

Self Sustainable Township Planning

Padhye P. R¹, Urade S. P², Deo N. N³

¹R V College of Engineering, Bangalore, Karnataka India

²G H Rasoni College of Engineering, Nagpur, M.H. India

³Civil Engineering Department, SITS, Narhe, Pune, M.H. India

Email: ¹pranavpadhye4@gmail.com, ²Shrinivas.urade@gmail.com, ³narendrdeo@gmail.com

Abstract: More than 50% of all new growth is happening in urban areas for the reasons that cities are the social and economic development engines at both local and national levels. They offer significant economies of scale in the provision of jobs, housing and services and are important centers of productivity and social advancement. Most states in India today have township policies. State governments are encouraging private real estate sector to develop townships where the entire security, street maintenance and administration of the estate are managed by the developers. These new townships can be developed as smart and intelligent urban centers with focus on becoming drivers of technology innovation and environment conservation.

The concept of smart cities and their immense technology potential can address various environmental issues. For instance, integrated municipal solid waste management and decentralized wastewater treatment systems can form the core of sustainable city operations. The same should be combined with low-cost housing techniques and pre-fabricated constructions as solution to meet the fast growing housing needs. Another important aspect is creating the efficient public transportation for addressing concerns of urban mobility and carbon emissions in India. Mixed land-use development and integration of land-use with transportation and resource efficiency are the key strategies for promoting self-sustaining Indian urban cities. To enforce these strategies we require introducing of techno-legal regime through provisions in building regulatory media. The same can be applied during the stages of EIA Clearance, Building & Development Permit, Supervision Control, Completion Certificate and Occupancy Permit. Additionally, various green rating tools like LEED, IGBC etc. facilitate building owners and facility managers in implementation of green building strategies, measuring their impacts and sustaining of the building performance in the long run. This can include Pre-certified and Certified Green Building Ratings and Periodic Renewal Certificate.

This paper contains the planning and design of a new self sustainable township at the selected site using Auto CAD with some new ideas. Here you write abstract of your research article with Times New Roman, 10 font size and it should not exceed 250 words. You can also retype your document in this template of the paper. [Times New Roman - 10pt, single spacing, justified alignment]

Keywords: Township, environment conservation, urban mobility, green building

I. Introduction

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The urban problems are not all of recent making. In India the urban situation had become serious because of the large increase in population since 1921. While the percentage increase for the nation as a whole was 11%, 14%, 3% and 13.4% respectively, for the decennial periods 1921-1951, the urban areas increased by 21%, 32% and 54% respectively, during the same periods. The urban drift is continuing unabated. The heavy shifts of population are the result of the lack of adequate employment opportunities in the villages and the attraction of relatively high wages and amenities in the towns. Some of the key features of Urban Planning In India are Regulation of land use for residential and commercial purposes, Planning for economic and social development, Construction of roads and bridges, Water supply and Sewerage management, Protection of environment through sustainable development, Promotion of ecological balance and maintenance, Increased provision of basic urban facilities like public urinals, subways, footpaths, parks, gardens, and playgrounds, Increased public amenities including street lighting, parking lots, bus-stop and public conveyances, etc.

1.1 Concept of Town Planning

The term township planning is used to indicate the arrangement of various components or units of a town in such a way that the town as such attains the significance of a living organism. It also includes ways and means to be adopted for the improvement of the existing towns or for the extension of the towns. The township planning demands active imagination and sharp common sense of the understanding of the various needs of the society occupying or likely to occupy the township. A well planned township carries out its activities in a normal way like a living organism.

1.1.1 Principles of Township Planning

Some of the guiding principles of township planning are as follows --

1. Green Belt – The provision of the green belt on the periphery of township results in the limitations in its size and hence, the final size of the township can well be anticipated.
2. Housing – Extreme care should be taken to provide housing accommodation to various categories of people. It

should be observed that there is no development of slums and further, if slums are existing. They are cleared by the provision of some alternative arrangement.

3. Public Buildings – There should be a well-balanced grouping and distribution of various public buildings throughout the town. The unnecessary concentration of public buildings at certain spots of the townships should be avoided.
4. Recreation Centers – Depending upon the size of township, enough space should be reserved for the development as recreation centers for the general public.
5. Road Systems – The efficiency of any township is measured by the layout of its roads. A nicely designed road system puts a great impression in the minds of people, especially the visitors to the township.
6. Transport Facilities – The Township should be provided with suitable transport facilities so that there is minimum loss of time from place of work to the place of residence.
7. Zoning – The Township should be divided into suitable zones such as commercial, industrial, residential etc. The suitable rules and regulations should be formed for the development of each zone.

II. Methodology

The Maval Vadgaon City municipality is the local self-government body which looks after the development of the Vadgaon city. Pune district is situated in the river basins of the Bhima and Nira rivers. The valley of the River Bhima and its tributaries is one of the greenest areas of the country. Other small rivers, such as the Pawna and the Mula-Mutha, flow into the River Bhima. Maval-Vadgaon Taluka is situated in Pune district. Its area is about 1131 sq. km. Its population according to census 2011 is 3.05 lakh, population density 270 persons per sq. km. with a decadal growth rate of 26%.

2.1 Geographical Details

Pune district is located in the western part of Maharashtra. It is bounded by Satara and Solapur districts to the south, Ahmednagar district to the east, Nashik district to the north and Raigad district to the west of North Latitudes 18.771761°N and East Longitude 73.4271854°E having average rainfall 1100 mm to 1150 mm.

2.2 Zoning of Various Buildings in the Proposed Township

The area of the Proposed Town is 250 acres. In it, actual working area is 180 acres. Area provided for future expansion is 70 acres. Area of Each Outer Sector is 267 x 267 m. Area of Each Inner Sector is 235.5 x 235.5 m. Total Population of City is 21500 persons. Total calculated approximate water demand of City is 3117405 lit/day.

2.2.1 Residential Buildings

The area and percentage adopted for residential purpose in this proposed township is 57.5% = 0.3490 km². It consists of 1, 1.5, 2, 2.5 and 3 BHK Apartments, Individual Bungalows, Twin Bungalows and Row Houses. Following are some of the specifications provided for all the above units.

R.C.C framed structure having outer wall of 150 mm and inner wall of 115 mm in red bricks / fly ash. 12 mm cement plaster in inner walls and outer sand faced plaster of 15 mm to 20 mm thick. All plumbing in PVC pipes with chromium plated fittings. Landscaping is within the premises and boundary wall is with MS gate. Paved pathway is provided. Street lights for

external illumination of drive way and other parts will be Solar-Powered, Intelligent I-lock on main door from Godrej Locks, Video phone connection with the security room and reception area, CCTV Surveillance on strategic location, etc.

Combination of Granite / Vitrified tiles in common areas, vitrified tiles in foyer, living, dining and kitchen, ceramic tiles in bedroom, balcony and utility, Anti-skid ceramic tiles and chromium plated fittings in bathrooms as flooring. Apartment main door in teakwood frame with polished designer shutters and PVC / Aluminum, three track glazed sliding shutters with mosquito mesh and safety grill to windows. Black granite kitchen counter, stainless steel sink with single drain board. Long-lasting textured paints for building exteriors and Acrylic emulsion paint for interior walls and OBD for ceilings. Electrical fittings includes concealed conduit with copper wiring for electrical fittings throughout the apartment. Back-up generator for apartments, common area lighting and lifts, Continuous water supply through overhead tanks, two high-speed passengers lifts having 13 person capacity and one service lift with 1,000 kg capacity. Two-level covered car parking—upper and lower basements.

2.2.2 Commercial Buildings

The area and percentage adopted for commercial purpose in this proposed township is 7.26% = 0.0441 km². Commercial buildings are one of the major components in any township. It consists of the places for shopping, auditoriums, basic needs like police station, fire station, banks, petrol pumps etc. In our proposed township we have adopted the following commercial units,

Table 1 Commercial Units with their numbers

Sr. No.	Name of Unit	Number of Units
1	Shopping Malls	2
2	Function and Marriage Halls	1
3	Open Market and Small Shops Complex	2
4	Petrol Pumps	2
5	Police Station	1
6	Fire Station	1
7	Banks	2

2.2.3 Educational Buildings

The area and percentage adopted for educational purpose in this proposed township is 5.44% = 0.0330 km². Educational buildings are the buildings providing educational facilities like primary and secondary schools, colleges etc. There is two primary and secondary schools and one number of junior college.

2.2.4 Open Spaces and Recreational Centres

The area and percentage adopted for open places and recreational centers in this proposed township is 12.5% = 0.0909 km². All the residential apartments are provided with the small play grounds and swimming pools in their building premises. But concerning to the whole township, we have provision for ample numbers of gardens and open spaces in the city. There is one number of an open ground for playing for kids and a big sports complex.

2.2.5 Roads

The total area of roads in the township is $13.61\% = 0.0826 \text{ km}^2$. The road pattern adopted in the city is Grid Iron Pattern. It is most common and convenient pattern and adopted almost in all the cities. This pattern ensures urban transportation very good and rapid. Following is the road width hierarchy followed in the proposed township,

Table 2 Road Width Hierarchy in the City

Sr. No.	Particulars	Road Width (m)
1	Main Roads in the City	15
2	Subsidiary Roads Perpendicular to the Main Roads	12
3	Internal City Roads	9
4	Internal Society Roads	6

2.2.6 Self-Sustainability Aspects

The total area covered by self-sustainability aspects is $7.4\% = 0.0449 \text{ km}^2$

Table 3 Details of Basic Units in the city

Sr. No.	Particulars	Road Width (m)
1	Water Treatment Plant	1
2	Sewage Treatment Plant	1
3	Biogas Plant	2
4	Electricity Generation Plant	1 Substation
5	Solid Waste Management	Provision of Dumping Ground and Incineration

III. Results and Tables

The proposed township is studied with respect to the following aspects.

3.1 Computer Model

Concerning to the current study, AutoCAD software (version 2014) is used in the study for drawing and drafting of all the building units individually. The layout plan as well as detailed plan of the proposed township is drawn with the scale. Another plan showing the locations of various units in the township is also drawn. The township is drawn to the scale in the 3D view also in the AutoCAD. Figure 1 shows the Auto CAD drawing of the proposed study.

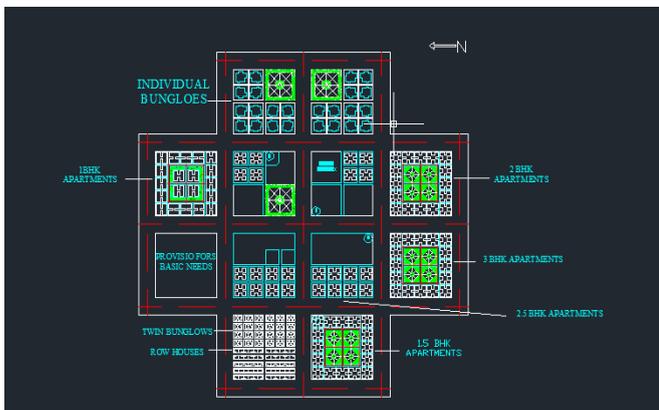


Figure 1 2D Plan of Township in Auto CAD

3.2 Physical Model

Physical modelling is one of the important and needy parts in the project. The model is made up of mainly plywood board of 1M x 1M size as a base material. Above the plywood sheet, drawing sheets are attached and the layout of the township is drawn on it. Using different colour codes as per the standards suggested by UDPFI various units have been coloured. Vertical extent of the model is not considered. Figure 2 shows the photograph of the model prepared.



Figure 2 Physical Model of Proposed Township

3.3 Approximate Cost Analysis

Approximate cost analyses of various building units in this study have been performed and the calculated cost of the proposed township project is presented herein table No 4.

Table 4 Approximate Cost Analysis

Sr. No.	Name of Unit	Approximate Cost (Rs)
1	1 BHK Apartment	238984680
2	1.5 BHK Apartment	165598456
3	2 BHK Apartment	165598456
4	2.5 BHK Apartment	187550352
5	3 BHK Apartment	187550352
6	Commercial Building: Mall and Shopping Complex	284813088
7	Educational Building: School Building	799801747
8	Recreational Building: Marriage Hall	24132000
9	Amenities: 1. Fire Station 2. Wi-Fi Connection	25187550 902100
10	Self-Sustainability Aspect: 1. Water Treatment Plant 2. Sewage Treatment Plant	3600000 3000000

3.4 Proposals

Some of the proposals which have been studied and necessary to implement in any new township project are as follows -

3.4.1 Environmental Proposal

- 1 Grey Water Management.
- 2 Afforestation and Landscaping on hill slopes.
- 3 Insulated Walls.
- 4 Green Roof, Green Paint, Green Cement as far as possible.
- 5 Solar Panels on every Residential Apartment and some of the commercial buildings.
- 6 Wind Turbine to develop wind energy.
- 7 Water Table Harvesting.
- 8 Solar Tree and Solar Street Lights.
- 9 Arboriculture.

3.4.2 Physical Proposals

- 1 The city is planned to the ideal "PLUS" shape as the land available is sufficiently beneficial for this shape.
- 2 All roads are planned according to the standard norms suggested by UDPFI in "GRID IRON PATTERN".
- 3 Sufficient wide footpaths and cycle tracks are provided along the main roads.
- 4 The entire residential complex is of 11 storied, constructed by adopting the FSI available at the site.
- 5 All the commercial buildings are either single or G+1 or G+2 storied.
- 6 Parking for all the residential and commercial buildings are provided in basements either in a single or double storey as per the requirement of that building.
- 7 Water distribution system is provided in the "GRID IRON PATTERN".
- 8 Drainage system is also in the "GRID IRON PATTERN".

3.4.3 Socio economic/social Proposals

- 1 Primary and Secondary School and a Junior College
- 2 Sports Complex having all sports facilities.
- 3 An Open Cricket Stadium
- 4 Temples and Recreational Centres having Playground for Children.
- 5 Couple of Shopping Malls with the Multiplex.
- 6 An Auditorium and a well maintained Marriage Hall.
- 7 Footpath and Covered Vegetable Market and Small Shops.

3.4.4 Proposals regarding the Services

- 1 Post Office
- 2 One Police Station and couple of Police Chowkis.
- 3 Fire Station.
- 4 Couple of Banks with ATM facility.
- 5 City Bus Stand and Taxi Stand.
- 6 24 x 7 Security to the city
- 7 Wi-Fi connectivity to some residential buildings

3.4.5 Proposals regarding Self Sustainability

- 1 A Water Treatment Plant in 20 acres of sufficient capacity having all the processes of water treatment starting from Aeration to Chlorination.
- 2 A well-equipped Sewage Treatment Plant in 10 acres of sufficient capacity to treat the household sewage systematically.
- 3 Provision of a Dumping Ground away for the Town for Solid Waste Management.

- 4 Provision of the Incineration for burning of the Solid Waste.
- 5 Provision for Biogas Plant in each residential society.
- 6 An Electricity Substation.

IV. Conclusions

The various aspects of the planning of a self sustainable town have been studied and some of the conclusions have stated.

1. The population our country is increasing tremendously, that to in urban areas and the load of human activities like increasing vehicles, increasing waste, increasing pollution etc. Therefore there is a need of reducing this load on cities; self sustainable townships may be one of the solutions.
2. There is a big problem of disposal of household waste, biomedical waste, industrial solid waste etc. in Pune as well as in many metropolitan cities in India. This problem may be solved on large scale by developing the self sustainable townships in such cities.
3. The policy of the new government in favour of FDI by which the cities like Pune becoming the smart cities in which there is development in intelligent transport system, development in renewable energy, development in various mechanical and IT industries etc. This leads to increase in the population of the city. To fulfill the demand of this population, the development of such townships are of great importance.
4. Energy is the integral part of the survival of the human being. Due to the ever increasing pollution, energy sources are getting depleted. Hence there is a demand for non-conventional energy sources which can be effectively implemented in the development of such artificial self sustainable townships.
5. Reuse of water is also effectively implemented by constructing water treatment plants. Public facilities like hospitals, schools and colleges, gardens, function halls, malls, sports complex etc. can be made available for the people living in township under one roof.
6. India's plans for urban development or her schemes for rural welfare, efforts toward exploitation of resources and industrialization to raise the standard of living of people. If the rewards of economic development are to be realized far greater attention must be given to the urban areas which are the center of the country's productive machine and economic progress.

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