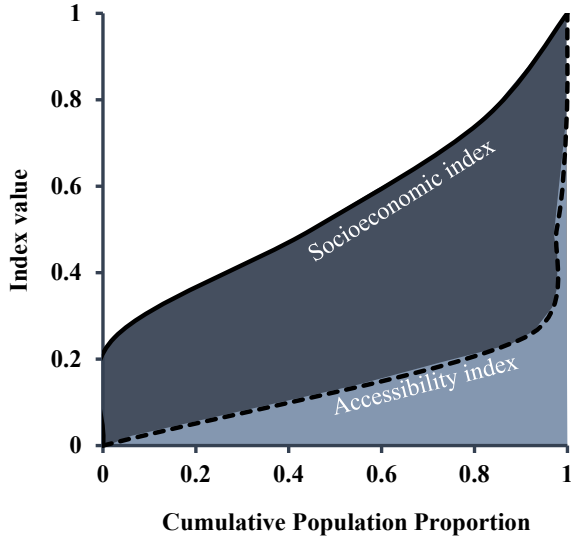
form of informal settlements) and social space (insensitive behavior towards low-income groups, increasing crime, and public safety). Simultaneously, urban areas in developing countries have exhibited disparity in access to social infrastructures (workplace, school, hospital, etc.) and transportation options. Figure 2 is a representative graph indicating the social and geographical inequity existing in developing countries. Geographical and transport inequity are generally the derivate of social inequity; hence, approaches to build geographical and transport equity benefit social coherence. The new towns must be built as a space with maximum urban equity (social, geographical, and transport equity, and safety).

The urban citizens have the challenge to meet their daily needs of water, sanitation, electricity, and transportation when there is a lack of reliable and affordable infrastructure and services provided by the municipal authority. The high-income group tends to access more reliable and convenient options providing extra cost. For example, they use privatized vehicles to travel for opportunities at distant places, live in gated communities with better infrastructure and services such as continuous water and electricity supply, and avail appliances that provide clean water, air, etc., while the rest of the citizens eventually choose mediocre or expensive arrangements, affecting their quality of life and productivity. Moreover, higher inequality can also harm well-being and the environment; that is, there can be an increase in atmospheric emissions and water pollution (Boyce 2018). Thus, there is a cumulative effect of urban inequity on the sustainability of that urban area as well as the global environment.

Sensitive planning can help solve the social, geographical, and transport equity issues. Informal settlements and large families living in small spaces are familiar scenes of the urban areas in low-income countries, resulting from a lack of affordable

housing. Urban residents from large cities may tend to move to new towns for affordable housing if it can provide better opportunities and space in their budget. Therefore, urban areas must be planned to accommodate all kinds of income groups. Mixed development can avoid the growth of informal settlements. People from different income groups should be sharing the public spaces, and their communities must not be segregated to increase social cohesion. In addition to housing, affordable transport, and accessibility to the workplace, public places and services play major roles in developing social inclusivity and improving urban equity.

The planning authority must have a vision for its space and population to build urban equity. Instead of segregating a section of the population with gated communities, we need to prioritize building safer communities with reliable and affordable services where the residents with different social statuses can interact daily. A large proportion of low-income people are commuting with active modes (such as walking or bicycle); however, most urban authorities focus on infrastructure developments for motorized transportation. The infrastructures in the new towns must be developed for its citizens, not for the new developments invented to reduce the people's hardship. While the motorized vehicle can provide an undeniable amount of opportunities to the people, such options must be restricted wisely by building more walkable urban areas and providing accessible and affordable public transportation. The infrastructure for active modes (footpath and cycle lanes) and public transport needs to be given priority to reduce the inequity in the urban spaces.

Urban equity is the catalyst for other determinants while building a sustainable urban area because any inequity may affect the economic and environmental balance and resilience of the urban area. Hence, social, geographical, and transport inequity can be a major challenge for new town development in developing countries.

2.2 Economy, Opportunities, and Productivity

Urban areas contribute to more than 80% of the global gross domestic product (GDP) (World Bank 2021), and economic growth is a primary objective of the urban areas. There are two major issues faced by urban areas in developing countries while concentrating on economic growth, which are difficult to be rectified in the old urban areas but should be considered while developing new towns.

First, the scalability of the urban area is that the urban areas do not have the space to accommodate new opportunities and increase demand for infrastructure. An urban area should attract people through the establishments it has and the opportunities it can provide. The planning authority plays a major role in encouraging innovations, businesses, entrepreneurship, and investments in urban areas. In the current world, the industrial association is not the sole option to attract a large population; other income-generating options such as technology parks and tourism can have a place in the urban area. The planning of the new towns is pivotal for accommodating any such opportunities for generations. Therefore, physical form and the land use pattern should be developed considering multiple dimensions and changes that can occur

in the future in terms of opportunities, population growth, and the infrastructure and service needs for them. The fast-paced development attracts the people towards the urban areas, resulting in over-crowded spaces and overburdened infrastructures if there is no proper planning. In addition, the urban area should be capable of providing jobs to people from different economic and occupation sectors. If else, the unemployment rate will increase, thereby increasing poverty and forming informal settlements (slums). The planning measures are taken accounting for the heterogeneity of the society and the future population to avoid the unsustainable sprawl existing in the old cities.

Secondly, economic development can have unfavourable impacts on the social system and environment. Developing countries are in the transition phase, and they compromise on the ecosystem while struggling for economic growth (Nazneen et al. 2021). Several times, the urban authorities fail to evaluate the carrying capacity of the urban area and environmental effects while determining for fast economic developments. The new towns will be a new core for the environmental deterioration and social inequality if the authorities fail to incorporate approaches to restrict such adverse effects by enforcing relevant policies and planning strategies.

Although access to good infrastructure and services, such as water, electricity, transportation, education, and hospitals, is a determinant that attracts people towards the urban area, the effort, time, and money spent for availing the infrastructure and services are crucial indicators suggesting sustainability of the urban system. Economic growth is associated with the productivity of the urban area, which depends on its citizens' stability and efficiency. However, the urban areas in the Global South display disparity among the urban residents regarding accessibility to infrastructure and services, and a large population of about 70% or more are under-served by the municipal infrastructures (Mahendra et al. 2021). Thus, a massive gap in service accessibilities is observed between the privileged citizens and the rest of the urban residents, which forces the under-privileged to procure the necessary services through alternative or informal arrangements that affect their health, well-being, and livelihood. Such effects cause poverty and environmental exploitation that lead to loss of attractiveness of the new towns. Thus, the provision of safe, reliable, and affordable infrastructure and service for all the urban residents is a key determinant for developing countries to build a sustainable urban area.

Further, the urban areas should be growing smart with the rapid technological advancements happening in the world. The young and middle-age groups who are the major immigrants to the urban areas are riveted to the impression of technological advancements. Public administrations in developing countries are taking 'smart city' initiatives to make the urban system smart and convenient for their citizens (Tan and Taeihagh 2020.).

2.3   Environmental Quality

Urban areas are the predominant consumer of natural resources, and they impact three major resources: water, air, and soil. The urban areas contribute to more than seventy percent of the global Greenhouse Gas (GHGs) emissions (World Bank 2021), consume seventy-five percent of the natural resources, and generate fifty percent of global waste (Rama et al. 2021). Further, several urban areas face a shortage of clean water, waste management issues, and a lack of green space. As discussed in Sects. 2.1 and 2.2, higher inequality can also harm the environment by increasing atmospheric emissions and water pollution.

Three key approaches to improve environmental quality for the new town are identified and discussed here. First, act to preserve natural resources and balance the share of water bodies, green and open spaces in the urban areas. The urban area must have dedicated spaces for natural or man-made water bodies, green spaces as nature parks or forests, and open areas as playgrounds and neighbourhood parks. Majorly, future planning or sprawl should not affect the share of these natural resources. Second, the self-sustainability of the urban system, that is, the urban system must be producing, recycling, reducing, and reusing the resources it requires—for example, efficient and affordable water and waste management units, food and energy production, etc. Third is to reduce Greenhouse Gas (GHG) emissions through policy and planning measures. In order to protect biodiversity and the ecosystem, authorities can play an important role in integrating sustainability concerns in policy plans and focusing on green infrastructure (Valente et al. 2020). Besides, transportation and commerce play an important role in GHG emissions. New towns must promote active mode and public transport through several approaches. These include providing safer pedestrian paths and bicycling routes, developing the city along transit routes, providing safer, accessible, and affordable public transport, and providing the public and social infrastructures easily accessible through geographical equity and mixed-use development.

2.4   Resilience

Urbanization, climate changes, and unanticipated disasters affect people, places, economy, and environment in numerous ways. Urban areas are encountering several natural calamities such as flooding in recent years, which could be due to climate and spatial changes. Urban areas are the most challenged during all kinds of disasters, including epidemics. The high-density urban areas in low-income countries suffer the most during such instances of disasters. The rapid changes distress unplanned and informal settlements massively, and it is identified that about ninety percent of urban expansion in developing countries is informal and unplanned settlements or built near hazard-prone areas such as coastal areas (World Bank 2021). Thus, building resilient urban areas is identified as another prime determinant for the new

town development. Urban authority plays a major role in building resilient cities at different stages, as described below.

(i)   Site selection stage through feasibility study (understanding the vulnerability, risks, and impacts) to identify the exposure risk,

(ii) Planning stage to reduce the vulnerability by determining the carrying capacity and appropriate building bye-laws, and land use distribution, primarily, service planning (water, sanitation, energy, transportation, and communication), and social infrastructure planning (accessible, affordable, and adequate emergency infrastructures such as health facilities, fire station, and transport options), and

(iii) Functioning or growing stage through recovery, adapting, and transforming actions for rapid changes due to urbanization, climate changes, and disasters. The actions can be accomplished through immediate policy plans and adopting innovations and technological advancements to aid urban areas to be resilient to the changes.

While adapting to innovations and technological advancements can support adjusting to the changes and reduce the negative impacts, certain other technologies and innovations can affect the environment, such as motorized transport modes and non-degradable wastes. Thus, the urban area needs to restrain the use of some innovations that affect the environment through policy and planning approaches. The resilience among the urban residents also is depended upon their socio-economic characteristics. The high-income group is generally more resilient to the changes as they tend to acquire their needs faster, providing money, while the vulnerable groups (like low-income people) suffer the most if the government does not support them or attempt to build urban equity. Figure 3 demonstrates the effect of the determinants on the sustainability of the urban area.

An urban area developed and functioning upholding sustainability principles would be providing a higher standard of living and satisfaction to its citizens. For this study, we hypothesize that 'a well-planned sustainable city would derive higher satisfaction from living and travel environment which is a subject of non-polluting trips'. Exploratory analysis coupled with statistical logistic regression models were applied to understand the residents' mode choice behaviour for short and leisure trips, weekday and weekend trips with respect to their socio-economic and demographic characteristics. This study would pave the way to identify determinants for sustainable new town planning and formulate environment-sensitive policies by reducing travel-based carbon footprint through efficient city planning.

3   Data and Methodology

This section focuses on the investigation methodology adopted for the study by describing the data collection methodology, study area, and research methodology. Thereby, the conceptual framework, hypotheses, modelling techniques, and the
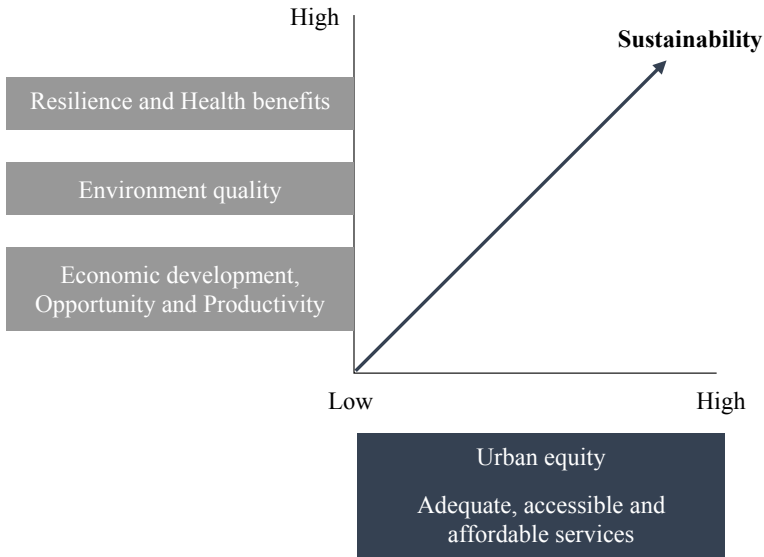
Fig. 3   Effect of the determinants on the sustainability of the urban area

description of the variables used in the models were elaborated in the following way.

3.1   Study Area

The new town of Navi Mumbai, a part of this mega region, was primarily designed to relieve Mumbai of unprecedented urbanization stress and growing population pressure (Jana and Sarkar 2018). A satellite city of area 108.6 km^2 is composed of 14 development nodes laid along a longitudinal transport corridor. Among these 14 nodes, the centrally located nodes of Belapur and Nerul were selected for this study. While Belapur is currently denoted as the 'Central Business District (CBD)' of Navi Mumbai, Nerul was selected for its typical residential neighbourhood character. Belapur with a total area of 24.5 km^2, and total population of 92,520, whereas Nerul with a total population of 3, 13,144 and 14.90 km^2 area hold a residential land use share of 67.34% and 25.16%, respectively. As illustrated in Fig. 4, the grid-iron pattern of residential development is observed in Belapur, while Nerul has witnessed a mixture of radial and grid-iron development.
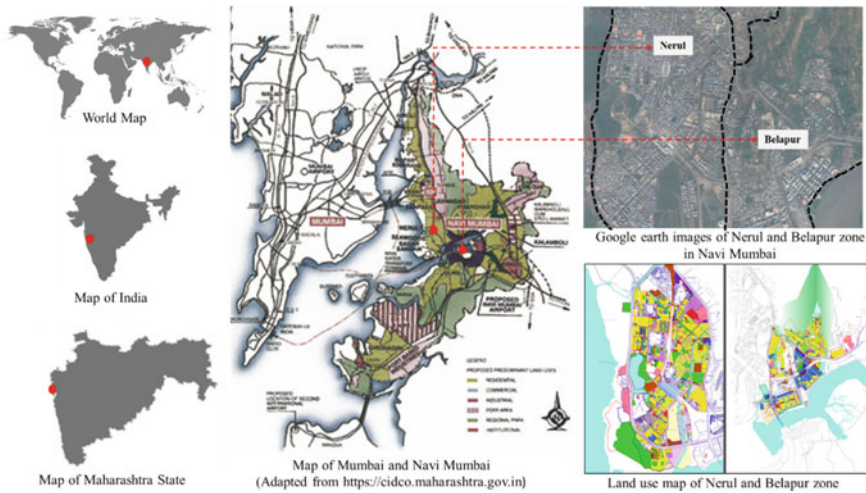
Fig. 4 Regional setting of the two studied sectors of Navi Mumbai. *Source* CIDCO website

3.2 Data Collection

The survey was conducted for 212 households between the months of August 2019 and October 2019. A major attempt was made to collect a representative sample across all the sectors of the two zones and reduce sampling bias. Personal face-to-face interviews of individuals were conducted at their households capturing the revealed preferences. In addition, face-to-face (F2F) computer aided personal interview (CAPI) survey questionnaires were selected to conduct the surveys, owning to their higher response rate. The main intention of the survey was to explore the residential satisfaction levels of the residents of the new town, who had recently shifted from other locations. Table 1 represents the general characteristics.

The survey was created in order to investigate the satisfaction and safety levels of the new town residents. The survey questionnaire was segregated into sections: Part I—socio-economic status of the households, their present and previous locations, and other household attributes; Part II—details of different facilities the households use, the distances of the facilities from the houses, their usage frequency, and overall satisfaction levels. In Part III, five-point scales marking '5' for very satisfied and '1' for very dissatisfied were utilized for understanding the households' satisfaction levels regarding the transport and living environment in the new towns. Data pertaining to the perception of safety and security of the households were also noted. Concerning residential satisfaction and well-being-specific investigation, questions also focused on the levels of happiness before and after shifting to Navi Mumbai.

The survey was conducted in both English and Hindi while making it comparable with the international studies. In the questionnaire, the general individual and household-level data was followed by information concerning the residential environment. A pilot survey of 20 households, taking 10 from each of the two zones,

Table 1 Profile of surveyed respondents in Navi Mumbai

Category	Sub-category	Percent
Zone	Belapur	66.98
	Nerul	33.09
Household income	3000–9000	11.79
	9001–18,000	43.86
	18,001–27,000	24.05
	27,001–40,000	14.62
	40,001–50,000	1.41
	50,001–65,000	2.83
	65,001–75,000	0.47
	75,001–90,000	0.47
	90,001–150,000	0
	More than 90,000	0.47
Type of house	Detached house	52.8
	High-rise apartment	40.5
	Villa	4.71
	Others (chawl)	1.88
House ownership status	Own	72.17
	Rent	27.83
Previous location	In-state migration	88.68
	Out-state migration	11.32

was conducted initially, followed by a field survey of 250 households. Finally, 212 samples were sorted for further analysis.

Out of 212 samples, 142 samples were collected from the Belapur zone, while 70 samples were collected from the Nerul zone. It was also observed that while approximately 11% of the studied population had shifted to Navi Mumbai from other states such as West Bengal, Rajasthan, Karnataka, and Bihar, the remaining 88.68% belonged to the in-state migrant sector.

4 Exploratory Findings and Discussion

4.1 Built-Environment Setting

The survey observed two major typologies of houses in Navi Mumbai, with 52.8% of detached houses and 40.5% high-rises. These findings corroborate with the reconnaissance survey, where detached individual-level houses and villas were observed in Belapur, whereas apartments and multi-storied cooperative housing were found

Inner areas: Along the radial sector 21

Inner areas: Along the main roads

Fig. 5 Built-environment and street network pattern in Nerul. *Source* Authors

to manifest the built-environment character of Nerul as seen in Fig. 5. Around 72% of the households owned the houses, with 27% population paying monthly house rents in the range of 5000–1000INR (USD 69.69–139.38). 37.7% of the houses were found new with an age of less than or equal to 10 years, while the rest of the built-structures aged 11–25 years. While low- to medium-rise single houses were mostly observed in the inner sectors, the high-rises were bounded by high-rises.

An important character of Sector 8 of Belapur node is the CIDCO Artist Village, a residential neighbourhood designed by architect Charles Correa, where high-density incremental housing could be achieved with low-rise courtyard homes. Based on clusters of between seven and 12 pairs of houses arranged around communal courtyards, the buildings did get space to extend (see Fig. 6).

Owing to the medium slope of the land, and excessive rainfall during monsoon season, the specially designed centralized drainage canal as shown in Fig. 7 aids in streaming out the excess rainwater especially for 4 months a year.

Belapur: Artist Village (designed by Architect Charles Correa)

Fig. 6 Built-environment and street network pattern in Belapur. *Source* Authors

Fig. 7 Nullah or drainage canal in Artist village, Belapur. *Source* Authors

4.2   Facility

The different facilities that were asked out included work office, supermarket, departmental store, kindergarten, school, hospital, pharmacy, gym, beauty salon, parks, bus stop, etc. While only community-level green belts and parks were found in Nerul, hierarchical arrangements of neighbourhood green belts, parks, and community-level parks were found in Belapur. Reconnaissance survey identified the presence of kindergarten, community centres, health care, and markets in close proximity to the residential zones. It was also observed that around 66 and 87.82% of the studied population used non-motorized mode to avail hospital and pharmacy. While 50% of the population had to use motorized mode for using the facility of supermarkets, departmental stores and regular local markets were found in close proximity with only 10% of motorized trips. Figure 8 also demonstrates the presence of local educational institutions within the residential communities, hence resulting in 72 and 86% of non-motorized trips for kindergartens and schools. Around 67% of the population

Fig. 8 Neighbourhood facilities in Navi Mumbai. *Source* Authors

used non-motorized trips for availing bank services. However, 50% of commuting trips were observed motorized.

4.3   Residential Satisfaction

Using results from household interviews with residents in two different sectors of the satellite town of Navi Mumbai—Belapur and Nerul, this section investigates several measures of neighbourhood and community satisfaction levels. On the neighbourhood scale, the best predictor of satisfaction was the respondents' rating of the living environment. At community or nodal scale, extent of community planning in the new town and accessibility to work and local facilities were important components of community appeal and satisfaction. In addition, the study also asked respondents to indicate their current satisfaction with the area followed by probes to get at the reasoning for the community rating. Quality of living components such as pavement quality of road network, width of vehicular road network and pedestrian paths, provision of parking space, and amount of public greenery. The respondents were asked on a 5-point scale. Figure 9 explains that satisfaction rates were high for all the afore-mentioned components, both the nodes of Belapur and Nerul. The planned areas scored well, with over 80% of the respondents being 'satisfied' or 'very satisfied' with the neighbourhood and residential environment in Navi Mumbai as shown in Fig. 9. Around 87% of the respondents were satisfied with the quality and width of the road network, which also corroborates with the observations from Fig. 10. Highest positive response was retrieved in case of the provision of the number of parking spaces.
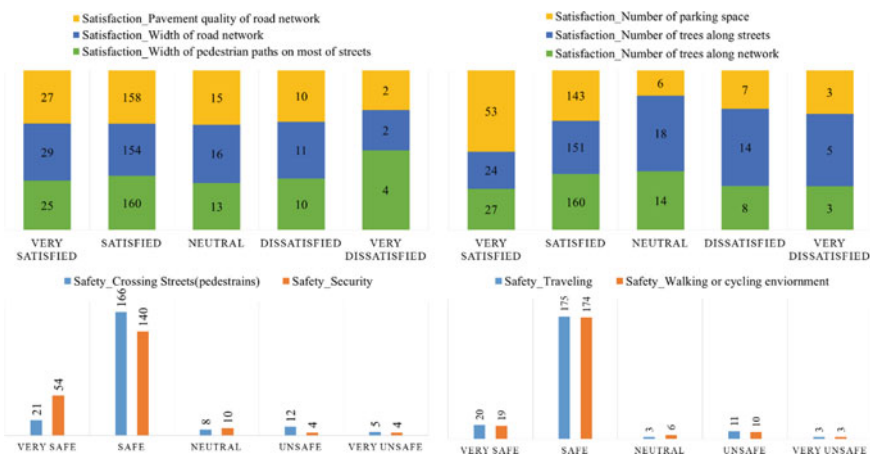

Fig. 9   Results of residential satisfaction survey

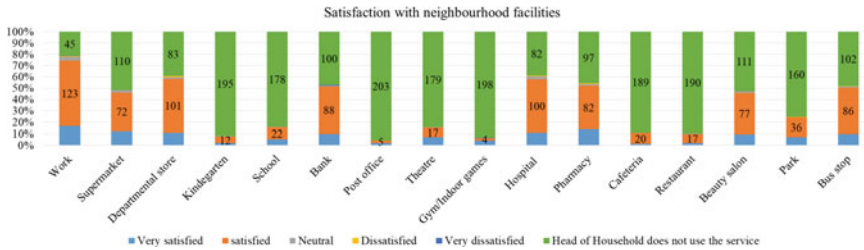**Fig. 10** Transport and living environment. *Source* Authors

Fig. 11 Satisfaction levels with accessibility to community-level services in Navi Mumbai. *Source* Authors

In the study reported here, the length of the questionnaire precluded the depth of some dimensions of resident responses to their environments. Among these dimensions, an integrally crucial factor was the safety quotient. An effort was made to include a more comprehensive array of possible determinants of neighbourhood satisfaction. Safety quotient was found high in transport environment especially regarding travelling and cycling or walking environment, with 85–90% respondents marking 'safe' or 'very safe'.

The interview also provided a measure of 15 plausible local facilities other than work, and information pertaining to the respondents' overall satisfaction concerning the accessibility to the facilities was collected. Figure 11 explains that the most significant local community-level services required in a new town included commuting, departmental store, hospital, and pharmacy where the residents. While services like the post office, gym/indoor games, and restaurants are rarely used by the head of households or respondents, around 60–70% of respondents were reckoned to be highly satisfied with commuting and medical facilities.

4.4 Reasons for Shifting to Navi Mumbai

Integrally crucial measures often overlooked in new town studies is the reason behind shifting to the new areas on the one hand and happiness level after shifting to the new towns. Figure 12 (left) elucidates the reasons stated by the respondents for shifting
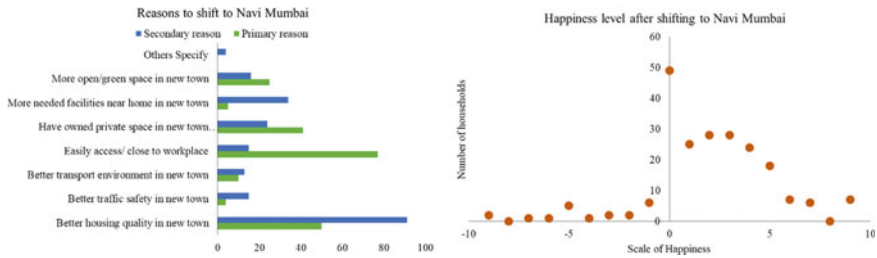
Fig. 12 Reasons to move to Navi Mumbai (left) and happiness levels after shifting to Navi Mumbai (right)

to Navi Mumbai. In this study, in order to apprehend the plausible factors behind shifting, the respondents were asked to emphasize and rank two specific reasons.

It was observed that the most preferred primary reason behind moving to Navi Mumbai was higher easy accessibility to the workplace, where around 80% of the respondents preferred to stay in close proximity to their workplace and hence shifted to Navi Mumbai (Zehner 1971). The results corroborate with another study conducted in 13 American new towns where one of the new community selection criteria was the nearness to workplace. This can be attributed to the presence of the CBD area and offices, especially in the Belapur node. However, around 85% of the respondents selected 'better quality of housing in new town' as the secondary reason behind shifting to a new town. New towns are often characterized by highly planned neighbourhoods with improved quality of housing characteristics and services. In addition, they tend to feature clustered service and recreational facilities in proximity to residential areas, connoting middle-class vision of 'good life'. While most new town related researches have focused on the performance of community service systems like elementary schools, health care, recreation, shopping, and transportation accessibility as fundamental criteria for assessing the quality of life of new towns (Omar 2009; Burby et al. 1975), this study reveals that improved built-environment is an integrally crucial factor behind selecting and shifting to a particular new town. Another important measure was the change in house ownership status. This study identified that around 45% of the respondents had shifted to Navi Mumbai as they owned a private house. Extremely affordable land prices in Navi Mumbai with respect to the core island city of Mumbai has pushed the middle-income group (MIG) to settle down in owned residences in the new town, which would otherwise have been impossible in the heart of Mumbai. Other reasons included the availability of higher facilities and public greenery.

Figure 12 (right) demonstrates the difference in happiness levels of the interviewed respondents after shifting to a new town. Surprisingly, it was observed that there was no change in happiness level for 25% of the population even after shifting to a planned neighbourhood. 9.5% of respondents expressed decreased happiness, with increased happiness for 67.4% of respondents. A more grounded understanding concerning the reasons behind the decreased happiness should be performed for this behaviour.

5   Conclusion

The study showcased that Navi Mumbai has well-satisfied its primary target of housing the excess urban population of Mumbai. Apart from delivering its citizens with improved housing opportunities, easier access to their work places it has offered convenience, comfort, and liveable environment. The access to varying transportation choices along with well-planned roads as well as social and public infrastructure such as parks, markets, shopping centres, bus terminals etc. access to these facilities and overall, better and safe environment has increased the residential satisfaction among the Navi Mumbai inhabitants, thereby achieving success in terms of sustainability. Despite few studies have highlighted the unaffordability of the housing choices in Navi Mumbai, thereby losing the purpose of serving as a satellite town, this study showcases that Navi Mumbai have served the purpose of serving as a sustainable township at various levels.

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