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ABSTRACT

Given the acute housing shortage for the economically weaker and lower income segements in urban areas, there is a need to develop minimum standards that can be consistently used as a basis for providing housing for the economically weaker and lower income segments. This report attempts to develop minimum standards based on livability and adequacy criteria for housing for the economically weaker and lower income sections whether it is new construction or rehabilitation of existing dwelling units.

The motivation for this report is to:

- ATTEMPT TO DEVELOP various minimum broad sustainable criteria based on best practices for adequacy and livability of residential units that can be developed as minimum standards for housing for the economically weaker and lower income segments of the urban population

- EXPLORE whether the development standards can be consistently applied for developing housing projects based on the targeted size of the project and the targeted population that the projects are intended to serve

- PROVIDE a value added advantage with respect to livability, adequate services and amenities, community development, environmental preservation and growth management.

The objective of the housing projects for the economically weaker and lower income and sections should be not only to provide housing within the affordability limits of these income groups but also to provide housing that satisfies minimum adequate norms.

The methodology for developing minimum development standards in this report attempts to achieve this objective by providing minimum standards for adequacy and livability. Once adequate housing is defined, then housing programs can be developed for making this housing affordable to various income groups.

Using the methodology in this report, minimum development standards can be developed for future housing projects by researching appropriate adequate and livability data and standards. These standards can then be used as minimum standards that can be added to and adapted on a case by case basis for various housing options and as frameworks for future housing projects.

At present, the ground realities of providing housing and basic services to the poor remains a challenge with low utilization of the existing services by the lower income and economically weaker groups. This report attempts to develop minimum standards as a future and targeted scenario when the existing services and programs for the lower income and economically weaker sections are appropriately utilized.

CHAPTER 1 – INTRODUCTION

1.1 BACKGROUND

According to the 2011 Census, the population of India was approximately 1,210 million, out of which, approximately 377 million (approximately 31%) lived in urban areas. It is projected that by 2041, 50% of the total population will be living in urban areas (Ministry of Housing and Urban Poverty Alleviation, 2008).

The growing population in urban areas in the recent years has created problems of housing shortages and congested traffic. Provision of basic amenities like water, power and open spaces has become a challenge.

It is estimated that approximately 30 million additional houses will be required by 2020 for the growing urban population in India. Approximately 99% of the housing shortage is for housing the economically weaker segments and lower income groups of the urban population and only a small portion of the housing shortage (approximately 1%) is for housing the middle and higher income groups.

In India, private developers typically build houses for the higher-middle income groups and the Government provides housing for the economically weaker and lower income segments for welfare purposes. Several policies adopted by the Central and State Governments have delivered affordable housing for the economically weaker sections and lower income groups of the population. These housing policies specify critieria like income levels, minimum size and number of units, extent of susbsidies, list of basic amenities etc. (Jones Lang La Salle, 2012). These critieria differ from programme to programme and lack consistency with respect to the minimum requirements for income and development standards.

Given the acute housing shortage for the economically weaker and lower income segments and the problems of land shortage, congested transit and adequacy of basic amenities like water, power and open spaces, there is a need to develop minimum standards that will utilize the available resources effectively and that can be consistently used as a basis for providing housing for the economically weaker segments and lower income groups of the urban population.

The purpose of this report is to attempt to develop minimum development standards based on adequacy and livability for housing for the economically weaker segments and lower income segments.

1.2 MOTIVATION FOR THE REPORT

The motivation for this report is to:

- ATTEMPT TO DEVELOP various minimum broad sustainable criteria based on best practices for adequacy and livability of residential units that can be developed as minimum standards for housing for the economically weaker and lower income segments of the urban population

- EXPLORE whether the development standards can be consistently applied for developing housing projects based on the targeted size of the project and the targeted population that the projects are intended to serve

- PROVIDE a value added advantage with respect to livability, adequate services and amenities, community development, environmental preservation and growth management.

1.3 SCOPE OF THE REPORT

Various Government Housing Schemes and reports for the economically weaker segments and lower income groups of the urban population were analyzed for this report. Site visits to two housing projects in Bangalore, Karnataka for the economically weaker segments and lower income groups were conducted. Best practices for sustainable standards were analyzed.

This report will only analyze the development standards and will not analyze any of the other criteria of the housing schemes reviewed for this report.

This report will not analyze or review the following:

- construction techniques and practices for these housing projects
- the income criteria, the eligibility criteria, the land availability, the cost of land, the cost of construction, loan eligibility and subsidies for these housing projects
- the definition of various income groups

1.4 METHODOLOGY

The following methodology will be followed for this report:

- Analysis of current affordable housing policies and byelaws
- Analysis of development standards for the housing
- Review of best practices for minimum standards
- Development of sustainable development standards for livability, adequate services and amenities, community development, environmental preservation and growth management.

1.5 BENEFECIARIES OF THE REPORT

The beneficiaries of the Report will be:

- Urban Population
- Agencies providing housing for the economically weaker segments
- Research Institutions and other Government agencies

CHAPTER 2 – HOUSING IN INDIA

2.1 HOUSING IN INDIA

Housing in India is diverse due to the social, economic and cultural diversity of its population and diverse climatic conditions across India. One of the urbanization challenges in India has been the wide disparities in housing between the affluent, middle-income and low-income segments of the population.

Most of the economically weaker segments of the urban population in India live in slums. A "slum" is typically a heavily populated urban area with substandard housing. They could be vast informal settlements with buildings varying from simple shacks to well-maintained structures. Often, they lack basic services. They are becoming the most visible manifestation of urban poverty in India and the developing world cities. (UN-Habitat, 2007).

Approximately 24% of the total population in Indian cities (million + population) lives in the slums. 10% of the total population in Bangalore, Karnataka, lives in slums and 54% of the total population in Greater Mumbai lives in slums (Source: Census India 2001)

2.2 HOUSING PROGRAMS FOR THE ECONOMICALLY WEAKER AND LOWER INCOME SEGMENTS

The National and State governments are running programs, some funded by the World Bank, to improve the housing conditions for the economically weaker and lower income segments of the urban population. Some private sector builders have started building housing for these segments. The main goal of all these programs is to provide affordable housing for all and livelihood, shelter and basic services to the economically weaker and lower income segments of the urban population.

Challenges of Providing Housing Programs

Most of the housing programs include an inclusive approach to providing housing and basic services for the lower income and economically weaker sections. Due to the various problems faced by these groups, there is low utilization of existing services and programs available for these groups.

Often there are delays in project implementation and delays in rehabilitating the existing population and convincing the existing population to shift to the new housing. Often, the beneficiaries preferred to rent out the units they were allotted. The allotment of the units depends on the ability to access entitlements from the government. Often, the allotments are not equitable.

To further build on previous initiatives, Rajiv Awas Yojana (RAY) was announced. RAY aims at creating slum-free cities and under RAY, central assistance is extended to states that are willing to meet certain conditions. Some of these conditions include assigning property rights to slum dwellers, reserving land for economically weaker sections and lower income groups and earmarking 25% of municipal budget for basic services to the urban poor/slum dwellers, and bringing in legislative amendments and policy changes to redress land and affordable housing shortages for the urban poor. (Pani, Iyer, 2013).

Current Affordable Housing Programs – A Snapshot

A number of housing policies for the economically weaker and lower income segments and local byelaws for various townships were reviewed for criteria and requirements for housing for the economically weaker and lower income segments. A summary of the criteria is included in Appendix I.

The policies and byelaws specify the following for these housing developments:

- minimum plot area and width
- minimum carpet area or floor area
- minimum cost per square foot or per unit
- minimum amount of subsidy for each unit
- income criteria for various types of units
- percentage of land or FAR to be reserved for these housing developments
- maximum density and maximum size of the housing development
- amenities and facilities like water supply, sewage facilities etc. as upgrading elements

The requirements and criteria are varied and differ from policy to policy and state to state. There are no consistent eligibility criteria or requirements for these housing developments. The minimum floor areas and the minimum size of a unit vary from policy to policy.

Current Affordable Housing Programs – Income Levels

The various income segments of the population are classified according to their income levels as follows:

EWS (Economically Weaker Section) – The maximum income or income ceiling for the 'Economically Weaker Section' category is Rs.5,000 per month

LIG (Lower Income Group) - The maximum income or income ceiling for the 'Lower Income Group' category is Rs.7,300 per month

MIG (Middle Income Group) - The maximum income or income ceiling for the 'Middle Income Group' category is Rs.14,500 per month

HIG (Higher Income Group) - The minimum income or income ceiling for the 'Middle Income Group' category is above Rs.14,500 per month

(Jones Lang La Salle, 2012).

Most National and Local housing programs for the economically weaker and lower income segments of the population are for the EWS and LIG categories. The EWS and LIG categories are helpful to determine the eligibility for various housing programs, the eligibility for the appropriate housing subsidies and the eligibility for housing loans.

There is also a category of population that is below poverty line (BPL). BPL is an economic benchmark and poverty threshold used by the Government of India to indicate economic disadvantage and to identify individuals and households in need of government assistance and aid. It is determined using various parameters which vary from state to state and within states (Source: Wikipedia and Moyna, 2011)

Current Affordable Housing Programs – Minimum Sizes of Dwelling Units

The National Building Code recommends the following minimum sizes of a habitable EWS/LIG dwelling unit (du):

EWS (Economically Weaker Section) – 21 to 27 square meters carpet area

LIG (Lower Income Group) – 28 to 40 square meters carpet area

Carpet Area is defined as the **a**rea between the walls.

Built-up Area is defined as the Carpet Area + area occupied by walls, doors of the unit.

Superbuiltup Area is defined as Carpet area + terrace + balconies + areas occupied by walls + area occupied by common/shared construction (e.g. lift, stairs, club house, etc.). Generally builders use loading factor on carpet area to arrive at superbuiltup area.

Saleable Area is generally superbuiltup area

Gross Floor Area (GFA) is a real estate term referring to the total floor area inside the building envelope, including the external walls, and excluding the roof.

(Source: http://nripro.com/dp/area_calculations_carpet_superbuiltup_saleable)

Current Affordable Housing Programs - Summary

The typical affordable housing projects in Indian metropolitan cities include the following (Jones Lang La Salle, 2012):

Location: 25-30 kilometers from the center of the city

Project Size: 1,500 to 3,000 units

Dwelling Density: 80 to 100 units per acre

Land Area: 15 to 35 acres

Composition: mostly 1 Room (one room units) and some 1 BHK (one bedroom units) and 2 BHK (two bedroom units)

Unit Size: 1 Room – 25 to 35 sq.mts and1 BHK 40 to 50 sq.mts

Sale Price: 1 Room – Rs. 5,00,000 to 7,00,000 and 1 BHK – Rs. 7,00,00 to 10,00,000

Structure: Ground or stilt + 3 (walk up multistory buildings without lifts)

Current Affordable Housing Programs - Examples

A site analysis was conducted for two housing projects near Bangalore, Karantaka by Karnataka Housing Board and Bangalore Development Authority. The details about the projects and site analysis are included in Appendix II.

A summary of the two affordable housing projects are as follows:

Level & range	Carpet Area	Built Area	No. of Units	Price	Income level	Distance from center of the city
Minimum	328 sq ft	470 sq ft	96	2,40,000	Rs. 1,00,000 per annum for EWS for 1 BHK only	10 kms
Maximum	900 sq ft	1100 sq ft	1520	27,00,000		40 kms
Average	600 sq ft	800 sq ft	386	14,00,000		20 kms

Figure 1. Summary of two affordable housing projects near Bangalore, Karnataka

The nearest affordable housing project by the Bangalore Development Authority (BDA) in Bangalore is approximately 12 kilometers from the City Center (Source: BDA, Bangalore).

Figure 2. Distance of affordable housing projects from the City Center for Bangalore, Karnataka

Figure 3. Affordable Housing Programs in Karnataka

CHAPTER 3 - EWS/LIG HOUSING DEVELOPMENT STANDARDS

3.1 CURRENT DEVELOPMENT STANDARDS FOR EWS/LIG HOUSING

The minimum current development standards based on various municipal byelaws, housing regulations, schemes and policies analyzed in Appendix I are as follows. All the regulations, byelaws and policies do not include all the criteria listed below. Only some criteria are included in each byelaw, regulation or policy:

Location: less than 20 kilometers

Project Size: None specified

Dwelling Density: 250 units per hectare = 100 units per acre

Land Area: No Minimum specified

Total land area to be reserved for EWS/LIG units is recommended as follows:

- a percentage of the total area for residential uses
- a percentage of the entire area for a township/development including and excluding roads
- a percentage of the total number of units proposed
- a percentage of the total FAR proposed

Composition: specifies that the units to be built for EWS units only or a combination of EWS/LIG units; There are no specific requirements whether the units should be one room or 1 BHK or 2 BHK units.

Plot Size: Minimum 20 square meters. No specific information is provided whether the area specified is for carpet area, built up area, superbuilt up area or saleable area

Frontage: Minimum 3 meters

Unit Size: Minimum 12.5 square meters. No specific information is provided whether the area specified is for carpet area, built up area, superbuilt up area or saleable area

Unit Width: Minimum 2.5 meters

Unit Type: No specific information regarding whether the units should be one room, one – bedroom or two bedroom units.

Height: Minimum 2.6 meters at the roof and 2 meters at the eaves

Internal Volume: 2,250 cubic feet = 63.7 cubic meters

Road Width: Minimum 7.5 meters

Room Sizes:

Single Habitable Room – 12.5 square meters,

Two Rooms – Main Habitable Room – 9 square meters, Second Room – 6.5 square meters

Combined bathroom and WC – 2.8 square meters

Bath – 1.8 square meters,

WC – 0.9 square meters

Sale Price: Rs 750/square feet or Rs. 7500/ square meter

Unit Sale Price: Rs.100,000 per unit

Density – 100 units per acre

Structure: None specified

3.2 ANALYSIS OF THE CURRENT DEVELOPMENT STANDARDS

The minimum current requirements are varied and lack consistency. The minimum requirements are based on affordability and cost issues and not sustainability and habitable issues. Given the limitations of ATP (Affordability to Pay) of lower income groups, housing options for these groups are decided in terms of whatever cost is affordable. Out of all the housing characteristics like location, tenure, size, infrastructure etc, compromise is made mainly on the location and size of the units (Wadhwa, 2009).

There is no justification for the minimum standards. Although the National Building Code standards are used as a reference, they are not consistently followed. Consistent and uniform implementation of the development standards to provide affordable housing becomes difficult with lack of consistency in minimum development standards.

CHAPTER 4 –FLEXIBLE & SUSTAINABLE DEVELOPMENT STANDARDS

4.1 RATIONALE FOR FLEXIBLE AND SUSTAINABLE DEVELOPMENT STANDARDS

The objective of a Housing policy should be to not only provide affordable housing but to provide housing which satisfies minimum adequate norms (Wadhwa, 2009). This objective cannot be achieved with lack of consistency regarding minimum and adequate norms.

Therefore, there is a need to establish minimum and adequate development standards for housing for the economically weaker and lower income segments. The proposed minimum development standards must be based on livability, adequate services, sanitation and health requirements, and adequate amenities for overall health. They must provide a value added advantage with respect to community development, environmental preservation, growth management and sustainability. Minimum and maximum density requirements must be developed.

The proposed development standards must be flexible enough to be added to and adapted on a case by case basis for various sizes of housing developments and population targets. These flexible standards must provide a framework for future housing projects that can be consistently applied for various housing programs for the economically weaker and lower income segments to develop appropriate pricing for the housing, income level targets for eligibility, various housing subsidies etc. These minimum standards must be applicable to both rehabilation/redevelopment projects and new construction.

Best practices for the following must be followed:
- the size, livability and sufficiency of the proposed units
- adequate light, ventilation and air circulation for the proposed units
- adequate services for health, hygiene and sanitation
- adequate amenities and facilities for overall health and development
- community development, sustainable environment
- environmental preservation, growth management
- appropriate housing densities

At present, the ground realities of providing housing and basic services to the poor remain a challenge with low utilization of the existing services by the lower income and economically weaker groups. The above minimum standards must be developed as a future and targeted scenario when the existing services and programs for the lower income and economically weaker sections are appropriately utilized.

4.2 FLEXIBLE AND SUSTAINABLE DEVELOPMENT STANDARDS

The criteria and best practices for developing these minimum development standards for housing for the economically weaker and lower income groups are included in Appendix III.

For the Size, Livability and Sufficiency of the Proposed Units

These standards were developed using criteria for the minimum size of a room so that it is habitable, livable and sufficient. A habitable room with a cooking area was explored as a minimum requirement and accordingly a minimum size for a dwelling unit with one room and minimum sizes for dwelling units with more than one room were developed.

Standards for a multifamily residential building were developed based on how many units per floor can be supported by one staircase, whether providing a lift is an economical option for housing for the economically weaker and lower income groups, the maximum number of floors for a building without a lift etc. Occupancy standards were developed based on healthy and adequate living environment requirements.

Minimum Requirement for Housing

The minimum requirements for housing shall include at least a habitable room with a cooking area and a provision for common and shared bathroom and toilet facilities.

Minimum Sized Dwelling Unit

The minimum size of a dwelling unit shall include a habitable room with a cooking area and a bathroom with either a combined bathroom or a separate bathroom and toilet.

Dwelling Unit with More than One Room

The minimum area of a dwelling unit with more than one room shall include one habitable room, either a combined bathroom or separate bathroom and toilet facilities and one or more additional rooms and a kitchen. The minimum area for each additional room and a separate kitchen shall be used.

Plot

Since land shortage and the high cost of land are major issues in urban areas, housing with individual plots and row housing is not considered for the development standards in this report. It is most economical to provide multistory buildings for housing for the low income and economically weaker sections. Plots and row housing may be provided for housing for the low income and economically weaker sections in areas where land is less expensive and available like rural areas or outside the limits of the urban areas.

Residential Building Type for Urban Areas

Given the scarce availability of land in urban areas, high density development for housing for the economically weaker and lower income sections is the most economical option to reduce the housing shortage for these income levels. Studies have shown that high density housing have the following advantages:

enhances a community's character

increases affordable housing

spurs economic development

reduces costs

reduces vehicle travel and pollution

preserves agricultural land and open space.

(Source: scanph, 2004)

Standards for a multifamily residential building were developed based on how many units per floor can be supported by one staircase, whether providing a lift is an economical option for housing for the economically weaker and lower income groups, the maximum number of floors for a building without a lift etc. Occupancy standards were developed based on healthy and adequate living environment requirements.

Multifamily Residential Building

A building without a lift is most economical because the costs of providing a lift are eliminated. A lift is not required for a building with ground + 3 floors or stilt+ 3 floors. Therefore, criteria for a multistory building with either ground+3 floors or a stilt+3 floors and a maximum floor area per floor and the maximum number of units per floor that can be served by a single staircase shall be used as a minimum requirement for a housing development for the economically weaker and lower income sections.

Occupancy

Since the minimum size of a dwelling unit is a single habitable room, the maximum number of persons per household was established for a single habitable room and a maximum number of persons per household were established for larger units to prevent overcrowding.

A multistory building meeting the maximum number of units per floor with the above occupancy requirements shall be considered as a minimum requirement for a housing development. The ground floor and the lower floors of the multifamily residential buildings can be used for housing for the senior citizens, elderly and the handicapped so that accessible units can be provided without the provision of a lift.

Summary

This minimum sized dwelling unit will be adequate for livability and can be used as a minimum standard to determine housing size. Based on the affordability criteria the following can be developed:

- the size of the dwelling units can be increased to include additional rooms and amenities
- various housing programs with options according to affordability
- extent of subsidies

For Adequate Day Light, Ventilation, Air Circulation and Accessibility for the Proposed Units

These standards were developed using criteria for the minimum opening size (usually a percentage of the area of the room) for adequate day lighting, ventilation and air circulation. Based on these, the minimum window and door sizes were developed for a minimum sized dwelling unit. Minimum window and opening requirements were developed for staircases and building entrances for multifamily residential buildings and minimum building entrance

ramp and landing requirements were developed for adequate accessibility. Criteria for adequate unobstructed open space around the buildings were explored to develop minimum setbacks around a multifamily residential building. The adequate unobstructed open space is required to ensure adequate day light, ventilation and air circulation through the openings in a building. The minimum setbacks are also based on the height of a multistory residential building to ensure adequate day light, ventilation and air circulation through the openings in a building for all the floors especially the lower floors. As the height of the building increases, additional setbacks are required.

For adequate day lighting, ventilation and air circulation for multistory residential buildings, minimum area for doors and windows for a unit, a minimum window area for the staircase and minimum entrance requirements for accessibility shall be provided.

For Adequate Services for Health, Hygiene and Sanitation

These standards were developed using criteria for the minimum requirements for adequate water supply, water conservation, waste water disposal, sewage disposal and solid waste disposal to ensure adequate services for health, hygiene and sanitation. The minimum standards are based on adequate standards for a multistory residential building. Criteria for energy requirements for lighting and ventilation and criteria for energy conservation and green buildings were used to develop minimum energy requirements for a multistory residential building.

Plumbing, Water Supply, Water Conservation

A multistory residential building shall have minimum plumbing and sanitary facilities based on occupancy, water required by the population generated by the building and the sewage, waste water and solid waste generated by the population in the building. All plumbing facilities shall be connected to a public or private water supply system and all sanitary facilities shall be connected to a public sewage system or other alternative systems. Appropriate sanitary and stormwater drains shall be provided.

The following minimum standards shall be considered for developing standards for plumbing, water supply and water conservation:

- a minimum clean water consumption requirement per person per day
- A minimum waste water reuse and recycled water requirement per person per day for other purposes like flushing and gardening
- Dual piping systems to handle the minimum consumption requirements
- Appropriate water storage facilities
- Appropriate water reuse infrastructure
- Adequate plumbing and disposal fixtures

Disposal of polluted and unpolluted water

These standards were developed using criteria for appropriate dual drainage systems for polluted and non-polluted water based on the amount of waste water generated by a multifamily residential building. Accordingly, adequate dual piping systems shall be provided for the waste water generated by the number of units in a multifamily residential building.

Sewage Disposal

These standards were developed using criteria for an appropriate sewage disposal system for disposing the sewage generated by the number of units in a multifamily residential building when not connected to a public sewage system. Accordingly, adequate sewage disposal systems on site shall be provided for the sewage generated by the number of units in a multifamily residential building.

Solid Waste Disposal/Management

These standards were developed using criteria for appropriate solid waste disposal facilities on site for disposing the solid waste generated per day per person for the total number of persons in a multistory building. Accordingly, adequate solid waste disposal systems on site shall be provided for the solid waste generated by the number of units in a multifamily residential building.

Energy Conservation, Green Buildings

These standards were developed based on criteria for energy conservation strategies so that at least a percentage of the power requirements are from renewable energy sources and at least a percentage of the renewable energy requirement are from solar renewable energy. In addition, energy saving fixtures and materials shall be encouraged to reduce the need for energy. To the extent feasible, the proposed housing shall try to comply with the various criteria and try to meet the minimum green building rating system. Accordingly, adequate energy conservation strategies shall be developed based on the energy requirements of the number of units in a multifamily residential building.

Open Space, Roads, Street Lighting

These standards were developed based on criteria for a minimum percentage of the plot area that can be used as open space or green space in addition to the proposed setbacks. The open space can be used for providing the required green spaces and/or can be used as a recreational amenity. The standards for roads were developed based on criteria for vehicular and pedestrian access roads to multifamily residential buildings. Criteria for street lighting are based on illumination and safety requirements for night lighting for public areas. Energy conservation methods for street lighting including solar powered lighting were also developed. Accordingly, adequate areas for open spaces and roads shall be developed for a plot with a multifamily residential building. Appropriate street lighting with energy conservation requirements shall be developed.

For Appropriate Housing Densities

For the Minimum Size of a Housing Development

Based on the above analysis, the minimum size of a housing development shall include at least a single multifamily residential unit. Therefore, the minimum size of a housing development shall be a plot that can accommodate a multistory residential building. These standards for the area of a housing development shall be developed based on the building area, setbacks, heights, amount of open space and amount of road area required. Ground coverage, FAR, minimum and maximum density shall be calculated based on these requirements.

For the Minimum Size of a Housing Layout

If larger areas are available for providing housing for the economically weaker and lower income sections, facilities for community development, environmental preservation and sustainable development can be provided. Provisions for facilities like schools, shopping centers, clinics, bus stops, transit facilities etc. can be made.
Based on the above, a minimum population of 5,000 is required for providing schools, clinics etc. Therefore, a minimum population of 5,000 shall be considered for providing schools, clinics, shopping centers etc. The standards for the area of a housing layout shall be developed based on the number of multifamily residential developments, amount of open space, amount of road area and amenities required for a population of 5,000. Minimum and maximum density shall be calculated based on these requirements.

For Adequate Amenities and Facilities for Overall Health and Development for a Housing Layout

An amenity includes roads, streets, open spaces, parks, recreational grounds, play grounds, gardens, utilities, services and conveniences. Good quality, well managed, accessible and well-designed green spaces for active and passive recreation are amenities with sustainable benefits that contribute to the overall health and development of a community. Roads with adequate night lighting provide safety to the residents.

Open Space

Open space standards based on the minimum amount of open space required per person and the population generated by the housing layout and/or a percentage of the plot that would be adequate as open space were analyzed. The open space can be used for providing the required green spaces and/or can be used as a recreational amenity. Accordingly, adequate areas for open spaces shall be developed for a housing layout.

Roads

A housing layout for the economically weaker and lower income sections must be able to accommodate large vehicles like public transit vehicles, trucks for moving, loading and unloading and emergency vehicles and pedestrian space for access and walkability.

These standards were developed based on minimum road widths that will be able to accommodate the above and the maximum percentage of the area of the development that can be used for the roads. The standards for roads were also developed based on criteria for vehicular and pedestrian access roads to multifamily residential buildings. Accordingly, adequate areas for roads shall be developed for a housing layout.

Street Lighting

Criteria for street lighting are based on illumination and safety requirements for night lighting for public areas and roads. Energy conservation methods for street lighting including solar powered lighting were also developed. Accordingly, adequate and appropriate street lighting with energy conservation requirements shall be developed for a housing layout.

For Community Development and Sustainable Development for a Housing Layout

Adequate spaces for community gathering and recreation contribute to the overall health and development of a community. The proposed open spaces can be used as a multipurpose space for community gathering and recreation when separate spaces for community development cannot be provided. If multistory buildings on stilts are proposed, the stilt area can be utilized for parking and community spaces.

Community Amenities

These standards were developed based on the minimum amenities like clinic, schools, shopping etc. required for the population generated by the development. When existing community amenities are not available within the vicinity of a development, adequate community amenities shall be developed for a. housing layout.

Transportation

Encouraging access to safe and reliable public transportation discourages dependence on private vehicles and promotes sustainability. These standards for transportation were developed based on the walking distance to a transit facility. Accordingly, accessibility to transit shall be developed for a housing layout.

For Environmental Preservation and Growth Management for a Housing Layout

Tree Preservation

Sustainability strategies like tree planting, tree preservation, use of native landscaping materials, use of low water requiring plants etc. shall be used for environmental preservation. Existing natural features shall be preserved to the extent feasible. Tree preservation criteria were developed based on these standards. Accordingly, tree preservation and tree planting criteria shall be developed for a housing layout.

Housing Developments and Housing Layout Location

Growth management can be achieved by developing a maximum population density and proposing the required facilities and amenities for the target population. This way compact developments served by public transportation can be developed to avoid sprawl.

The housing developments and housing layouts shall be strategically located along with market rate housing developments whenever feasible. These standards were based on an appropriate percentage of land in market rate housing developments that can be allocated for housing for economically weaker and lower income sections so that the common infrastructure facilities like public transportation etc. can be accessible to all income groups. Underutilized and vacant sites within the urban areas can also be used for these housing developments. Accordingly, criteria for locating these housing developments and layouts shall be developed based on the land available at such suitable locations.

4.3 SUMMARY OF FLEXIBLE AND SUSTAINABLE DEVELOPMENT STANDARDS

The criteria and best practices for developing these minimum development standards for housing for the economically weaker and lower income sections are included in Appendix III.

For the Size, Livability and Sufficiency of the Proposed Units

Residential Rooms	
Habitable Room	11 square meters
Second Habitable Room	6.5 square meters
Minimum Room Width	2.1 meters
Minimum Room Height	2.3 meters
Cooking area	2.4 square meters; width-1.2 meters
Kitchen	3.3 square meters; width – 1.5 meters
Accessible Bathroom Combined	2.8 square meters
Accessible Bathroom Separate	1.4 square meters each for bathroom and WC
Regular Bathroom Combined	1.8 square meters
Regular Bathroom Separate	1.2 square meters – bathroom; 0.9 square meters WC
Residential Unit, Multifamily Residential Building and Plot	
Minimum Unit Size (Habitable Room + Toilet)	13.1 square meters
Multifamily Development Plot	264 to 594 square meters
Each Floor Square Footage	200 to 500 square meters
Each Floor Number of Units	Maximum 12
Number of stories	Ground + 3 or stilt + 3
Number of units	36 to 48
Number of Staircases	One
Occupancy	4 to 6 persons per unit

For Adequate Day Light, Ventilation and Air Circulation for the Proposed Units and a Multifamily Residential Building and Plot

Doors	1.52 square meters
Windows	1.05 square meters
Setbacks - Multifamily Residential Unit	All sides – 1 meter
Staircase	Width - 1 meter; headroom – 2.1 meters; height between landings – 1.75 meters; Window – 1.5 square meters
Entrance	Ramp width - 1.8 meters; maximum gradient - 1:12; maximum length - 9 meters; Entrance landing - 1.8 meters x 2 meters; Access road width - 3.5 meters

For Adequate Services for Health, Hygiene and Sanitation for the Proposed Units and a Multifamily Residential Building and Plot

Plumbing	Minimum fixtures for cooking area, bathroom, WC
Water Supply	Dual piping for clean water and waste water reuse
Water Conservation	Low capacity fixtures, water harvesting, water recycling
Disposal of Polluted & Unpolluted Water	Separate drains for polluted and non-polluted water
Sewage Disposal	Appropriate facility for 36 to 48 units
Solid waste disposal & management	Appropriate facility for 115 to 239 kgs of waste per day
Energy Conservation	20% from renewable energy; 5% of the 20% from solar
Green Buildings	Appropriate certification level to the extent feasible

For Adequate Amenities and Facilities for Overall Health and Development for the a Multifamily Residential Building and Plot

Open Space	15% of plot area for a development; 1 sq.ft. per person in a layout
Roads	10% of plot area for a development; 20% of plot area for a layout
Street Lighting	As appropriate with solar and other energy conservation methods

For Appropriate Housing Densities

Housing Development consisting of a multifamily residential building and plot	
Plot Area	330 to 742 square meters
FAR	2.4 to 2.7
Ground Coverage	60% to 67%
Roads	Maximum 10% of plot area
Open Space	Minimum 15% of plot area
Density	196 units/acre to 588 units/acre
Number of Units	36 to 48

Housing Layout for a population of 5,000	
Target Population	5,000
Roads	Maximum 20% of plot area
Open Space	1 square meter per person, 5,000 sq.ft.
For Residential Development	2.78 to 6.23 acres
Schools, Clinic, Shopping	5,000 square meters
Total Plot Area	6.28 acres to 10.44 acres
Minimum Density	119 units/acre
Maximum Density	259 units/acre

For Community Development and Sustainable Development for a Multifamily Residential Layout

Community Amenities	population 5,000 - 10,000 square meter area school including a playground and clinic 1,000 square meters Appropriate telecommunication facilities and shopping facilities
Transportation	Bus stop, transit within 500 meter radius of development

For Environmental Preservation and Growth Management for a Multifamily Residential Development and Layout

Tree Preservation	Tree planting, preservation, native species, low water
Housing Developments Location	Along with market rate units close to infrastructure

Table 4. Development Standards Table

CHAPTER 5 – CONCLUSIONS AND NEXT STEPS

5.1 CONCLUSIONS

The above standards are an attempt to develop minimum standards based on livability and adequacy criteria.. By developing minimum standards for a unit based on adequacy and livability and not based on affordability or the extent of subsidy available, a minimum standard for a livable unit can be established. This way, the livability of a unit is not reduced due to affordability issues.

Based on the unit size, minimum and maximum occupancy limits can be established for adequacy of living space and avoiding overcrowding. Service and sanitary requirements can be developed based on occupancy and health requirements.

The number of units in a multifamily residential building, the type of residential building, the total number of floors etc. can be based on land availability and costs, the requirement for lifts and staircases, the requirements for adequate setbacks for light, air and ventilation and the requirements for energy and water conservation.

Minimum standards for a multifamily residential development consisting of a single residential building and minimum standards for a multifamily residential layout consisting of several multifamily residential buildings can be developed.

Minimum and maximum density requirements can be developed based on the target population, land availability and the extent of amenities required and provided.

Adequate amenities based on the population generated can be provided.

Since the proposed minimum standards are based on livability, adequate services, sanitation and health requirements and adequate amenities for overall health, they provide a value added advantage with respect to community development, environmental preservation, sustainability and growth management.

The proposed standards can be used as minimum standards that can be added to and adapted on a case by case basis for various housing options.

The objective of the housing projects for the lower income and economically weaker sections should be not only to provide housing within the affordability limits of these income groups but also to provide housing that satisfies minimum adequate norms.

The above methodology for developing minimum development standards attempts to achieve this objective by providing minimum standards for adequacy and livability. Once adequate housing is defined, then housing programs can be developed for making this housing affordable to various income groups.

Using the above methodology, minimum development standards can be developed for future housing projects by researching appropriate adequate and livability data and standards. The development standards can then be made flexible enough to be adapted for housing projects based on:

- the size of the development,
- the proposed population target
- development standards for amenities, services and sustainability

These flexible standards can provide a framework for future housing projects that can be consistently applied for various housing programs for the economically weaker and lower income groups to develop various housing subsidies, income level targets for eligibility and appropriate pricing for the housing.

Since the unit sizes for housing for lower income and economically weaker sections are fairly small, an efficiently designed high density project with low to mid rise multifamily dwellings and with adequate and appropriate amenities can reduce the cost of these houses by sharing amenities, preserving open spaces and achieving growth management. Using the above methodology, frameworks for such high density housing projects in urban areas can be developed.

5.2 NEXT STEPS

The ultimate goal of a housing program should be to provide a superior package of housing than what they have at present (Wadhwa, 2009). At present, the ground realities of providing housing and basic services to the poor remain a challenge with low utilization of the existing services by the lower income and economically weaker groups. The above minimum standards must be developed as a future and targeted scenario when the existing services and housing programs for the lower income and economically weaker sections are appropriately utilized. Ongoing efforts must be made to improve access and utilization of the housing programs and services by these sections of the population.

Efficiently designed high density housing projects with low to mid rise multifamily dwellings and with adequate and appropriate amenities should be developed as a target for providing housing for the economically weaker and low income groups to reduce costs in urban areas and fulfill the high demand for housing for these groups of population.

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APPENDIX