STUDY ON COMPREHENSIVE REHABILITATION STRATEGIES FOR THE URBAN POOR IN PUNE CITY

FINAL REPORT
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 PUNE, INDIA

Acknowledgements

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Introduction

Shelter Associates (SA) has undertaken a study, to work out a comprehensive strategy for housing the urban poor of Pune city, in the light of the Slum Rehabilitation Authority (SRA) and Jawaharlal Nehru National Urban Renewal Mission (JNNURM). The study is based on actual data and mapping information gathered and integrated on GIS by SA in the year 2000 for over two hundred Pune settlements, and PMC data available for slums not covered by the survey. This provides a look at almost 70% of the city's poor.

a. Project Background

Due to Pune's steady population growth, it is estimated that as of 2006, almost 42% of the city's population (approximately 2 lakh households) lives in degraded areas, comprised of 564 slum pockets (Environmental Status Report 2006). In an effort to mitigate the increasing housing gap, the Slum Rehabilitation Authority (SRA) was formally instituted in 2005 in the city of Pune (similar to the Mumbai SRA) by the Government of Maharashtra to address issues of slum housing, especially those located on private land.

In December 2005, the Government of India introduced the JNNURM programme with special emphasis on strengthening infrastructure and housing for the urban poor. As recipient of funding under the JNNURM (BSUP), Pune (Urban Local Body) has identified 40,000 households located in slums on marginal or no-development zones for relocation. This comprises approximately 20% of the total slum households in the city (Pune City Development Plan). The city has applied for NURM funding under the BSUP program to relocate these families and has been the largest beneficiary of this program so far. The plans already cleared in Pune and Pimpri Chinchwad total at just over Rs.640 crore.[1]

While NURM is expected to provide funding for the relocation of 20% of the poor, the city is yet to chalk out a clear policy for slums located on government and private land. It is depending on the SRA for the in-situ rehabilitation of the poor on private and government land, (CDP), by building in incentives for private developers and builders to participate.

In order to offer a viable menu of options for the poor, it would be necessary to understand the implications of the current government initiatives to address this issue. The SRA and JNNURM are considered to be the key programmes under which the city hopes to mitigate the increasing housing gap. Coincidentally both these were launched in December 2005: the SRA as part of the State initiative to rehabilitate the poor, and the JNNURM by the Central Government to strengthen urban infrastructure in cities with special emphasis on housing and basic services for the poor.

It would be imperative to study the SRA rules in some detail to gauge its citywide impact. The future conditions for increasing rapid development in Pune is a particularly important issue to address, especially in light of the potential mobility of

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[1] http://www.jnnurm.nic.in , DPR's, April 21, 2007.

vast resources that the JNNURM has made available. Since the JNNURM inception, in December of 2005, Pune City is a significant current and future applicant.

b. Aims & Objectives

This study will attempt to apply the SRA guidelines to a few selected Pune slums to understand how it impacts development locally. Then the same principles will be applied on a larger scale to gauge its effect on the city. After understanding this, an attempt will be made to draw up a comprehensive strategy for re-housing the poor based on their location and land ownership.

Shelter Associates has prepared this report, as a way of presenting the SRA system of slum rehabilitation in a manner that is understandable to everyone. It is necessary that the general public have access to the basic workings of Slum Rehabilitation Schemes and the concept of Transferable Development Rights (TDR) in order that ordinary citizens are informed, and so that transparency in these schemes will become the norm.

In order to best apply JNNURM objectives to existing Pune mechanisms for handling slum rehabilitation, it is important to classify slums to come to an integrative strategy for Pune city development. SA aims to do this on the basis of slum location, land ownership, etc. to gauge how many slums either SRA or JNNURM programmes can address. From this information, an attempt will be made to draw up guidelines, which will offer a menu of options to the stakeholders.

Through this presentation, it is hoped that this study will aid input on how to successfully apply national funding schemes (JNNURM) at the local level. The case of Pune may serve as model for trouble-shooting during the application of the JNNURM at the city level.

c. Approach

The SRA schemes implemented in Pune (under Appendix T) have been very few and provide little empirical knowledge at an implementation level. So it is imperative to look to historical and practical lessons from the development of the SRA in Mumbai. In this way, Pune may draw upon positive characteristics of the approval and planning stages. It is also necessary to achieve a basic understanding of the way Slum Rehabilitation Schemes are intended to work, despite the various ambiguities in the Pune SRA Rules and Regulations.

Only then can the SRA become accessible to the layman, and transparency on the part of the Urban Local Bodies (PMC/PCMC) achieved. Transparency (toward ULB efficacy), integrative development, and a participatory approach are all driving factors of the JNNURM. As highlighted in this study, the founders of the national mission clearly envision a national development based on a strengthening of urban infrastructure that is linked to government reform.

Shelter Data Analysis and Design. Shelter's basic approach for this report has been to analyze their existing data for the purpose of policy recommendations about comprehensive Pune housing strategy. SA has firstly made this analysis from a technical perspective: by creating specific slum redevelopment designs of specific

slums based on its own data, thus working on the microcosmic level of planning. Secondly, Shelter has tried to project from the very specific implications of these designs, as well as from SRA and JNNURM principles, to what a comprehensive/holistic approach to slum renewal in Pune could look like. This may be seen as a macrocosmic approach.

Tools for Pune Slum Rehabilitation a Citywide Basis. Shelter Associates has access to survey data on 211 Pune slum pockets, which together with the information from the PMC, covers sufficient information to feed into slum redevelopment for more than 60% of the city. SA will draw on this data to do analysis and design. Cost calculations at the slum, zone, and city level will also be made in relation to a SRA slum rehabilitation scheme. Alternatives that draw upon JNNURM funding will be presented.

After a very specific approach to calculating the impact of TDR and creating designs, a telescopic view of Pune slum redevelopment will be taken. This requires projections about the most useful comprehensive approach for Pune, when factoring in issues of slum land ownership. The findings on these areas- socio-economic/mapping of the slums, SRA impact on slum, zone, and city level, redevelopment designs, and overview on total Pune slum lands- lead to policy options for citywide housing.

SA will take the following steps for the study:
1. Present socio-economic and mapping details pertaining to three selected Pune settlements.
2. Create designs for those three slums that compare a likely SRA rehabilitation scheme and alternatives.
3. Do calculations of TDR generation resulting from SRA slum rehabilitation schemes relative to the city's slums, zones, and city.
4. Categorize the Pune slums according to land ownership.
5. Make policy suggestions for comprehensive housing strategy for Pune using SRA and JNNURM methods and funding.

2. Slum Rehabilitation Authority (SRA)

a. Background of the SRA originating in Mumbai

The Pune Municipal Corporation adopted similar procedures to the Mumbai SRA when it appended its Development Control Regulations (*Appendix 'T') in 1994. Since slum rehabilitation in Pune has been so far modeled after the Mumbai SRA, reviewing the lessons learned from Mumbai may give some insights into ways to offset the negative impacts of past slum housing policies.

The Mumbai Slum Rehabilitation Scheme and its regulating body, the SRA, instated in 1995, was devised as a part of a Shiv Sena election promise to provide free housing to four million slum dwellers. The current SRA's method creates incentives for private developers to take on slum rehabilitation by granting Transferable Development Rights (TDR). This idea dates back to the Moghe and Awale Committee of the 1980's, which allowed the private developers to sell additional built-up space, as a way of enticing them into such projects. In 1991, the Congress Party's Slum Redevelopment Scheme (SRD) motivated developers to rehabilitate notified slums by increasing the maximum FAR to 2.5.[2] "After re-housing slum dwellers in 180 sq. ft. (about 18 sq.m.) tenements, builders were free to sell the remaining floor space in the open market", with a 25% profit ceiling.[3] In this scheme, the consent of 70% of the slum dwellers was required to proceed with a redevelopment scheme. Then slum residents, who formed housing cooperatives, made 1/3 down payment on their tenement rebuilding and paid rest under a 15-year loan.

In Shiv Sena's 1995 plans, called the Slum Rehabilitation Schemes (SRS), the carpet area of tenements was increased to 225 sq.ft. and given free to the residents; and eligibility in slum renewal projects was opened up to all dwellers on in the electoral role before 1995. For every 10-sq. ft. of rehabilitated space, builders were given a 7.5 sq. ft. free sale component. A 5% commercial component was also added. Within a maximum 2.5 F.S.I. (Floor Space Index) for each slum pocket: "Surplus of floor area, if any, could be transferred to another area under Transferable Development Rights (TDR)."[4]

A central monitoring agency called the Slum Rehabilitation Authority (SRA) was set up to increase financial capacities to complete rehabilitation schemes and to co-ordinate the executing agencies. The SRA was also in charge of constructing transit accommodations on vacant public lands and providing critical elements of redevelopment, such as infrastructure. This scheme gave additional incentives to private investors by legal avenues: it phased out all other slum improvement projects to limit the rights that slum dwellers had to appeal to court laws concerning redevelopment. Project schemes fell under the authority of the government, and police power was invoked for executing the projects.[5]

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[2] Neelima Risbud, "The Case of Mumbai", from *Understanding Slums: Case Studies for the Global Report for Human Settlements 2003*, p.15.
[3] Justice Hosbet Suresh et al, "Bulldozing Rights. A Report on Forced Evictions and Housing Policies for the Poor in Mumbai", *Indian People's Tribunal on Environment and Human Rights*, June 2005, p. 42.
[4] Risbud, p.16.
[5] Suresh et al, p. 42.
* For details of Appendix T SRA refer to Appendix 1

Various problems arose with these approaches. Builders were reluctant to invest, fearing delays and lack of political continuity. Slum dwellers occupying more than 25 sq.m. tenements were hesitant to join. NGO's intervened to protect squatters and aid their inclusion in the SRS's. A huge tenement change of ownership took place, as mainly affluent areas came to be considered for SRS's. Developers quoted prices that were lower than those on the open market to remain within profit ceilings. Further, there were no pro-active provisions to resettle the families or specify the nature of resettlements and types of entitlement. Of the promised 8 Lakh tenements, only 19,000 were completed in the 1990's.[6] Concerns lingered over densities, consumption of water and electricity, and lacking availability of transit accommodation and maintenance costs.

In 1998, the Shiv Sena- BJP plan produced a new agency, the Shivshahi Punarvasan Prakalp Ltd. (SPPL), which was set up on a loan from the MHADA. The SPPL hired out private builders as contractors, who used profits from building commercial complexes to cross-subsidize the rehabilitation of slum areas. Here builders were expected to make their own capital investment but had no profit margins. In a scheme that relied upon public land as its resource (often already occupied by squatters) an estimated Rs.73 crore was given to contractors, of which Rs.50 crore still needs to be repaid. Regulations were routinely violated and special favors granted. The 2001 S.S. Tinaikar Committee exposed the scheme as "a fraud, designed to enrich Mumbai's powerful construction lobby by robbing both public assets and the urban poor."[7]

b. SRA in Pune

On 3rd June 2005 the government of Maharashtra formed the joint Slum Rehabilitation Authority (SRA) for the cities of Pune and Pimpri-Chinchwad. It is based on the same format as the Mumbai S.R.A. The PMC commissioner is declared as the head authority of the SRA given the additional charge for this post. The objective of the SRA is to find a solution to the problems of slums and slum-dwellers and to provide them with permanent houses. The current rules and regulations for the SRA were approved in December 2005. These are since being updated and reviewed by the State Chief Minister.

The basis of Slum Rehabilitation Schemes is to use the policy of cross subsidy. By letting developers build and sell marketable commercial spaces/flats in the open markets, they can use this profit for covering the cost of building new, free housing for the slum dwellers. However, before embarking on such projects it was mandatory for the developers to get consensus of at least 70% of the slum dwellers.

However, since 2005, the rules have made the consent of slum dwellers and landowners obligatory for slum rehabilitation under the SRA, which has the direct authority to sanction projects in the city. Slum Rehabilitation Schemes are primarily addressed to the redevelopment of slums on private lands but can be allowed on public land too. Earlier, a builder, along with the agreement of the landowner and at least 70% of the slum dwellers, would prepare a proposal and submit it to the SRA which would review and sanction it if it met the requirement. The builder would get the building permissions from the PMC, and the authority would monitor the project

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[6] Ibid, p.43.
[7] Ibid, p.44.

to ensure the proper rehabilitation of the slum dwellers. The same system applied to slums located on public land.

Since 1st April 1994, slum rehabilitation schemes in Pune city are being approved and implemented in accordance with the guidelines provided in Appendix T of Development Control Regulations. 78 schemes were submitted to PMC under these regulations and are in various stages of approval and construction. A total 7 have been completed. Refer to the table below, which shows the number and status of the project as of December 2005.

- *Table 1: Status of SRA projects by December 2005*

No.	Status of Project	No. of Projects	Total Tenements	No. of Beneficiaries	Tenements to be given to PMC/PCMC	Rehabilitated Families	%	Tenements handed over to PMC/PCMC	%	Comment
	Completed	7	427	322	105	322	100%	84	80%	Projects completed
	Under construction	26	5132	3797	1405	857	22.57	4	0.27%	Under process
	Still to begin construction	2	619	588	31	--	--		--	Projects stopped
	In Process	19	--	--	--	--	--		--	--
	Total	**54**	**6178**	**4707**	**1541**	**1179**	**28.33**	**88**	**5.71%**	

Source: SRA office, Pune

On March 27th 2007, the State Government published the new guidelines for the SRA in Pune. But since they specified several conditions, which were seen as objectionable in light of recent municipal election promises, they have again been withdrawn to be reviewed by the Chief Minister. Some of the relevant issues currently under review are:[8]

- Consent of the slum dwellers and landowners is not required for implementing the SRA projects. The CEO (SRA) shall survey the slum area and finalize a list of eligible beneficiaries on the declared rehabilitation area. The project shall be obligatory for all listed families to participate in the scheme.
- The cut-off date for rehabilitation has been set for January 1, 1995. This differs from the demand of slum dwellers for a 2000 eligibility date.
- The size of the tenements should be increased from 225 to 350 sq. ft.

c. SRA Current rules & regulations

Some of the salient features of the SRA rules are listed below: For detailed rules please refer to appendix 2.

- Every slum structure existing prior to 01/01/1995 is treated as protected structure.

- Every slum dweller whose name appears in the electoral rolls as on 01/01/1995 and who continues to stay in the slum is eligible for rehabilitation.

- Every eligible residential slum structure is provided with an alternative tenement admeasuring carpet area 225.00 sq. ft. preferably at the same site, irrespective of the area of slum structure.

- Every eligible slum structure that is being used for commercial purposes is granted an alternative tenement having area equal to the structure subject to an upper limit of 225.00 sq. ft.

- The developer puts in resources in the form of money, men and material for construction of free houses for the slum dwellers.

- The developer is compensated for his efforts in the form of free sale component. The developers are allowed to construct tenements for sale in the open market. The area allowed for sale in the open market is directly proportional to the area of tenements constructed for Rehabilitation of slum dwellers. For every 10 sq. mts. of rehab component the free sale component is 20 sq. mts in Zone A, 25 sq. mts, in Zone B and 30 sq. mts. in Zone C.

- Floor Space Index (known as FAR elsewhere) up to 2.5 is allowed for SRS.

- The minimum permissible tenement density is 360/hectares and the maximum tenement density is 1080 tenements/hectare

- The developer is required to construct the rehabilitation tenements on the plot itself. The balance FSI left is allowed for construction of free sale tenements.

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[8] "SRA's mantra: Settle for 270 sq. ft or exit scheme", *Pune Newsline- Indian Express* March 27, 2007.

- The spill over entitlement to the developer is permissible for sale in the form of transferable development rights (TDR) in the open market. These transferable rights can be utilized on other non-slum pockets subject to the provisions of D. C. Regulations.

- The plots which are reserved for public purposes and which are overrun by slums can also be taken up for implementation of a Slum Rehabilitation Scheme.

- In case of plots reserved for un-buildable reservations, 33% of the reservation area is left free for the intended reservation.

- In case of plots reserved for build able reservations, a certain predetermined proportion of the permissible built up area is to be constructed as per the requirement of user agency and handed over free of cost to the city administration as a part of SRS.

- Slum Rehabilitation Authority is designated as a local planning authority to provide all the requisite approvals for SRS under one roof. The authority is mandated to act as a facilitating agency for implementation of SRS.

- Along with the free rehabilitation tenements the developers also have to provide space for amenities like a crèche (Balawadi), society office, welfare center.

- Facilitating measure in the form of additional 5% incentive commercial area is available to the projects being implemented by either a society of slum dwellers directly or a NGO.

Table 2 - Salient Features of Revised Appendix T & SRA

	SALIENT FEATURES OF REVISED APPENDIX T (PUNE) DATED 26th Feb 2004:	SALIENT FEATURES OF SRA (PUNE):
1	The maximum FSI/FAR for Pune is 2.5, which means that the area a builder can develop on a slum site can be up to 2.5 times the actual net plot area.	
2	-	However, For tenement densities from 450 to 550: - FSI allowed = 2.75 For tenement densities greater than 550: - FSI allowed = 3.0
3	-	Maximum in-situ that can be utilized in all slums is only 2.5, and any remaining FSI granted in the higher tenement densities will be made available as TDR. But, with prior permission of CEO, the builder may utilize the additional FSI on site.
4	The Minimum Tenement Density is 360 tenements per square hectare, and a maximum of 1080.	
5	FSI/FAR relates to the three identified zones in Pune-A, B, and C: In **Zone A**, for every 10 square meters constructed for SRA, 20 sq.m. is granted as a free sale component to the developer (to be used as in-situ FSI or sold in the open market as slum TDR). This can be utilized in zone b and c. In **Zone B**, for every 10 sq. m. constructed for SRA, 25 sq.m. is granted as free sale component as a part of the FAR scheme. This can be utilized in zone B and C. In **Zones C**, for every 10 sq. m's constructed for SRA, 30 sq.m. is granted as free sale component FAR, which can be utilized only in zone c.	
6	Consent of 70% of eligible slum dwellers is required to pass the scheme.	Consent of the beneficiaries and Landowner is mandatory.
7	Beneficiaries to be on electoral roll of 1995.	
8	Each Rehab tenement will be 225 sq. ft. carpet area, including toilet and bath and balcony. The provision of lifts not necessary for building height up to 6 floors	
9	The maximum permissible height of the building is 36 mts. (11/12 floors)	The maximum permissible height of the building is 40 mts. (13/14 floors)
10	Transit camps to be provided within 2.0 kms of site.	Transit camps to be provided within 2.5 kms of site.
11	DC rules to govern setbacks and other building regulations	
12	Proposal approved by committee comprising Municipal Commissioner, Collector, CEO PHADB, Deputy Director Town Planning and Mayor	Proposal approved by CEO, SRA

d. SRA Incentive System

The concept of slum Transferable Development Rights (TDR) was introduced in 1991 in Mumbai as a part of Development Control Regulations. This mechanism was used to encourage the use of reserved land and to eliminate monetary compensation to the owners of the land on which slums are located. TDR is issued in relation to maximum Floor Space Index (FSI) or Floor Area Ratio (FAR).

Though the Pune SRA is a relatively new government body, having few actual completed slum rehabilitation projects previously implemented under Appendix T, there have been two drafting of the SRA rules and regulations since 2005. Here follows a description of the main concepts relating TDR generation, as can be clarified from those drafts.

What is FSI?
FSI is the ratio of the combined gross floor area of all floors (excepting areas specifically exempted under these regulations), to the net area of the plot.

$$FSI = \frac{Total\ covered\ area\ of\ all\ floors}{Net\ Area\ of\ plot}$$

FSI is a basic planning tool for regulating densities in an area. In Pune/Pimpri Chinchwad the current maximum permissible FSI on slum sites is 2.5 which means that the area a builder can develop on a slum site can be up to 2.5 times the actual net plot area. However, the recently proposed Pune SRA regulations allow an F.S.I of 2.75 for redeveloping slum areas with an existing tenement density of between 450 and 550 tenements per hectare and 3 FSI if the existing slum density is more than 550. Since the maximum in-situ that can be utilized in all slums is only 2.5, any remaining FSI granted in the higher density tenements will be made available as **Transfer of Development Rights (TDR).**

If the developer does not wish to consume permissible in-situ FSI/FAR, the free sale component shall be granted in part or fully in the form of TDR, with the approval of the Slum Rehabilitation Authority (SRA) CEO.[9]

TDR is akin to virtual land. Currently the slum TDR that can be loaded onto a receiving plot is .6, which means that an additional .6 FSI can be added to the permissible FSI. This could lead to high-rise, high-density projects. The cost of TDR is like stock market and subject to fluctuation depending on the market forces.

The Minimum Tenement Density is 360 tenements per square hectare, and a maximum of 1080. Certain non-residential development is allowed within this rule, except that it gets an allotment equivalent to the existing area or maximum of 25 sq.mts whichever is lesser.
Free Sale component relates to the three identified zones in Pune- A, B, and C:

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[9] "Special Rules and Regulations for Slum Rehabilitation Scheme Under SRA for Pune", August 18, 2005 Article K) 2. and 3.

In Zone A, for every 10 square meters constructed for SRA (as a rehabilitation component), 20 sq. mts. is granted as a free sale component to the developer (to be sold in the open market as in-situ FSI or slum TDR). This can be utilized only in zone b and c.

In Zone B, for every 10 sq. m. constructed for SRA, 25 Sq mts is granted as free sale component as a part of the FAR scheme. This can be utilized only in zone B and C.

In Zones C, for every 10 sq. m's constructed for SRA, 30 sq mts is granted as free sale component FAR, which can be utilized only in zone c.

For the purpose of studying the SRA rules and generation of TDR in Pune city we have chosen three representative slums each in A, B and C zone and carried out detailed analysis for them.

3. Study of three Slums redeveloped as per SRA regulations:

Currently, Pune City has been divided into three development zones– Zone A, Zone B and Zone C. Zone A is basically comprised of the inner city Peths (Mangalwar Peth, Somwar Peth, Kasba Peth etc.) and is marked by fairly dense development. Zone B has lesser tenement densities, comprising areas such as Tadiwala Road, Parvati, and Shivaji Nagar etc. Zone C, consists of the outer areas of Pune, including Aundh, Kothrud, and Yerawada, Hadapsar.

Map 1: Pune city showing the three development zones and all the slums
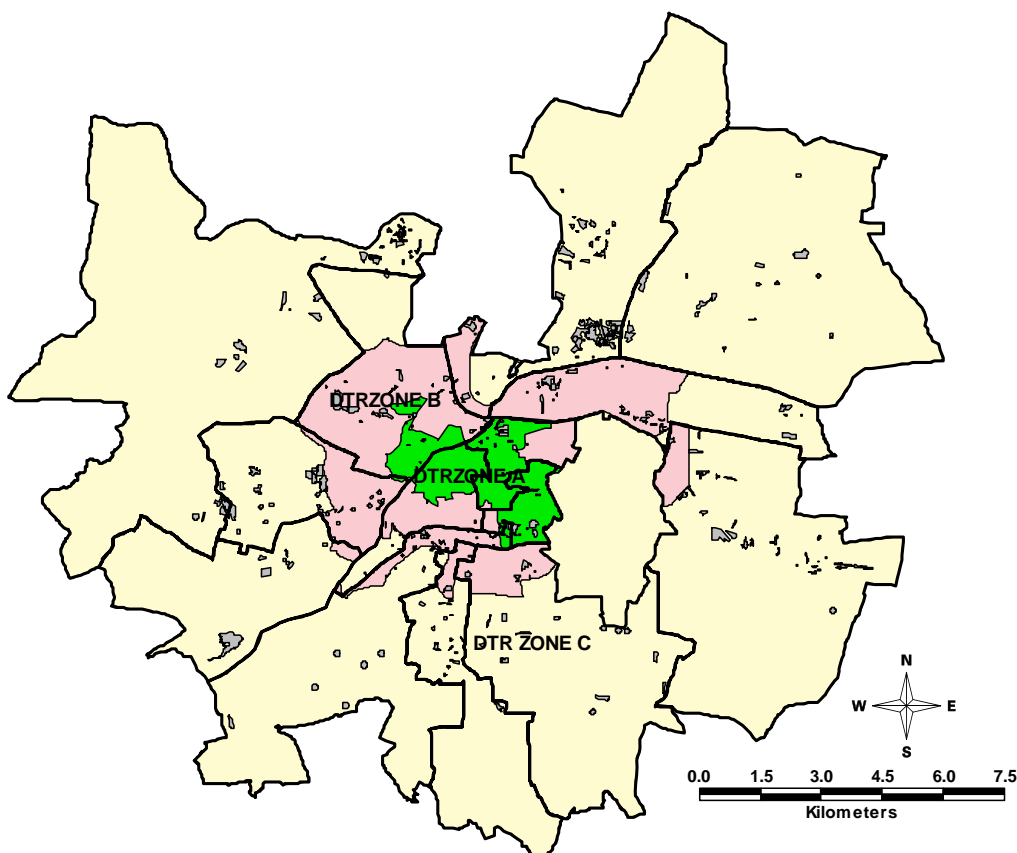
Table 3: Pune city slum information

	Land Area	No. of Slums	No. of tenements	Tenement density variations	Land Cost Variations/sqmts
Zone A	7.42 sq. kms.	99	18,458	82 to 776	Rs. 3800 To Rs. 23900
Zone B	26.16 sq. kms.	110	36,701	171 to 1589	Rs. 3200 To Rs. 17400
Zone C	213.41 sq. kms.	248	105,417	42 to 2029	Rs. 400 To Rs. 38204

Source: Combined data of SA and PMC

To study the general characteristics of the slums settled in Pune, three representative slums have been chosen from each Zone and detailed studies have been carried out on these slums.

- In Zone A, Lohiya Nagar, Bhavani Peth
- In Zone B, Dandekar Pul Survey No. 130, Parvati
- In Zone C, Kasturba Gandhi Vasahat located, Aundh area

The general physical features, dates of declaration, number of structures, tenement densities, land ownership and prices, infrastructure realities and costs of the three slums will be presented. These socio-economic and mapping details will feed the SRA analysis and slum rehabilitation design options that follow.

The map below shows the location of these slums within the various zones.

Map 2 : Pune City showing 3 slums - one in each development zone
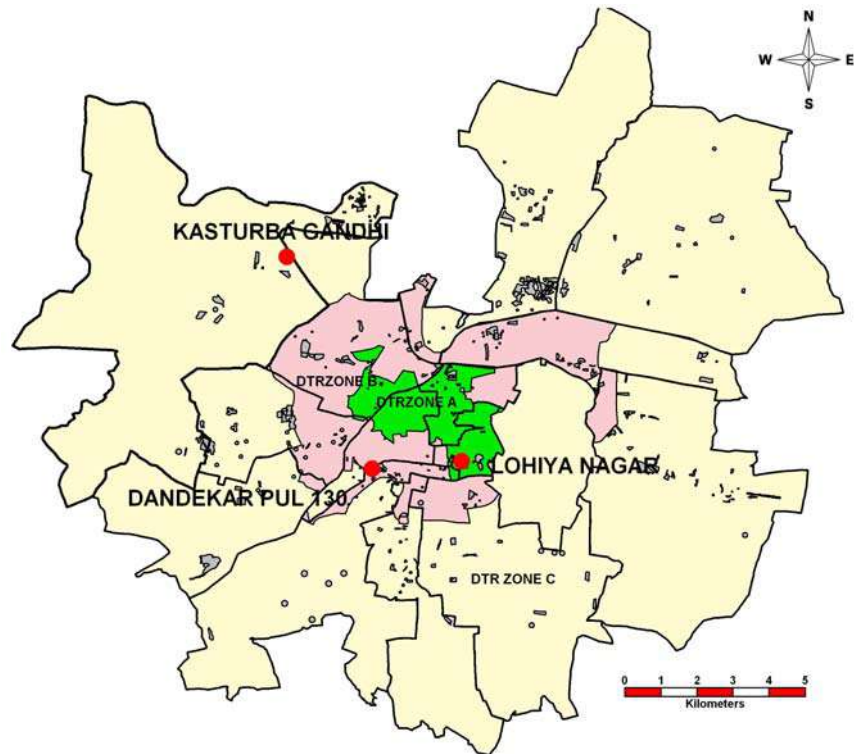
a . Zone A:

This covers approximately **7.8** sq. kms area. There are approximately 99 settlements in this zone. The tenement densities range from 59 to 663 tenements/hectare (based on actual calculations for 60% of slum households in zone A)
The cost of land also varies from Rs. 3800 to Rs. 29300/hectare

a.1. Lohiya Nagar- Bhavani Peth

a.1.i. Site context

The area north west of the slum is primarily residential, with some small commercial premises on the ground floor level. There is no major commercial or IT zones in the immediate vicinity. Southwest of the site is the PMC Hospital and to the south is a fire station. The southeast side of the site adjoins a nala. Southwest of the site is a timber market. East of the slum leads to the Sholapur Road, Swargate Bus Station, and some large commercial premises about a km away.

Map 3: Lohiya Nagar Existing site plan
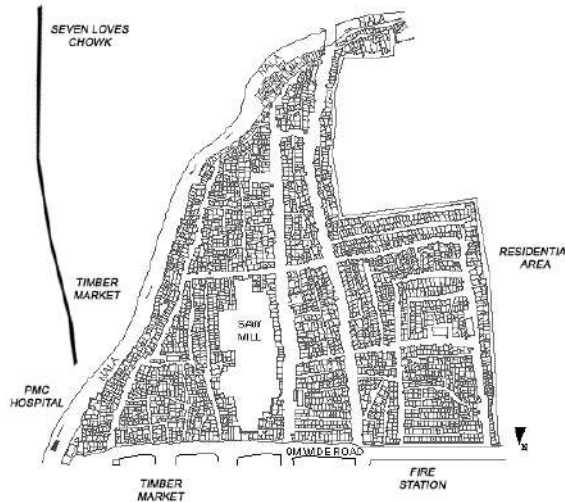
a.1.ii. History

Declared on the 21st of June 1984, the slum site exists on land reserved for the Economically Weak Sections (EWS) within the Development Plan Map of Pune. The slum land is privately owned. There are currently 3679 structures in the slum. It occupies an area of about 6.07 hectares (60,718 sq. m.) with a current tenement density of 534 per hectare. It is a residential slum with approximately 16,556 people living in 3,139 houses.

a.1.iii. General characteristics

The majority of the structures are of kutccha construction (81%) and the remaining structures are pucca (18%). Houses facing the road (approx. 10'X12') are currently worth 1.9 lakhs, and shops are 2.5 lakhs. Current land prices are Rs. 5200 per sq.m.

The infrastructure facilities are well established in this settlement. The main approach road to the slum is 9m wide. There is an underground gutter system, and the roads are fully paved. Water connections are also good, with 100% of families having individual water connections. There are two public water taps that are in working condition. Slum dwellers use a garbage bin, which is located within the slum. There are 12 public toilet blocks with 166 stalls in the entire slum. All slum dwellers pay a Rs. 375 tax per year for use of water, electricity and drainage and other infrastructure facilities provided by the PMC.

Map 4:

LOHIYA NAGAR
BHAVANI PETH
ZONE A

TYPICAL SRA SCHEME STILT + 8 STRUCTURES
CLUSTER OF 8 TENEMENTS PER FLOOR, WITH LIFTS

MODIFIED SRA SCHEME STILT + 3, 4 AND 5 STRUCTURES
CLUSTER OF 6 AND 8 TENEMENTS PER FLOOR WITH LIFTS

CLUSTER OF 8 TENEMENTS PER FLOOR , S+8 STRUCTURES

CLUSTER OF 8 TENEMENTS PER FLOOR , S+8 STRUCTURES WITH SHOPS ON GRD. FLR.

ROADS

COMMERCIAL DEVELOPMENT UP TO 7 FLOORS

AMENITIES

OPEN SPACES

CLUSTER OF 8 TENEMENTS PER FLOOR , S+5 STRUCTURES

CLUSTER OF 8 TENEMENTS PER FLOOR , S+4 STRUCTURES

CLUSTER OF 6 TENEMENTS PER FLOOR , S+3 STRUCTURES

ROADS

AMENITIES

OPEN SPACES

COMMERCIAL DEVELOPMENT UP TO 7 FLOORS

SAW MILL

SAW MILL

20M   60M
00M   40M   80M

20M   60M
00M   40M   80M

Site area	60718 sq. m.
Commercial development	10938 sq. m (20%)
Area covered by SRA component	49780 sq. m. (80%)
Open area	6078 sq. m. (10%)
FSI consumed ny SRA	1.5

Site area	60718 sq. m.
Open area	10731 sq. m. (17.6%)
FSI consumed ny SRA	1.5

TOTAL NUMBER OF TENEMENTS = 3240
TENEMENT DENSITY PER HECTARE = 534

a.1.2 Design Options

For the SRA re-hab component a cluster of 8 and 6 tenements per floor are used. The buildings have partly stilts, which is used for parking and partly shops or houses.
The minimum distance between 2 stilt+8 buildings is 6 m. while the minimum distance between 2 stilt+3 buildings is 3 m. The minimum road width provided in the site range from 3m. to 6.5m.

a.1.2.i. Typical SRA Scheme

The SRA component is built on site in stilt + 8 structures and the remaining FSI available (i.e. FSI 1) is used for commercial development by the developer. This scheme leads to a high rise, high-density kind of development.

The SRA component thus has 9 storied structures while the commercial development has only 7 storied structures. All the structures have been provided with lifts.

A 7.5 m wide buffer area is left near the nala where no development is allowed. Though the rules state that a 3m wide buffer area is sufficient it has been observed that houses tend to get flooded if they are so close to the nala.

10% open space is provided which can be used for amenities and community spaces.

a.1.2.ii. Modified SRA Scheme

The SRA component is built on site in stilt + 4,5 and 6 storied structures and the remaining FSI available (i.e. FSI 1) is sold in the open market in the form of TDR by the developer. This scheme leads to a high rise, high-density kind of development.
Due to very high tenement densities, it is not possible to accommodate all the existing tenements in silt +3 structures.

Though the SRA regulations prescribe no elevators up to 6 storied structures, it is practically very difficult for families to negotiate this height- especially the old and the children. Thus any structure that goes beyond 12-mts. (or 4 storied) height has been provided with a lift. This in turn leads to high maintenance costs for the poor, which they can ill-afford.

In case we had to accommodate the tenements in a 4-storied structure, 1014 tenements will have to be re-located to other sites where extra housing has been generated. The occupation profile of the inhabitants reveals that almost 30% of the families belong to the roaming category, which means their work can take them anywhere within the city. If incentives are provided to them in the form of larger housing units in zone B and C, they might be willing to relocate to another area. If this 30% of families are willing to exercise the option of moving out, then the remaining residents could be rehabilitated in 4 storied structures.

17.6 % Open space is provided which can be used for amenities and community spaces.

b. Zone B

This covers approximately 26.16 sq. kms area. There are approximately 110 settlements in this zone (Refer to the slums details under Ward lists). The tenement densities per hectare range from 73 to 758 tenements per hectare. The cost of land also varies from Rs.3200 sq. mts. to Rs.23900/sq.mts.

b.1. Dandekar Pul Survey No. 130 – Parvati

Map 5: Dandekar Pul 130
Existing site plan

b.1.i. Site context

Primarily private residential housing surrounds Dandekar Pul slum, with some shops on its ground floors. Two main roads (Sinhagad Road and Dandekar Bridge) adjoin the southern and eastern sides of the slum. Opposite the slum, across Sinhagad Road, to the south, is the famous Ramakrishna Math. To the north of the slum is the Ambil Odha nala. The site is close to Ambedkar Chowk.

b.1.ii. History

The slum site has been reserved for EWS under the Development Plan of Pune. It was declared on the 19th of November 1983 and is on privately owned land. There are currently 1637 structures in the slum. It occupies an area of about 3.52 hectares / 35,238 sq.m. with a current tenement density of 408 per hectare. It is a residential slum with approximately 6,732 people living in 630 houses.

b.1.iii. General characteristics

The majority of the structures are of semi-pucca construction (63%) and the remaining structures are of Pucca (25%) and kuccha (10%) construction. The current land prices are Rs. 9600 per sq.m. G+1 semi-pucca houses cost 2 Lakhs and kuccha houses cost Rs. 90,000. Houses along the main road cost as much as 4-5 Lakhs. All the houses are approximately 10'x15'.

The infrastructure facilities are well established in this settlement. The main approach road to the slum is 9m wide and the inner roads within the slum are 3m wide. There is an underground gutter system and the roads are fully paved. Water connections are also good with 100% of families having individual water connections. There are two public water taps, which are in working condition. Slum dwellers use a garbage bin, which is located outside the slum. There are 5 public toilet blocks with 70 stalls in the entire slum. All slum dwellers pay Rs. 375 as a tax on infrastructure per year.

Map 6:

TYPICAL SRA SCHEME STILT + 8 STRUCTURES
CLUSTER OF 6 AND 8 TENEMENTS PER FLOOR WITH LIFTS

DANDEKAR PUL
SURVEY No.130
PARVATI
ZONE B

MODIFIED SRA SCHEME STILT + 3 STRUCTURES
CLUSTER OF 6 AND 8 TENEMNETS PER FLOOR WITH OUT LIFTS

COMMERCIAL
DEVELOPMENT UP TO 3 FLOORS

Legend:
- OPEN SPACES
- AMENITIES
- ROADS
- 7.5 M BUFFER ZONE NEAR NALA
- COMMERCIAL DEVELOPMENT UP TO 3 FLOORS
- CLUSTER OF 8 PER FLOOR
- CLUSTER OF 6 PER FLOOR

Site area	35283 sq. m.
Commercial development	14025 sq. m (40%)
Area covered by SRA component	21258 sq. m. (60%)
Open area	3525 sq. m. (10%)
FSI consumed ny SRA	1.1

Site area	35283 sq. m.
Open area	4475 sq. m. (12.6%)
FSI consumed ny SRA	1.1

TOTAL NUMBER OF TENEMENTS = 1440
TENEMENT DENSITY PER HECTARE = 408

10 M   30 M   50 M
00 M   20 M   40 M

b.2. Design Analysis

For the SRA re-hab component a cluster of 6 tenements per floor is used. The buildings have partly stilts, which is used for parking and partly shops or houses.
The minimum distance between 2 stilt+8 buildings is 6 m. while the minimum distance between 2 stilt+3 buildings is 3 m. The minimum road width provided in the site range from 3m. to 6.5m.

b.2.i. Typical SRA Scheme

The SRA component is built on site in stilt + 8 structures and the remaining FSI available (i.e. FSI 1.4) is used for commercial development by the developer. This scheme leads to a high rise, high-density kind of development.

The commercial sale component goes up to only 3 floors while the SRA scheme is an 8-storied development.

All structures which goes beyond 12-mts. (or 4 storied) height has been provided with a lift, which leads to high maintenance costs for the poor, which they can ill-afford.

A 7.5 m wide buffer area is left near the nala where no development is allowed. Though the rules state that a 3m wide buffer area is sufficient it has been observed that houses tend to get flooded if they are so close to the nala**.**

10% open space is provided which can be used for amenities and community spaces.

b.2.ii. Modified SRA Scheme

The SRA component is built on site in stilt + 3 storied structures and the remaining FSI available (i.e. FSI 1.4) is sold in the open market in the form of TDR by the developer. This scheme leads to a low-rise development.

Due to low tenement densities (i.e. 408 tenements per hectare), it is possible to accommodate all the existing tenements in silt +3 structures.

All tenements including those that are presently located in the 7.5 M buffer zone has been re-housed in situ itself.

12.6 % open space is provided which can be used for amenities and community spaces.

c. Zone C

This covers approximately 213.41 sq. kms. in area. There are approximately 110 settlements in this zone (Refer to the slums details under Ward lists). The tenement densities per hectare range from 42 to 2029. The cost of land also varies from Rs.400 sq. mts. to Rs.37000/sq.mts.
The cost of TDR per sq.m. in the market is approximately Rs. 25000 in Zones C.

c.1. Kasturba Vasahat – Aundh

c.1.i. Site context

Map 7: Kasturba Vasahat Existing site plan

Kasturba Vasahat slum is situated alongside a main road, called Ganeshkind Road (more popularly known as University Road). The north and west sides of the slum are flanked on two sides by by-lanes and face residential areas, which have small commercial premises at ground floor level. To the north east of the slum, across the main road, is Pune University. To the south of the slum, and separated by a wall, is government land comprising of military buildings and a military market (Gul Market).

c.1.ii. History

The slum site has been reserved for residential purposes under the Development Plan of Pune and was declared in 1984. The slum is on private land with a number of owners. There are currently 526 structures in the slum. It occupies an area of about 2.16 hectares (21,628 sq.m.) with a current tenement density of 218 per hectare. It is a residential slum with approximately 2,461 people living in 523 houses.

c.1.iii. General characteristics

The majority of the structures are of semi-pucca construction (77%), and the remaining structures are Pucca (6%) and kuccha (17%). The land price of the slum is Rs. 6000 per sq.m (Ready Reckoner-2006). The cost of a semi-pucca house is 1-1.5 Lakhs and a kuccha house is Rs. 50,000 (approx. 10'X12'). A 10x15 sq. ft shop costs 2.5-3 Lakhs (approx. 12'X15').

The infrastructure facilities are well established in this settlement. The main approach road to the slum is 6m wide and the inner roads within the slum are 3m wide. There is an underground gutter system and the roads are fully paved. Water connections are also good with 100% of families having individual water connections. Slum dwellers use a garbage bin, which is located along the main road of the slum. There are 8 public toilet blocks with 91 stalls in the slum. There are 3 water stand posts with 3 taps in the slum. All slum dwellers pay Rs. 375 as a tax on infrastructure per year.

KASTURBA VASAHAT
AUNDH
ZONE C

TYPICAL SRA SCHEME STILT + 8 STRUCTURES
CLUSTER OF 6 TENEMNETS PER FLOOR WITH LIFTS

COMMERCIAL DEVELOPMENT UP TO 5 FLOORS

MODIFIED SRA SCHEME STILT + 3 STRUCTURES
CLUSTER OF 6 TENEMENTS PER FLOOR WITH OUT LIFTS
EXTRA HOUSING STOCK - CLUSTER OF 4 TENEMENTS OF
LARGER CARPET AREA PER FLOOR WITH OUT LIFTS

COMMERCIAL DEVELOPMENT 5 FLOORS

ROADS

OPEN SPACE

AMENITIES

220 EXTRA TENEMENTS CLUSTER OF 4 PER FLOOR, S+8 STRUCTURES

EXISTING TENEMENTS, CLUSTER OF 6 PER FLOOR, S+8 STRUCTURES

Site area	21628 sq. m.
Commercial development	7580 sq. m (35%)
Area covered by SRA component	14048 sq. m. (65%)
Open area	2450 sq. m. (11%)
FSI consumed ny SRA	1.0

324 EXTRA TENEMENTS CLUSTER OF 4 PER FLOOR, S+3 STRUCTURES

EXISTING TENEMENTS, CLUSTER OF 6 PER FLOOR, S+3 STRUCTURES

ROADS

OPEN SPACE

Site area	21628 sq. m.
Open area	2484 sq. m. (11.5%)
FSI consumed ny SRA	1.0

TOTAL NUMBER OF TENEMENTS
EXISTING = 560 PROPOSED = 780
TENEMENT DENSITY PER HECTARE
EXISTING = 258   PROPOSED = 360

c.2. Design Analysis

For the SRA re hab component a cluster of 4 and 6 tenements per floor is used. The buildings have partly stilts, which is used for parking and partly shops or houses.
The minimum distance between 2 stilt+8 buildings is 6 m. while the minimum distance between 2 stilt+3 buildings is 3 m. The minimum road width provided in the site range from 3m. to 6.5 m.

c.2.i. Typical SRA Scheme

The SRA component is built on site in stilt + 8 structures and the remaining FSI available (i.e. FSI 1.5) is used for commercial development by the developer. This scheme leads to a high rise, high-density kind of development.

The commercial sale component goes up to 5 floors while the SRA scheme is a 9-storied development. All the structures have been provided with lifts.

There are only 560 existing tenements with 259 tenements density per hectare. As per the rules, it is necessary to build up to a tenement density of 360 per hectare. This creates an extra housing stock of 220 houses, which can be used to accommodate the tenements that get re-located from very dense slums.

11 % open space is provided which can be used for amenities and community spaces.

c.2.ii. Modified SRA Scheme

The SRA component is built on site in stilt + 4 storied structures and the remaining FSI available (i.e. FSI 1.5) is sold in the open market in the form of TDR by the developer. This scheme leads to a low-rise development.
Due to low tenement densities (i.e. 360 tenements per hectare), it is possible to accommodate all the existing tenements in silt +3 structures.

Along with the 220 extra houses that are built for bringing the tenement density up to 360 per hectare it is also possible to build an 104 extra houses over and above the 220 extra housing stock generated. These extra houses built are of 330 sq. ft as against 225 sq. ft. The larger areas provided for these tenements act as an incentive for people to move out of their existing slums.
11.5 % open space is provided which can be used for amenities and community spaces.

d. Findings from case studies

d.1. Comparative Analysis of the three settlements

Table 4: Details pertaining to the three representative slums

	Lohiya Nagar	Dandekar Pul 130	Kasturba Gandhi
Total Plot Area In sq. m.	60718	35283	21628
Net Plot Area In sq. m.	54646.2	31754.7	19465.2
No of exisitng Slum tenaments on site	3240	1440	560
Exisitng tenement density per hectare	534	408	218
No of Slum tenaments on site (min 360 tene/hectare)	3240	1440	780
Gross built up area per tnmnt (sq. m.)	25	25	25
FSI consumed by SRA component	1.5	1.1	1
Max. permissible FSI	2.75	2.5	2.5
Land Cost per Sq.Mtr.	5200	9600	4400

d.2. Cost Assumptions

The assumptions that are taken into consideration for the purpose of the cost analysis are:

1. Cost of construction per sq. m. of slum re-hab component = Rs. 9,000/- including infrastructure cost.

2. Sale price of TDR
   Zone A and B = Rs. 35,000/-
   Zone C = Rs. 25,000/-

3. Transit accommodation per tenement for 2 years = Rs. 50,000/-

4. Sale price of commercial component and land cost taken as per the Ready Reckoner of 2006.

d.3. Analysis as per 25 sq. m. built up area for the three representative slums

d.3.i. Lohiya Nagar:

Graph 1[10]: Details analysis of Lohiya Nagar (Built up area = 25 sq. m.)
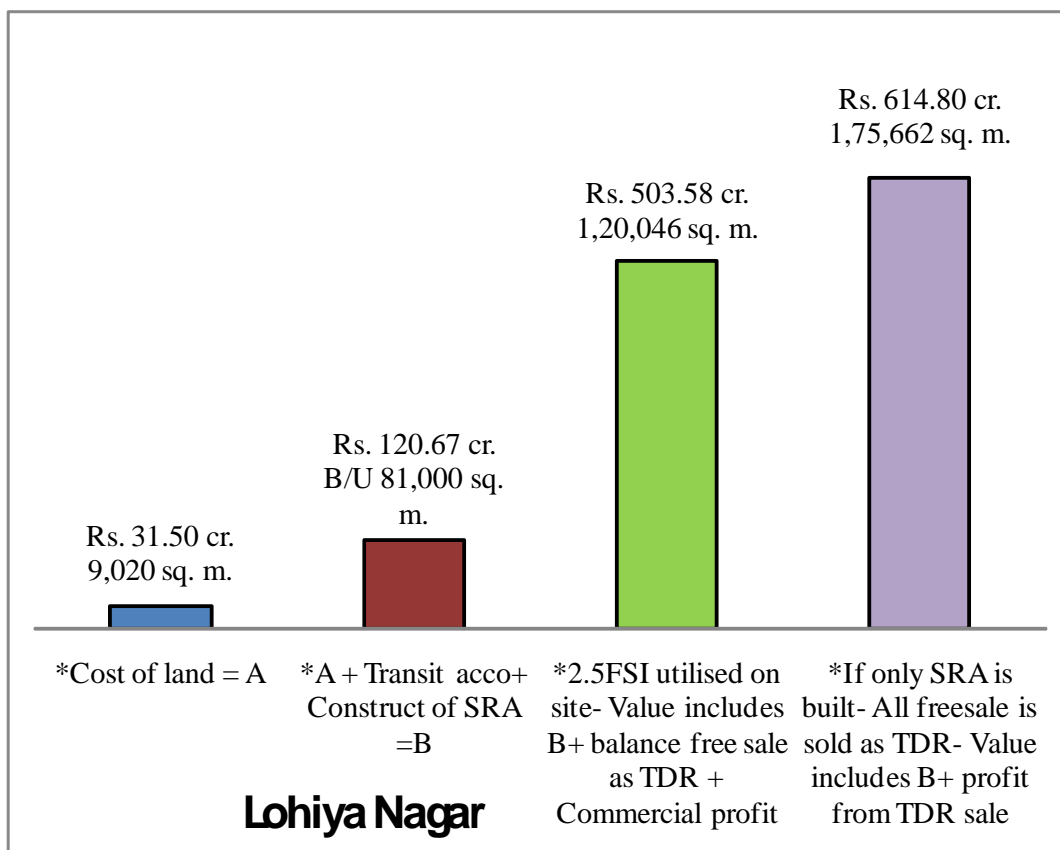
The first column in Graph 1 indicates the land cost for the entire site, which is Rs.31.50 cr. The second column represents the cost incurred, which includes the land cost, transit accommodation and construction of the SRA component. In this case, the amount of built up area for the SRA component is 81,000 sq. m. and the cost incurred is Rs. 120.67 cr.
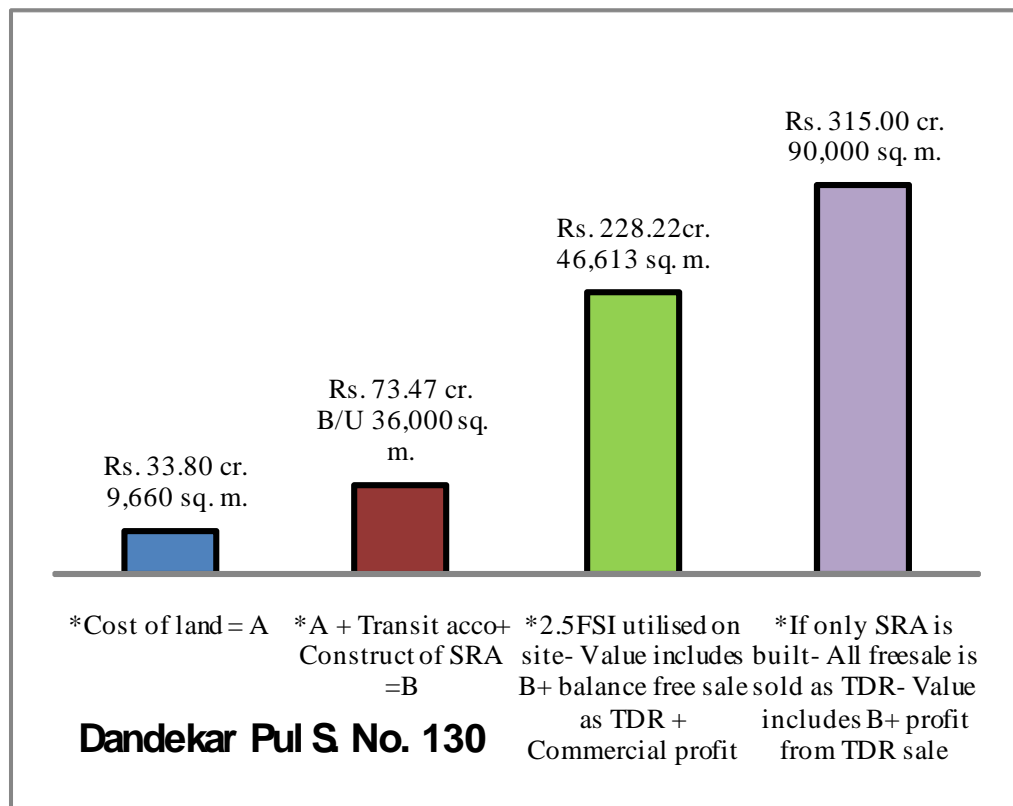
If the total of 2.5 FSI is utilised on site and the value of the remaining TDR sold in the open market along with profit from the commercial development is shown in the third column. This value is Rs.503.5 cr., and the unutilised free sale component which in terms of square meters TDR released in the city, is 1.20 lakh sq. m.

In comparison to this the last column shows the amount of square meters released as TDR and its value in Rs. if the total FSI of the site is not used. The developer here builds only the SRA component and takes all the TDR generated and sells it in the open market. It is observed that the square meters released in terms of TDR is 1.75-lakh sq. m. and the value of this TDR increases tremendously i.e. from Rs. 503.5 cr. to Rs. 614.8 cr.

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[10] Refer to Appendix 3 for detail calculations

d.3.ii. Dandekar Pul 130

Graph 2[11]: Details analysis of Dandekar Pul 130

The first column in Graph 2 indicates the land cost for the entire site, which is Rs.33.8 cr. The second column represents the cost incurred, which includes the land cost, transit accommodation and construction of the SRA component. In this case, the amount of built up area for the SRA component is 36,000 sq. m. and the cost incurred is Rs. 73.47 cr.

If the total of 2.5 FSI is utilised on site and the value of the remaining TDR sold in the open market along with profit from the commercial development is shown in the third column. This value is Rs.228.22 cr., and unutilised free sale component as square meters TDR released in the city, is 46,613 sq. m.

In comparison to this the last column shows the amount of square meters released and its value in Rs. if the total FSI of the site is not used. The developer here builds only the SRA component and takes all the TDR generated and sells it in the open market. It is observed that the square meters released in terms of TDR is 90,000 sq. m. and the value of this TDR increases from Rs. 228.22 cr. to Rs. 315 cr.

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[11] Refer to Appendix 3 for detail calculations

d.3.iii. Kasturba Gandhi Vasahat

Graph 3[12]: Details analysis of Kasturba Gandhi Vasahat

The first column in Graph 3 indicates the land cost for the entire site, which is Rs.9.51 cr. The second column represents the cost incurred, which includes the land cost, transit accommodation and construction of the SRA component. In this case, the amount of built up area for the SRA component is 19,500 sq. m. and the cost incurred is Rs. 30.96 cr.
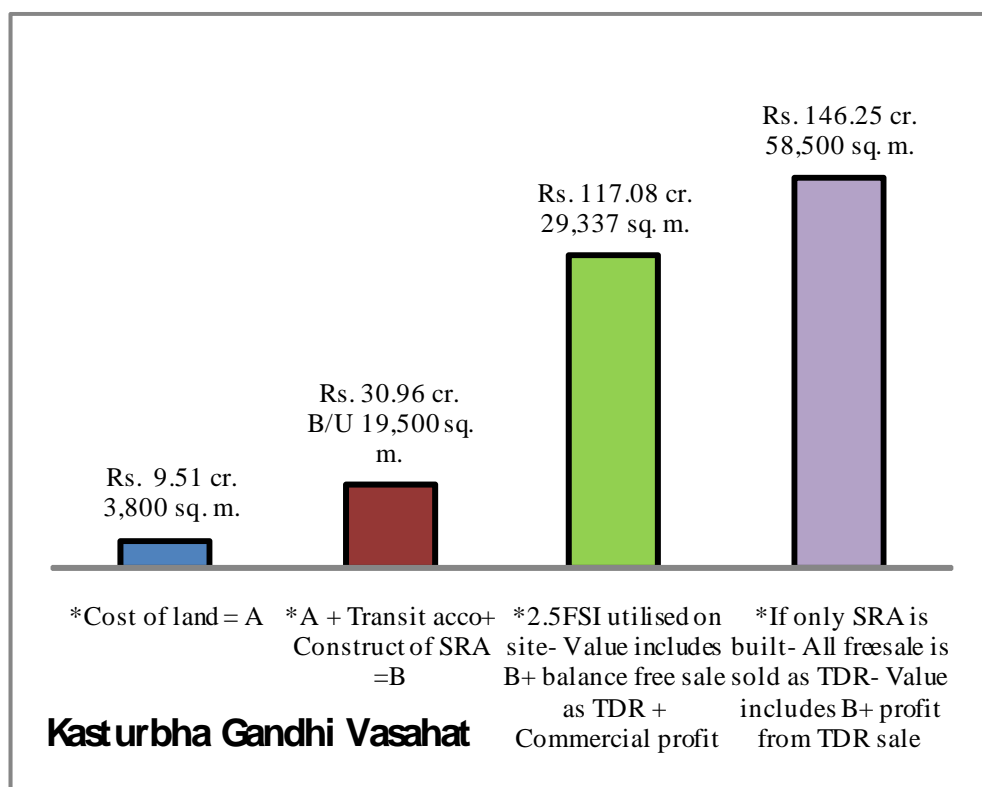
If the total of 2.5 FSI is utilised on site and the value of the remaining TDR sold in the open market along with profit from the commercial development is shown in the third column. This value is Rs.117 cr., and unutilised free sale component in terms of square meters TDR released in the city, is 29,337 sq. m.

In comparison to this the last column shows the amount of square meters released and its value in Rs. if the total FSI of the site is not used. The developer here builds only the SRA component and takes all the TDR generated and sells it in the open market. It is observed that the square meters released in terms of TDR is 58,500 sq. m. and the value of this TDR increases tremendously i.e. from Rs. 117 cr. to Rs. 146 cr.

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[12] Refer to Appendix 3 for detail calculations

d.4 Comparison of Lohiya Nagar, Dandekar Pul and Kasturba Gandhi
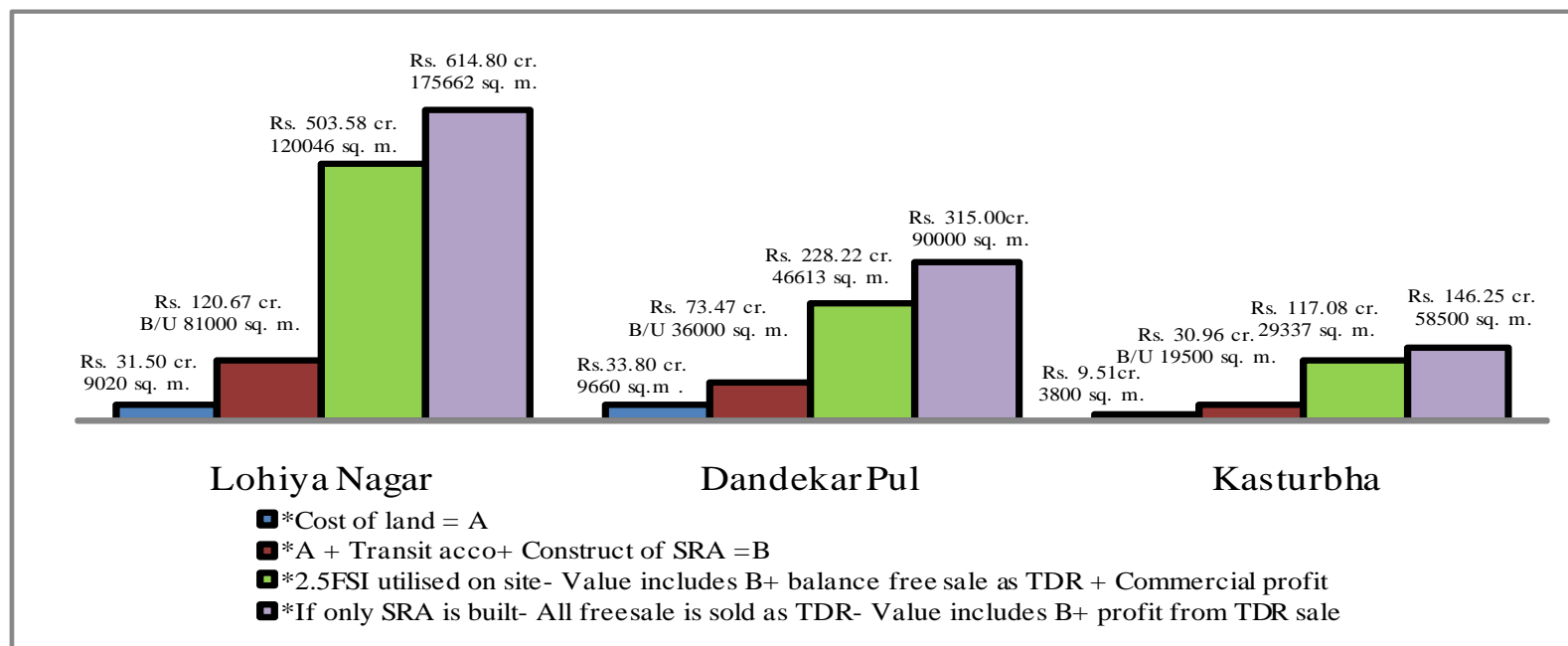
Graph 4[13]: Comparison of Lohiya Nagar, Dandekar Pul and Kasturba Gandhi

The chart shows consistency in the disproportionate compensation that is awarded to the developer as TDR or virtual land, which is also reflected in the profits. This is due to the fixed ratio of compensation that is awarded zone wise irrespective of slum densities, land prices and sale prices of commercial areas, which vary considerably within zones.
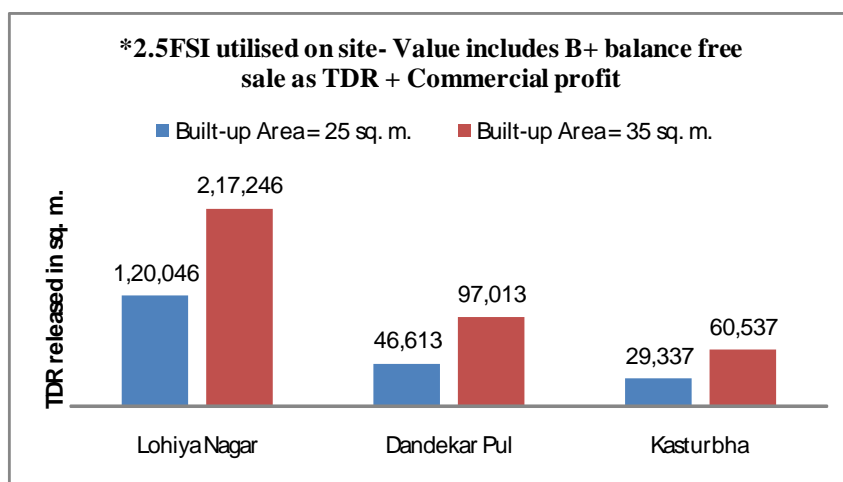
If we compare the above three examples we observe that it is more lucrative to sell all the free sale component as TDR in the open market than to commercially exploit the site up to 2.5 FSI.

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[13] Refer to Appendix 3 for detail calculations

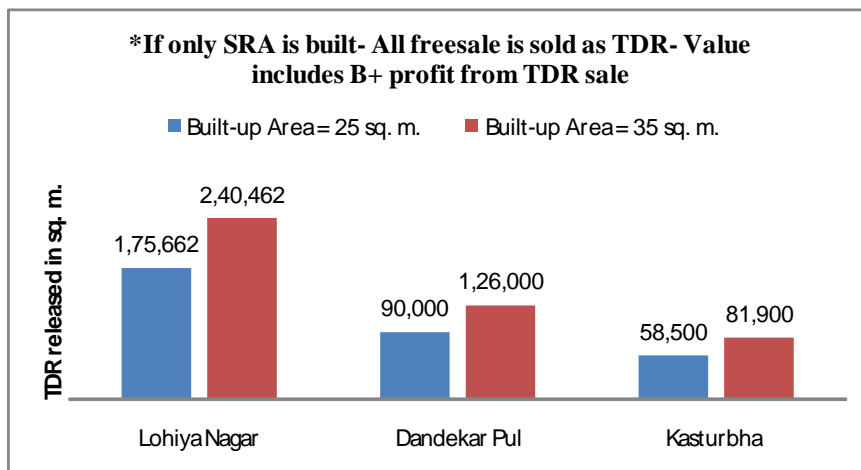### d.5. Implication of increasing size of tenement:

There has been a debate within various political parties regarding the minimum areas that should be given to the poor. Some parties feel that it should be at least 35 sq. mts. per family. The above analysis was carried out for a built up area of 25 sq. m. per SRA tenement. If the built up area is increased to 35sq. m. then there is a proportionate rise in the amount of free sale component that is released in the city in the form of TDR. This is shown in the graph below.

Graph 5[14]: Comparison between different tenement sizes utilising the entire 2.5 FSI

*2.5FSI utilised on site- Value includes B+ balance free sale as TDR + Commercial profit

- Built-up Area= 25 sq. m.
- Built-up Area= 35 sq. m.

In Lohiya Nagar, the amount of TDR released in the market increases from 1.20 lakhs to 2.17 lakhs, which is a 80 % increase in the amount of TDR released. This is if the site is exploited commercially to 2.5 FSI. In the same way for Dandekar Pul 130 there is a 108 % increase and in Kasturba Gandhi Vasahat there is a 106 % increase in the TDR released in the market.

Graph 6: Comparison between different tenement sizes when all the free sale component is converted to TDR

*If only SRA is built- All freesale is sold as TDR- Value includes B+ profit from TDR sale

- Built-up Area= 25 sq. m.
- Built-up Area= 35 sq. m.

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[14] Refer to Appendix 4 for detail calculations

In Lohiya Nagar, the amount of TDR released in the market increases from 1.20 lakhs to 2.17 lakhs, which is a 37 % increase in the amount of TDR released. This is if the site is not exploited commercially to 2.5 FSI and all the TDR generated is sold in the open market. In the same way there is a 40% increase in the TDR released in Dandekar Pul 130 and Kasturba Gandhi Vasahat.

The three slums that have been detailed out give an insight regarding SRA and how it would impact these settlements. It is fairly clear that averaging out land costs and densities across the zones are probably not going to make every project viable. If every project has to become viable, then it would necessitate changes in the parameters in the existing SRA rules. The parameters for every project should be linked to site-specific tenement densities, land price, sale price of commercial components etc.

4. Projection of SRA on Pune City

There are a total of 1,60,576 households in slums in Pune City. Out of these, Shelter Associates has carried out detailed analysis for 79,258 households and 40,000 have been identified under JNNURM for relocation projects.

Table 5: Basic classification of slum data (zone-wise)

	Zone A, 14 slums, 57% of total households covered	Zone B, 53 slums, 63% of total household covered	Zone C, 129 slums, 45% of total households
Total Plot Area	241599	734688	1589428
Exisitng No. of tenements	10603	23867	44788
No of Slum tenaments on site (min 360 tene/hectare)	11556	30243	60662
Gross built up area per tnmnt	23	23	23
Built up Ratio permitted (FAR) in proportion to rehabilitation zone	2.00	2.50	3.00
On site FSI allowed	2.5	2.50	2.5

Map 9: Slums surveyed by Shelter Associates and all other slums in Pune city
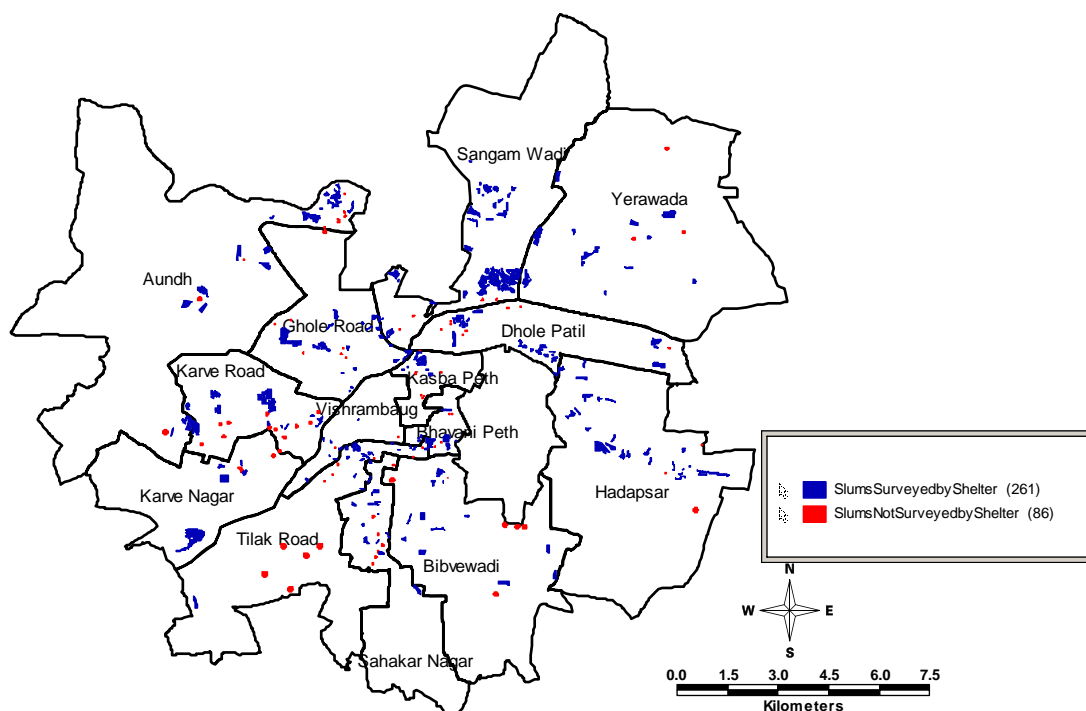
The Map 9 shows the slums that have been surveyed by Shelter Associates, which are indicated in blue. The remaining are the slums that exist in Pune city.

a. Projection of TDR generation citywide per zone based on SA data

Based on the surveys carried out by Shelter Associates, in the year 2000, we have calculated the TDR that would be released in the city by taking an average sample size of over 50% of the slum households across the city. The results have been tabulated below.

Table 6[15]: Distribution of slums in Pune city[16]

	Zone A, 14 slums, 57% of total households covered	Zone B, 53 slums, 63% of total household covered	Zone C, 129 slums, 45% of total households
Total Plot Area (sq mts)	241599	734688	1589428
Exisitng No. of tenements	10603	23867	44788
No of Slum tenaments on site (min 360 tene/hectare)	11556	30243	60662
Gross built up area per tnmnt	25	25	25
Free Sale ratio permitted in proportion to rehabilitation zone	2.00	2.50	3.00
On site FSI allowed	2.5	2.50	2.5

Table 5 shows the number of households that have been selected in each zone and the % that it represents of the total households in that zone. The total household figures have been compiled on the basis of primary data of SA ward wise. We have considered the tenement built up area as 25 sq. mts. The maximum permissible FSI for all sites has been taken as 2.5 in compliance with the SRA rules.

We have stated earlier that there are approximately 160,576[17] slum households in the city, of which 40000 families are being relocated to an alternate site under JNNURM. We are assuming that the balance 120,576 families will be rehabilitated under SRA. Based on the findings of the primary survey of SA covering 79,258 families we have projected the findings to cover 120, 576 families.

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[15] Total number of tenements in consideration is 79,258
[16] Primary surveys carried out by Shelter Associates
[17] Combination of data obtained from Shelter Associates surveys and PMC ward data

The total TDR released by Pune city is calculated by extrapolating the results obtained for 79,258 households for a total of 1,20,576 households. The graph below shows us the results obtained.

Graph 7[18]: Detailed analysis at City level
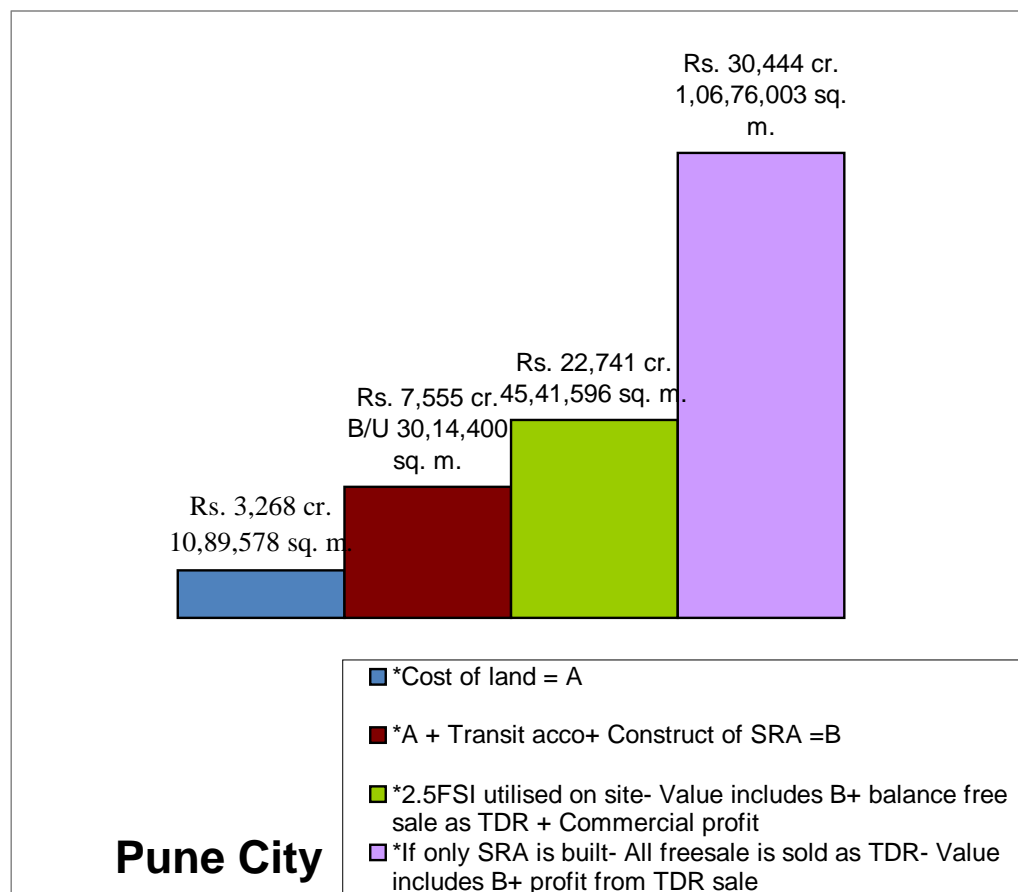
The total cost of land for all the slums in Pune city is Rs. 3,268 cr. as per the ready reckoner. A total of 30,14,400 sq. m. will have to be built to re-habilitate all the slum households for an amount of Rs. 7,555 cr.

If the entire site is commercially exploited to 2.5 FSI, the remaining amount of TDR that is sold in the open market is 45,41,596 sq. m. for an amount of Rs. 22,741 cr.

If the site is used only for the SRA component and it is not exploited commercially the then the amount of TDR released is 1,06,76,003 for an amount of Rs. 30,444 cr.
This analysis has again been carried put for a built up area of 25 sq. m per SRA tenement. In case the built up areas have to be increased to 35 sq. m. then there is a rise in the TDR released. This is indicated in the graph below.

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[18] Refer to Appendix 5 for detail calculations

Graph 8[19]: Details analysis of Pune City with different built up areas per SRA tenement
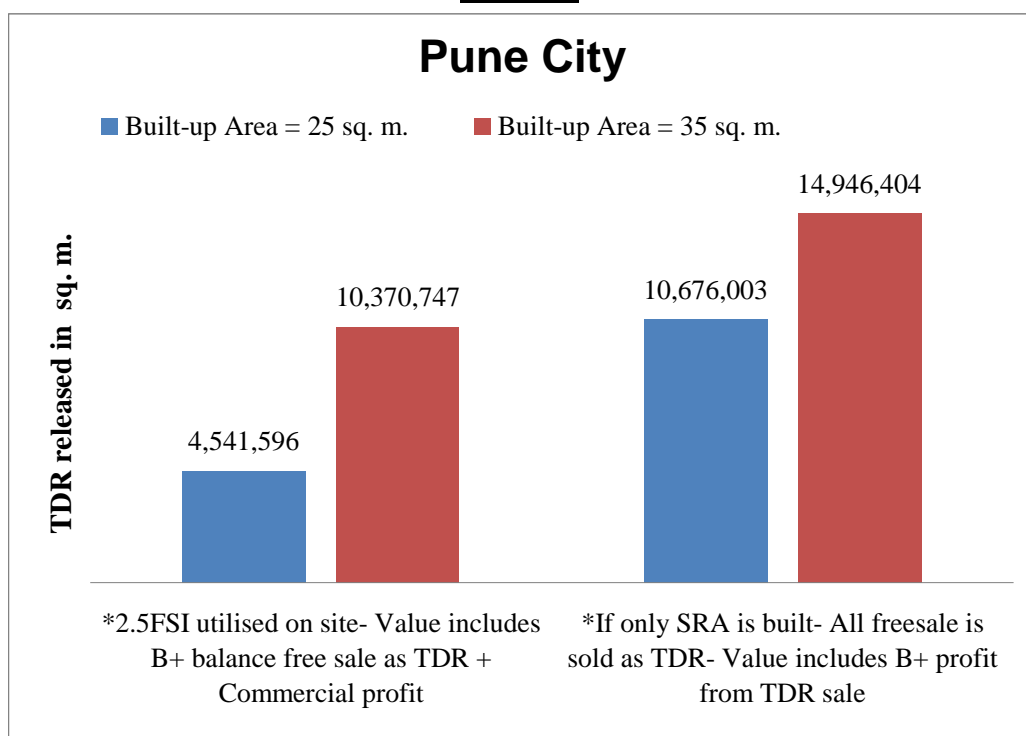
If the tenement size in increased there is a 128% increase in the amount of TDR released if the site is completely exploited to 2.5 FSI and a 40% increase in the TDR released if the site is not exploited commercially.

Key Facts of Free Sale FSI and TDR generated and Potential Load on City

- Most slums in Pune are in Zone C, where for every 1 sq mt of tenement space built under the SRS, 3.0 sq mt of "free sale" given as compensation to the developer

- A minimum of 1.5 sq mt of this free sale will convert to TDR since only 1.5 sq mt can be built on site in addition to the 1 sq mt of slum housing (FSI limit is 2.5)

- In many cases developers will not build the extra 1.5 sq mt on site that they are allowed but will move this elsewhere as TDR since the value of additional construction on the slum plot will be less due to presence of rehabbed slums and the location of the plot itself in the zone may not be ideal

- Thus the total TDR generated for every 1 sq.m. of rehab in Zone C will be closer to 2.25 sq mt (1.5 sq mt of excess + 50% x 1.5 sq mt of free sale that can but is not used on site). Averaging this across the other zones (where the compensation is either 2.5 or 2.0 sq.m.) reduces this "multiplier" from 2.25 to 2.0

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[19] Refer to Appendix 6 for detail calculations

- Assuming 1.2 lac slums to be rehabilitated (1.6 lac minus those on eco sensitive and govt. lands) and at 25 sq mt per tenement, there will 30 lac sq mt of slum redevelopment

- This 30 lac sq mt of slum redevelopment will generate close to 60 lac sq mts. of TDR (2.0 sq mt of TDR for 1 sq mt of slum construction) This is based on the assumption that 50% of the free sale generated in utilized on site and the remaining 50% is sold in the open market in the form of TDR.

- Of the 245 sq km in the PMC only 70 sq km is earmarked for residential or commercial construction and this would normally bear 700 lac sq mt of construction

- Thus the TDR generated from slum redevelopment will be <u>roughly 10%</u> of the total construction potential in the PMC

- However the TDR generated through the SRS <u>will not be evenly spread out across the city</u> but will be concentrated in high value areas in each zone

- These high value areas typically constitute just 25% of the total area in a zone and comprise of just 15-20 sq km of the city

These areas, which normally would bear 150 to 200 lac sq m of construction, will now be subject to an additional 60 lac sq mt of construction due to TDR from SRA, which is a <u>load of almost 40%</u>

5. Suggested Modifications and Improvements to SRA regulations:

1. Master Plan of Pune city, before any SRA project is sanctioned

Before any SRA scheme gets cleared, a Master plan of the whole city needs to be drawn up which has been stated in the SRA rules.

This would give clarity regarding location and spread of slums across the city zones, with land ownership, densities, vulnerable slums which probably need to be relocated etc. A master plan will not only give us a clear picture of the current situation but will also help us plan for future migrants. A range of options can thus be drawn out for the poor.

The extra housing stock that is generated from slums having tenement density lower than 360 needs to be demarcated. This would allow for comprehensive planning of the use of this extra stock for:

a) De-densify slums in inner city slum areas, where rehabilitation projects are under way.
b) Slightly larger tenements, which could be used as incentives to move families from very dense settlements. The socio-economic analysis shows that almost 20% of families in every settlement belong to the 'roaming category' with occupations like construction labour, rickshaw drivers etc. who could opt to move.
c) Part of the new housing stock would be available as rental accommodation
d) Some of it could be converted to dormitory type facilities for new migrants
e) Part of the new housing stock could be made available for relatively new migrants/ families who have come after 1995 on a rental basis.

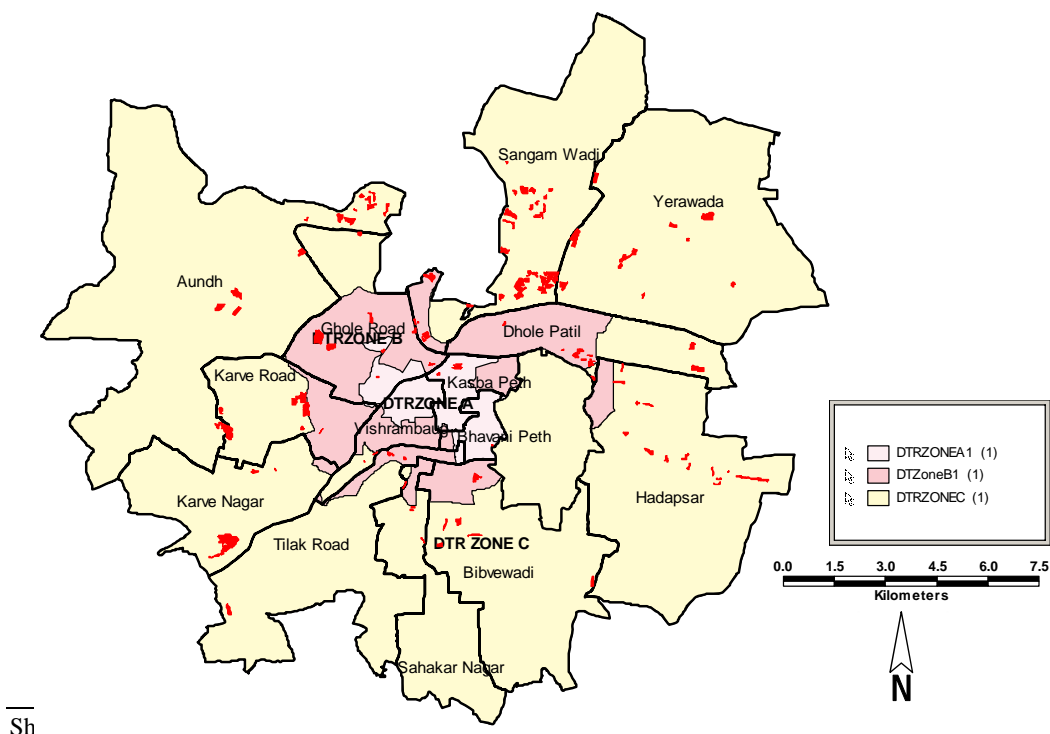**Map 10: Pune city showing slums where an extra housing stock can be created**

Sh_____

Table 7: Extra housing stock created

	Zone A	Zone B	Zone C
Extra Housing stock created zonewise	953	6375	15874

Total extra Housing stock	23202
% extra of total housing	**22.64%**

2. Allow PMC to Redefine Zones with More Precision:

The current rules are based on the division of the city into 3 zones (A, B, C) which go from most developed to least developed. The current rules allow the free sale component that is not used on the redeveloped slum plot itself to be transferred from Zone A to B or C and from Zone B to Zone C. While this made sense when the zones were defined almost 10 years ago, the current ground reality is quite different. There are parts of Zone B and C that are as developed as Zone A (this is reflected in the prevailing land and property values) and thus to allow further loading of these areas would be the same as allowing loading in Zone A (which the rules do not allow). Furthermore, as mentioned earlier, market forces will actually "push" the free sale component into those areas in each zone where the land and property prices are the highest – which is almost always the most developed parts of those zones and the ones that can least accommodate further loading. To rectify this, the SRS rules should allow the following two things:

a. Reclassification by the PMC as to what pockets fall in Zone A, B or C, with the provision that the areas falling into each zone does NOT have to be contiguous. The PMC should be allowed to update this classification every 5 years to keep up with changes in land use and development.

b. Ability of the PMC to charge a "TDR consumption fee" when the free sale component is not used in-situ but is converted to TDR and used elsewhere as per the SRA rules. This "TDR consumption fee" would be charged based on Ready Reckoner value (10% of RR value) and would be used to fund the infrastructure required to meet the increased population load in the area that the TDR generated from slum rehab is used.

3. Change Remuneration System for Slums on Private Land:

The current fixed remuneration system (saleable component of 2.0 or 2.5 or 3.0 times the total built up area of the tenements constructed) should be replaced with a competitive bidding system as follows:

a. Bidding would be based on standardized designs and specifications for both the dwelling units and the buildings these units are within

b. In addition to the existing landowner, developers too would have the right to submit bids for any slum project with the provision however

that the developer would still have to compensate the landowner at Ready Reckoner rate should the developer win the bid for that slum scheme.

    c. The lowest qualified bidder for each slum would be awarded the rehab scheme and landowners would be compensated (if they are not the winning bidder) as per Ready Reckoner rates for the land.

This system would ensure that the city only pays as much as it needs to based on prevailing market conditions at the time that a particular project is implemented under the SRS scheme. This will also ensure that all slums get rehabilitated rather than just those, which are profitable under the current fixed formula system.

The competitive bidding provision already exists for slum rehabilitation schemes on government lands, and what is being suggested is to extend this to slums on private lands as well.

4. Avoid Fragmented Development of Slums:

Each slum community should be rehabilitated as a single community and not a as series of separate developments simply because the land ownership in that slum is divided amongst several owners - which is a common occurrence in PMC and PCMC. In order to achieve this objective, the SRA should have the authority to define the borders, structures and members of each "slum community" and to insist on a single scheme for each such "slum community even if the land ownership of this slum community is split across several owners.

As seen in Dias plot there are 12 landowners and it is necessary to have one single comprehensive plan than a fragmented plan.

Another option to achieve the above objective is for the SRA to acquire the privately owned land on which slums exist through TDR and then develop these slums under the rules framed for slums on government land, which allow for competitive bidding. Landowner compensation in these cases would be based on the Ready Reckoner value. While there is nothing in the rules to prevent the PMC and PCMC from doing this, this should be clearly mentioned as an option in the new rules. This will also require fixing firm guidelines for landowner compensation, which should be linked to Ready Reckoner values.

5. Tenement Size:

Surveys of slums in PMC and PCMC indicate that roughly 65% of people currently have dwellings that are <u>less than</u> the current proposed minimum tenement size (275 square feet built up). Any increase in tenement size would create a corresponding increase in the Free Sale component generated and hence further increase the "development load" in Pune. Instead the rules should be modified to allow beneficiaries to purchase the additional 75 to 100 square feet over and above the 225 sq. ft. from the developer at market rates.

6. Consent Provision:

The prior consent provision, which required 70% consent of the affected slum dwellers – which was intended to protect the interests of the slum dwellers affected by the SRS – has been removed in the new rules because it has not worked as desired. Rather than eliminating the consent provision altogether, we would suggest the following approach:

  a. Eliminate the consent provision where the affected slums are located in eco-sensitive zones or land reserved for public infrastructure or amenities
  b. Consent must be required in any case where slums are not rehabilitated in-situ or beyond 1 km of original residence
  c. Consent for rehabilitation, where required, should be obtained by the SRA and not by a specific developer
  d. Participation of slum dwellers in every stage of the rehabilitation process should be strengthened
  e. Social mobilization should also be made compulsory for all re-development projects and NGO's must be involved in the entire process to ensure beneficiary participation.

7. Impact of a scheme on neighboring areas:

In an SRA scheme due to the commercial development there is likely to be additional load on the infrastructure in the neighboring areas. Before carrying out any commercial development it is necessary to make sure that the infrastructure of that area is capable of handling the extra load that it is going to face.

Graph 9: Comparison of infrastructure burden of different types of development
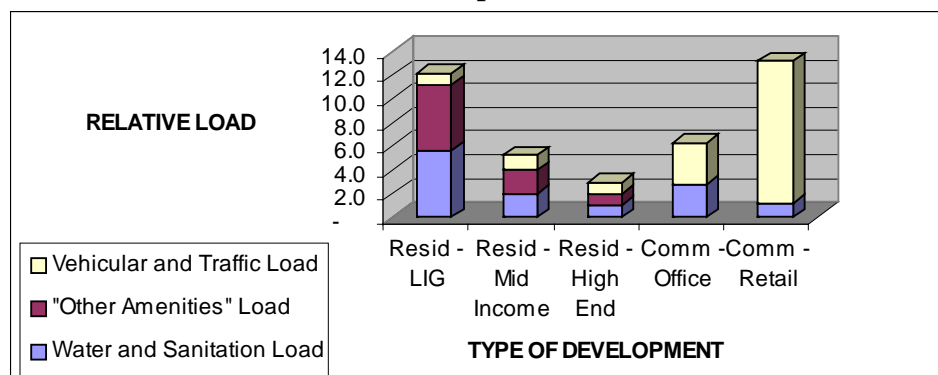
8. Form an independent oversight/feedback committee

An independent oversight committee could be made of experts: architects, urban planners, NGO representatives, regular citizens, and representatives from the slum areas actually impacted by the Slum Rehabilitation Schemes. This could serve as either an oversight committee, or as a feedback mechanism for hearing the objections of particular slum rehabilitation plans. This committee's function would become part of the SRS process, and aid developers and slum dwellers in the planning stages.

The committee's approval would be needed to approve an SRS project. However in disputes, the decision of the CEO would be binding. There could be system of fixed members/experts and a rotating citizen membership base that would consist of people from the slum communities undergoing the slum rehabilitation projects.

An oversight/feedback committee should be included in the drafting of SRA Rules and Regulations to ensure transparency. Clearly devised SRA Rules and Regulations would be needed to successfully achieve oversight, and help set parameters that would minimize manipulation of TDR. A system to enforce the implementation of suggestions from the committee majority must be applied.

9. Judicious use of TDR by local authorities

The TDR is an instrument used by local government bodies primarily for land acquisition. This is especially in case of private land that needs to be acquired for road widening or laying additional infrastructure or for land falling under reservation category. The ULB has devised a system for compensating landowners in such cases using TDR as an instrument for non-monetary transaction. However, as it happened in Mumbai, an indiscriminate release of TDR will result in a glut in the market and cease to serve as an effective instrument to the ULB for acquiring land.

A uniform ratio of giving free sale components and TDR across zones in exchange for slum rehabilitation is illogical. Land costs and densities vary significantly per slum. TDR is a lucrative incentive for developers, which means the process needs more transparency and focus on quality slum projects, affecting the residents for whom these schemes are intended. TDR will likely load development in other city zones. Without comprehensive planning, this negatively impacts already congested areas and burdens already strained transport and infrastructure.

TDR could be granted to landowners to compensate them for land price valued at the rates prescribed in the ready reckoner. The ULB can thereby acquire such land and use JNNURM funds to build for the poor. As seen in the analysis, The TDR required to compensate landowners will be very small compared to the TDR that gets released in the market when developers get involved.

Thus it is important to have a clear rationale guiding the release of TDR. In order to make projects viable, this could be probably linked to realistic parameters like:

- Slum specific tenement densities
- Cost of land (ready reckoner)
- Sale price of commercial areas (ready reckoner)
- Cost of TDR at the time of development

This would give a comprehensive idea of the total cost of the project and the SRA committee could decide on total project costs taking into account reasonable profits for developers and invite competitive bidding at par or below this value.

10. For sites with greater tenement densities, ambiguity regarding the extra FSI given.

For sites with tenement densities between 450 and 550 instead of 2.5 FSI, 2.75 FSI is granted and for sites with tenement densities greater than 550, 3.0 FSI is granted. This extra FSI granted cannot be used on site and is converted to TDR unless the CEO, SRA allows them to use it on site. FSI is normally the amount of built up area one is permitted to build on site but in this case it becomes extra TDR that is released in the open market. This particular point needs to be reviewed, as TDR need not be linked to tenement densities.

6. JNNURM Funding for Slum Rehabilitation
a. Jawaharlal Nehru National Urban Renewal Mission

The Jawaharlal Nehru National Urban Renewal Mission anticipates the large contribution of sustainable urban development in the picture of national success. In order to achieve maximum urban potential, a major investment in infrastructure is seen as necessary to support the economic contribution of large urban populations. The specific mission objectives of JNNURM are:

a) Focused attention to integrated development of infrastructural services in the cities covered under the Mission.
b) Secure effective linkages between asset creation and asset management so that the infrastructural services created in the cities are not only maintained efficiently but also become self-sustaining over time.
c) Ensure adequate investment of funds to fulfill deficiencies in the urban infrastructural services.
d) Planned development of identified cities including peri-urban areas, out growths, urban corridors, so that urbanization takes place in a dispersed manner.
e) Scale up delivery of civic amenities and provision of utilities with emphasis on universal access to urban poor.
f) To take up urban renewal programme, i.e., re-development of inner (old) cities area to reduce congestion.

Within this national vision is the need to link national reform to State and Urban Local Bodies. Within the NURM funding scheme, under the BSUP program, a city must first produce a City Development Plan. The City Development Plan (CDP) is appraised and approved by the Ministry of Urban Development. As per priorities identified by the CDP, Detailed Project Proposals are prepared and submitted to the State Nodal agencies for approval and sanction of the project.

Funding availability

For projects sanctioned under JNNURM, the funding available for cities with a Million plus population such as Pune is 50% from Central government, 20% from State and the remaining 30% must be provided by the Urban Local Body. Central assistance, as aforesaid, would be the maximum assistance available under JNNURM.

One of the major points to be noted under JNNURM Funding is:
The nodal agency will disburse central assistance to ULBs or para-statal agencies as the case may be as soft loan or grant-cum-loan or grant. However, grant-cum-loan may be sanctioned in such a manner that 25% of central and state grant put together is recovered and ploughed into Revolving Fund to leverage market funds for financing of further investment in infrastructure projects. At the end of the Mission period, the Revolving Fund may be graduated to a State Urban Infrastructure Fund.

Thus the funds available are not complete grants and each project would have to develop pay back capabilities to repay the loans it has received.

Reforms

The other important factor under JNNURM is the mandatory and option reforms prescribed for the ULBS. There is a great emphasis laid on sustainability of such reforms, like how to create and then manage assets on local government levels. The national mission finds it important to ensure efficient yet transparent and accountable systems of executing projects, while establishing public-private partnerships.

The mandatory reforms pertaining to the Urban poor to be implemented at the <u>Urban Local Body / Parastatal level Reforms are:</u>

- ❖ Internal earmarking within local body, budgets for basic services to the urban poor.
- ❖ Provision of basic services to urban poor including security of tenure at affordable prices, improved housing, water supply, sanitation and ensuing delivery of other already existing universal services of the Government for education, health and social security.

The optional reforms pertaining to the Urban poor are

- ❖ Earmarking at least 20-25% of developed land in all housing projects (both Public and Private Agencies) for EWS/LIG category with a system of cross subsidization.

Under the broad umbrella of JNNURM the funding for projects are broadly categorized into two heads, those for infrastructure related projects and those for Urban Poor.
Project proposals specifically for the urban poor for Pune have to be submitted under BSUP.

Thus the JNNURM lays the broad outline for comprehensive and integrated development of the city, and developing the overall infrastructure and policies to support the issues of urban poverty alleviation.

b. Basic Services for the Urban Poor (BSUP)

Integrated development is the main thrust of the Basic Services for the Urban Poor (BSUP) JNNURM funding guidelines. The JNNURM BSUP objectives clearly focus on the integrated development of housing, infrastructure, and basic services in the "Mission components."[20] The Mission objectives stated are as below:

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[20] JNNURM Guidelines for Basic Services for the Urban Poor, Ministry of Housing and Urban Poverty Alleviation, December, 2005, Article 7

Of these, Shelter Associates would like to focus on descriptions from the scope and outcome of BSUP guidelines. These are directly applicable for Pune's future slum improvement and rehabilitation projects:

* *Integrated development of slums, through projects for housing, basic services, and other amenities;*
* *City-wide framework for planning and governance;*
* *Community participatory/people-driven approach;*
* *Transparency and accountability in the way local services and governance are conducted*

Slum improvement and rehabilitation programmes should strive to provide houses at costs affordable to the slum dwellers, urban poor, EWS, and LIG categories (7.iii and 7.v.). Additionally, article 4.2 stresses that "care will be taken to see that the urban poor are provided housing near their place of occupation. NURM objectives include security of tenure for slum dwellers, as well as the improvement of housing, sanitation, and water that converges with other basic amenities for education, health, and social security.

"Local services and governance will be conducted in a manner that is transparent and accountable" is stated in "Outcomes" of the JNNURM. Therefore, the national initiative's emphasis on a type of governance that is democratic or accountable to citizens shines forward. Article 4 also mentions the importance of "secure and effective linkages between asset creation and asset management." (4.3) This is to ensure long-term sustainability of renewal projects. In the vein of democratic and transparent local governance, SA logically places asset management within the capacity of the urban poor, by ensuring their education about and participation in urban renewal projects.

JNNURM BSUP guidelines lay significant emphasis upon the reform of urban local governance via Urban Local Bodies (ULBs) to implement the National Renewal Mission. To work effectively with the private sector for the purpose of slum

redevelopment, ULB's, in this case PMC, would need comprehensive strategy and oversight capacities, to ensure the accountability of slum redevelopment to all citizens of Pune, especially the slum dwellers for whom the projects are intended. This approach can apply to SRA projects, which are expected to account for 80% of Pune slum rehabilitation.

The sub-Mission on Basic Services to the Urban Poor will cover the following: -

(a) Admissible components: -
i. Integrated development of slums, i.e., housing and development of infrastructure projects in the slums in the identified cities.
ii. Projects involving development/improvement/maintenance of basic services to the urban poor.
iii. Slum improvement and rehabilitation projects.
iv. Projects on water supply/sewerage/drainage, community toilets/baths, etc.
v. Houses at affordable costs for slum dwellers/ urban poor/EWS/LIG categories.
vi. Construction and improvements of drains/storm water drains.
vii. Environmental improvement of slums and solid waste management.
viii. Street lighting.
ix. Civic amenities, like, community halls, childcare centers, etc.
x. Operation and maintenance of assets created under this component.
xi. Convergence of health, education and social security schemes for the urban poor

NOTE: Land cost will not be financed.

(b) Inadmissible Components
Projects pertaining to the following will not be considered:
i) Power
ii) Telecom
iii) Wage employment programme & staff component
iv) Creation of fresh employment opportunities

NOTE: Detailed Project Reports will have to be prepared by the implementing agencies for funding under the Mission including specific project components, viz, health, education and social security. However, the schemes of health, education and social security will be funded through convergence of schemes and dovetailing of budgetary provisions *available under the programmes of respective sectors* (Health, Human Resource Development, Social Justice and Empowerment and Labor *etc.*). The Ministry of Housing and Urban Poverty Alleviation will also monitor it in so far as urban poor are concerned.

Funding under BSUP

Projects submitted under BSUP by cities like Pune with a million plus population would receive 50 % funding from Central Share and the remaining 50 % has to be from the state/ ULB/ Parastatal share including Beneficiary contribution. Again under BSUP there is a provision for a revolving fund as follows:

Revolving Fund

Under Sub-Mission on Basic Services to the Urban Poor (BSUP), wherever State Level nodal agency releases Central & State funds to the implementing agencies as soft loan or grant-cum-loan, it would ensure that at least 10% of the funds released are recovered and ploughed into the Revolving Fund. This fund will be utilized to meet operation & maintenance expenses of the assets created under the Sub-Mission. At the end of the Mission period, the Revolving Fund may be graduated to State Basic Services to the Urban Poor Fund.

Few other points mentioned regards priorities in funding to note are:

Projects with private sector participation will be given priority over projects to be executed by ULBs/Parastatals themselves, as this will help leverage private capital and bring in efficiency.

The Committee would assign priority in sanctioning projects of housing and development of infrastructure, basic services and other related civic amenities.

In order to enable cities to prepare City Development Plan, Detailed Project Reports (DPRs), training & capacity building, community participation, information, education and communication (IEC), a provision of 5% of the grant (Central & State) or the actual requirement, whichever is less, would be set apart for cities covered under the Mission.

In addition, not more than 5% of the grant (Central and State) or the actual requirement, whichever is less, may be used for Administrative and Other Expenses (A&OE) by the States.

Beneficiary Contribution

BSUP mandates that the State Government should not provide Housing free to the beneficiaries. A minimum of 12% beneficiary contribution should be stipulated, which in the case of SC/ST/BC/OBC/PH and other weaker sections shall be 10%.

c. Pune CDP's action agenda for Urban Poor

Following are excerpts from the Pune CDP regard projects and programs for the urban poor.

6.2.7 Slums and Basic Services for Urban Poor

The requirements in the sector are of immediate priority and hence, the planning horizon for the sector is 2011 and accordingly projects and investments are identified to be funded by 2011-12. A sum of Rs. 78930 lakhs is the investment identified for various slum rehabilitation and improvement projects and for providing basic services to urban poor. As part of the GoM/ PMC's strategy to improve the economic conditions in the slums and thereby erase the word 'slum' from the face of the city of Pune, various development works and improvement programs are being proposed. A sum of Rs. 51750 lakhs is proposed for rehabilitation/ construction of 50,000 dwelling units. Of this PMC proposes to mobilise 10 percent of the cost, i.e., Rs. 5175 lakhs through beneficiary contribution.

A sum of Rs. 1380 lakhs would be required to acquire land for the purpose of rehabilitation. An amount of Rs. 25800 lakhs is the estimated requirement for providing infrastructure facilities at these rehabilitated locations as well as other slum locations in the city. Of the total investment, a sum of Rs. 12900 lakhs is proposed under the Slum Rehabilitation Authority (SRA) Scheme of Government of Maharashtra.

Sector Strategies & Investment Need

Strategy identified	Rehabilitation of slum dwellers currently staying in vulnerable areas and in proposed project locations, in-site improvements and access to basic services and amenities
Expected Outcome	Improvement in quality of services for the urban poor, preservation of sensitive geographies, reduced vulnerability of urban poor
Total Investment Need	**Rs. 78930 lakhs**

Action Plan for Implementation

Slums and Urban Poor		2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
Investment upto 2011-12 (Rs. lakhs)	Rs. 78930 lakhs	19878	23103	28854	3870	3225	-
Capital Facilities	Land acquisition for Slum rehabilitation (non-SRA)	✓	✓	✓			
	Housing and Infrastructure development for Slum rehabilitation (50,000 units)	✓	✓	✓			
	In-site infrastructure development and providing basic services to Urban Poor	✓	✓	✓			
	Slum Development under SRA		✓	✓	✓	✓	
Support & System Sustenance Measures	Inventory and geographical mapping of all slums and infrastructure in slums for PMC and PCMC area	✓	✓				
	Socio-Economic Survey of all slums in PMC and PCMC area	✓	✓				
	Training for women in slums and urban poor towards self-employment and other income generating activities. NGOs and CBOs to play the lead role and PMC/ PCMC shall assume the secondary/ supportive role	✓	✓	✓	✓		
Other	• Take up slum networking involving mapping and integrating slum locations and the						

Slums and Urban Poor		2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
actions/ Measures	natural drainage paths of the town with parks, playgrounds etc. to form a continuous network of green corridor. The approach is to help build infrastructure in an economical way and also target the environmental improvement of the surroundings • Providing for reservation of lands for EWS in or near each type of commercial/ industrial/ residential land use in the development plan • Facilitating access to credit for urban poor. PMC can explore the option of acting as a guarantor. • Registration system for all the workers in the informal sector and creation of a specific cell with facilities and options for insurance, training etc to the workers. • Frequent meetings with slum dwellers towards encouraging participation in slum development programmes, awareness creation on beneficiary contribution to project development and also assuming the responsibility of implementing the projects. • Facilitate and encourage the neighbourhood concept in slums to carry out towards recreational activities such as reading, sports and drama.						
Sector Notes	• Infrastructure and basic services' provision in slums shall not in isolation but in conjunction and in line with overall infrastructure development in the respective city. • Awareness on health and hygiene shall be created among slum dwellers in line with the long term goal of moving towards individual toilets and doing away with public convenience systems.						
Performance Monitoring Indicators	• Road network – Degree of connectivity in terms of per-capita road length (min 0.75 mt) • Road condition - % municipal roads surfaced (100% - CC/ BT surfacing) • Road condition - Roughness (Max. Permissible 2000mm/km); Rutting (20 mm) Max. Permissible (1 %) • Public transport – CIRT norm of 37 buses/ lakh population; > 90% fleet utilisation; Average load factor > 75%						

The CDP has laid down the broad framework of activities that need to be undertaken by PMC to address the issues of urban poor. It does not specify projects of redevelopment. Since then the PMC has developed and has received sanction for seven DPRs for redevelopment of slums and other projects in Pune under the BSUP project.

d. Conclusions

The BSUP funds under the JNNURM have a major potential to serve as a boost for providing housing and basic services for the urban poor. As land costs are not provided, these funds are best suited for redevelopment of slums located on public lands that are within the control of the PMC. On other public lands such as those belonging to Central govt., railways, forestry etc, if land can be procured from them through negotiations by the ULB, these funds can be utilized for redevelopment on site or through relocation for these public lands.

The major component that appears is the component of funding that would come in the form of loans requiring repayment. The projects would thus need to have a mechanism to generate revenues that could be used for repayment of the loans. As 10 % of the funds available from the center and state is the minimum amount to be repaid, and this could increase as per the conditions under which funding is made available.

This revenue would have to be other than that from the beneficiary contributions, as the beneficiary contribution would go towards reducing the project cost.

7. Comparison of SRA & JNNURM

To evolve a comprehensive understanding of the two major programs available for housing the poor a SWOT Analysis of the two has been prepared as below:

a. SWOT Analysis of SRA

Strengths	Opportunities
❖ Effective mechanism for breaking deadlock between private owners and slum-dwellers for development ❖ Effective mechanism of cross subsidy for creating housing for the Urban Poor. ❖ Provides a incentive of FSI and TDR to the Builders (Market) to undertake slum projects ❖ A good mechanism for public private partnership	❖ Can cross subsidize and provide housing for the existing slum dwellers as well as create housing stock for future urban poor. ❖ Amendment to SRA rules can be made to provide builders with a satisfactory profit margin as well as provide better housing to the poor without compromising the interests of the city. ❖ To work out suitable compensation to the land owners to ensure holistic development of slum
Weakness	**Threats**
❖ Participation of slum dwellers not mandated ❖ The fixed ratio of compensation to builders leads to disproportionate release of TDR (or virtual land) in the market at the cost of the city's interest ❖ Current rules are pro- high rise buildings for slum dwellers ❖ Housing is provided free of cost to slum dweller with no beneficiary contribution. ❖ As most slums are on multiple land ownership, there are no rules to ensure holistic development of the slum ❖ No mechanism for compensating land owners ❖ No Master plan of the city in place	❖ The higher F.S.I. allowed for slum redevelopment projects along with TDR facility can lead to higher densities city wide creating a negative impact on the city. ❖ Landowners are not adequately compensated for the land price, in effect on private land it is a loss of landowner, and in case of public land indirectly a loss to the citizens of Pune. ❖ The glut of TDR in the city is likely to defeat the original purpose of use of TDR as an instrument for acquisition of land.

b. SWOT Analysis of JNNURM- BSUP Program for Urban poor

Strengths	Opportunities
❖ A fund/grant that can assist ULBs to bridge the financial gap and provide housing for the poor. ❖ Promotes public participation of the slum dwellers and other citizens ❖ Encourages Transparency and Accountability in its projects ❖ Beneficiaries have to contribute at least 10 % of dwelling cost. ❖ Provides funds for varied projects for urban poor towards housing and basic services. ❖ Encourages Public private partnerships	❖ <u>Innovative approaches and projects for integrated development of the urban poor can be developed and submitted.</u> ❖ Can provide housing for the existing slum dwellers as well as assist ULB to create housing stock and other services for future urban poor. ❖ Creates a Revolving fund that can provide for future programs for the poor.
Weakness	**Threats**
❖ <u>Does not provide for Land cost, so is suited for projects on public lands or where land is available free of cost.</u> ❖ Depends on the ULB to take initiative and submit a project. ❖ The ULB and State has to jointly raise 50% of the project cost. ❖ Scrutiny of DPR's needs improvement??	❖ <u>Minimum 10% of the central and state grant is a loan component, so the project has to develop revenue generating and repayment capacity. The loan component could be higher.</u>

8. Common suggestions for JNNURM and SRA re-development schemes:

1. Tenement Density[21]:

The current rules specify a minimum of 360 units/hectare and allow for tenement density up to 1080 units/hectare. The justification for allowing such high tenement density – which requires tall buildings (G+7 to G+13) - is that it allows for redevelopment of very dense slums or slums on very expensive land where the prospective developer would have to pay a large amount to compensate the owner of the land on which the slum is situated. However given the high prevailing market value of TDR, the maximum tenement density can be reduced to by half to 540 tenements/hectare without compromising the ability to develop slums on expensive lands.

2. High-rise Structures:

Urban Planners recommend the use of FSI restrictions to control the density of people in any given area. Rehabilitation units are small (270 sq ft) and have an average of 5 people per household as opposed to free sale units, which will be 4-5 times larger and have 4-5 people per household. Hence FSI for free sale construction areas can be up to 6 times more. In short, one should build low-rise structures for slum rehabilitation units and high-rise structures for the free sale flats. (G+2 to G+4) rehabilitation projects are considered by experts all over the world to be a more sustainable long-term solution for low-income housing. Also, it is also important to insist on provision for lifts in all structures that are more than G+3 since this is the universally accepted norm for providing a lift.

The current SRA rule allows for building height up to 40 mts. Also 6 storied structures are permitted without lifts.

The city should reconsider the decision of 2.5 FSI for slum projects especially in view of the fact that 40% of the city's population is in slums which occupy less than 5% of the total area of land in the city. Is it necessary to commercially exploit these sites, which raise the height of the SRA component?
As seen in the 3 representative slums, 2 slums can be re-housed on site in G+3 structures if the entire site is available. In slums where tenement densities are very high, slum dwellers can be given the option to relocate to other sites where extra housing stock has been created with slightly larger houses and the remaining dwellers can be housed in a G+3 structure.
Lifts must be introduced in buildings, which are over 4 storied in unavoidable conditions.

The crumbling infrastructure of the cities compound problems for everyone especially the poor as they are worst affected when electricity fails, lifts don't work, and water cannot be pumped. Also it is particularly insensitive to children, pregnant women, sick persons and the old. Hence, commercial development on the same site along with a slum re-hab component should be avoided as far as

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[21] Refer to Urban Layout, Densities and Quality of Urban Life by Shirish Patel - Appendix 7

possible. The city must safeguard the interest of the poor and prevent vertical slums, which would be even more disastrous for the city in future. There are ample evidences of failed projects in Mumbai and Pune.

There have also been a number of studies carried out internationally that prove that high-rise building leads to a higher crime rate than low rise buildings. One of the famous books written on this topic is "Defensible Spaces" by Oscar Newman and the graph below is taken from this book.

[22]**Graph 10: Correlation between crime and increased building height, and that most crime is in interior public spaces.**
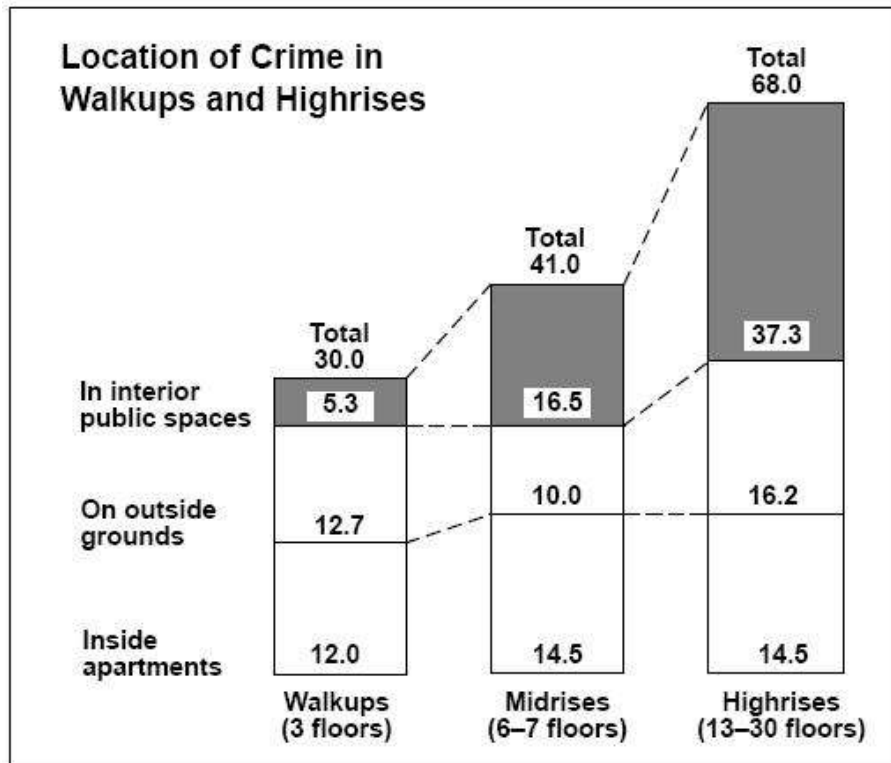
3. Include Post-1995 residents:

Rather than excluding post 1995 slum residents, they should be allowed to participate in the SRS scheme, but not on a totally free basis, as is the case with pre 1995 slum residents. Payment could be based on tenure with those between 1995 and 2000 paying 50% of the cost of the tenement and those between 2001 and 2005 paying 70% of the cost of the tenement. Loans for this would have to be arranged by the ULB. This would allow slum communities to stay together and also reduce resistance to SRA projects by those who would otherwise be excluded from rehabilitation.

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[22] *Extracted from Defensible Spaces by Oscar Newman*

9. Comprehensive Housing Strategies for Pune's Urban Poor.

9.1 Strategies as per Land classification for existing slums:

Existing Scenario as per Land Classification

Currently as per records available from the PMC, the land classification of slums is as given below:

Table 8: Break up of structures based on land classification

Criteria	Total Slums	Structures
Slums on Hill Top & Slope	22	32261
State Govt. Land	124	53537
Govt./privt.	13	5368
Forest	3	1376
Railway	21	8505
Irrigation	13	1158
Defence	3	1440
Private	242	56931
TOTAL	441	160576

Graph 11: Break up of structures based on land classification
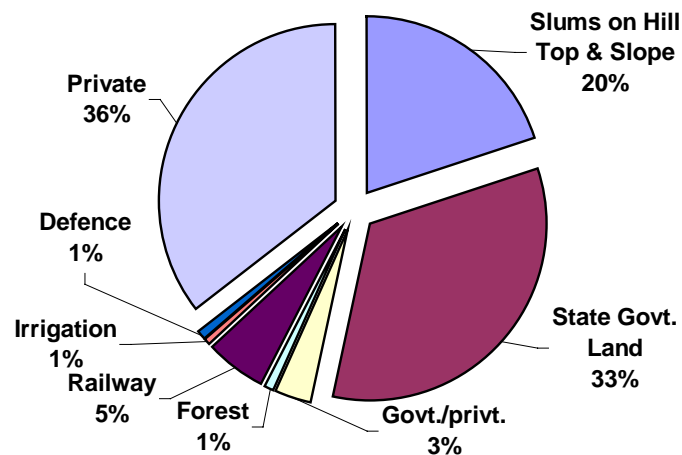
From the pie diagram we observe that 36% of slum households are on private land and 33% of the houses are on state government lands. 20% of the households are on

hill top and hill slopes and the remaining houses are distributed on defense land, irrigation land, railway lands and forest lands.

Map 11: Map of Pune city showing location of slums as per land classifications
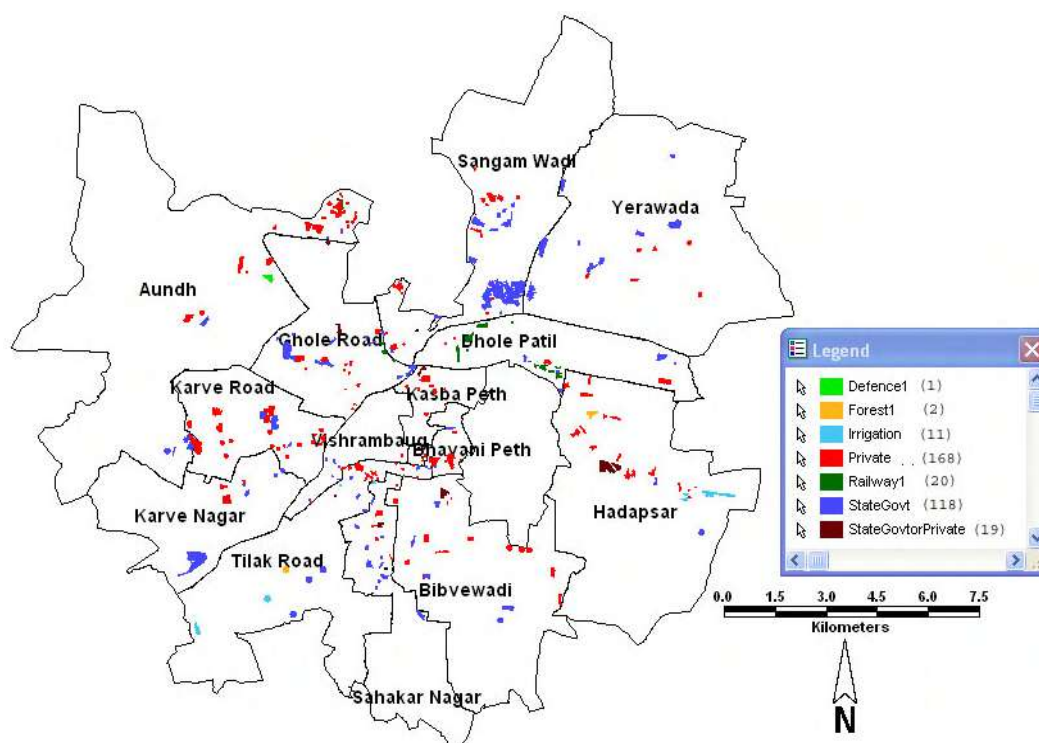
A.   Slums on reservation or vulnerable –

Slums located on vulnerable lands such as nala beds, or riverbanks, and hillsides are prone to natural hazards and calamities. Thus in situ rehabilitation of these slums is not always feasible. For other sites that are also reserved for public purposes or natural resources, in situ rehabilitation is not feasible. These slum dwellers have to be relocated to other sites, where either, the government owns the land or a housing stock has been created through other projects.

SA notes that these types of slums will likely come under **JNNURM** rehabilitation, because it is then purely based upon the relocation of slum dwellers.

B.   Slums located on public (city land) owned by the PMC/PCMC and State Government.

For slums located on public lands the land cost compensation is not an issue, but the purpose for which it has been reserved needs to be duly met too. For such project there are two options;

1. Re-development using JNNURM funding, since the only cost to be born is construction. Under the BSUP Beneficiary contribution of minimum 10% to 25% can

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be collected too. A repayment component for the loan portion through the beneficiaries would have to be developed. JNNURM projects would be preferable in this situation, as it would also curtail the release of TDR in the market.

2. Implementing an SRA project. According to the rules it would be tendered out and awarded to the most competent bidder. Here too, it should be made mandatory for the slum dwellers to contribute at least 10% of the total cost.

C.   Slums on private land.

For Slums on private land, cost of land is an additional factor, as the land owners need to be adequately compensated. Here there could be 4 approaches:

1. Compensating the land owner by awarding him TDR based on Ready Reckoner basis and then applying for JNNURM funds for rehabilitation,

2. Through an SRA project which would be linked to realistic parameters like:
   - Slum specific tenement densities
   - Cost of land (ready reckoner)
   - Sale price of commercial areas (ready reckoner)
   - Market value of TDR at that time

This would give a realistic estimate of the total cost of the project. The SRA can then fix the ceiling cost by including a reasonable percentage of profit and invite builders to bid at par or below this ceiling cost.

3. By tendering out the projects and choosing the most reasonable bidder under SRA.

4. If the slum overall is in good condition then the entire slum need not be demolished but partially redeveloped and services and infrastructure could be upgraded. Again here JNNURM funds could be sought or the ULB can undertake such projects through its slum improvement funds and through beneficiary contributions. Our studies have revealed that there are quite a few slums in Pune, which are reasonably well serviced. Families have invested considerably in their existing houses, often adding an extra floor on top for use. In such cases, it might be prudent to strengthen existing infrastructure and work out ways in which secure tenure could be granted to the families. Just like it is mandatory for the families to contribute a certain percentage towards the construction of new tenements, it should be mandatory for families to pay a certain percentage of the cost of land where tenure is being granted by the local body. However care must be taken to ensure that such consolidated slums have arterial roads, which are wide enough for fire engines to reach affected areas quickly. In order to create this access, it might be necessary to realign some of the houses thus leading to a partial redevelopment of the slum.

D.   Slums falling under central government land.

It is imperative to work out tenure issues for these, as there has been an inflexible attitude of Central government regarding land release for their rehabilitation.

Applying the above mentioned housing strategies as per the land classifications the possible scenarios are:

Table 9: Possible scenarios as per land classifications

	Type of Land ownership	Total Households	Housing Strategy
1.	Hazardous and	32261	JNNURM funding and relocation to extra stock created through other programs
2.	State Government land	53537	JNNURM funding and relocation to extra stock created through other programs
3.	Private land	56931	SRA, JNNURM, Combination of SRA & JNNURM, ULB's Slum Improvement Funds & Beneficiary contributions
4.	Pvt./public land	5368	JNNURM- private landowner to be compensated by awarding TDR, Combination of SRA & JNNURM,
5.	Central Govt. Land	11321	If land is not made available- Relocation as per in vulnerable lands, if land is made available - JNNURM funds can be procured.

Graph 12 : Possible scenarios as per land classifications

Government
44%
Can be done
under JNNURM

Private
36%

Hill tops and hill
slopes
20%
Under way
under JNNURM
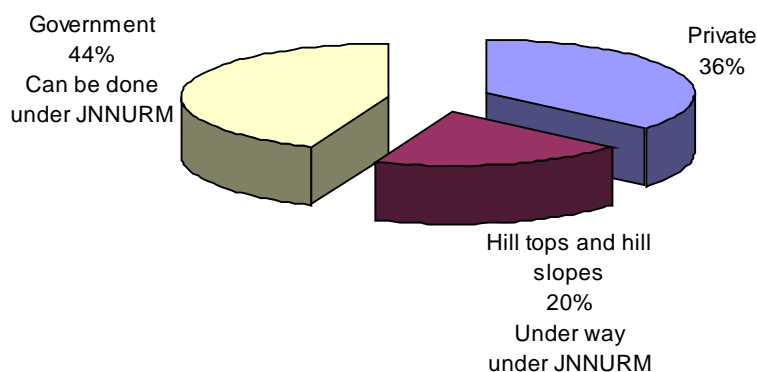
9.2 Generating Housing stock to meet the housing needs of future urban poor.

To generate a housing stock the ULB has to take proactive measures and evolve a system for managing the resources for providing for the future. A few recommended measures requiring policy level interventions and those mandated as reforms in JNNURM are as follows:

- ❖ Internal earmarking within local body, budgets for basic services to the urban poor.
- ❖ Earmarking at least 20-25% of developed land in all housing projects (both Public and Private Agencies) for EWS/LIG category with a system of cross subsidization.
- ❖ Reservation of land in the newly incorporated areas and while preparing a DP for EWS section housing and identifying appropriate funding mechanism for land acquisition and housing construction.

10. Summary of recommendations

❖ There should not be varying policies for re habilitating the poor in the city.
  - o Under JNNURM the beneficiaries are expected to contribute 10% to 12% of the cost of constructing their house whereas under SRA the houses are provided to the poor completely free.
  - o Also under JNNURM schemes it is mandatory to involve the beneficiaries in the entire process of rehabilitation whereas for SRA the beneficiaries' consent is not necessary. Also there is no provision in the rules to mandate their participation

❖ On Government owned land, the city should apply for JNNURM funds for in-situ rehabilitation, which would eliminate the need for releasing any TDR for development.

❖ The state could draw up a policy of compensating landowners by using TDR just as it does for acquiring reservation land or land which is needed for road widening. It is important to note here that the largest contributors to the SRA projects are the landowners and the city. The ULB should give this due consideration and arrive at a reasonable method of compensating the landowner.
Often several persons own the plots that have been encroached by the slum dwellers. This creates obstacles in developing a comprehensive plan for all families on that site leading to piecemeal development. It would be prudent to compensate all the landowners with TDR and appoint a single contractor/developer to develop the site.

❖ As is evident from our study, the current zoning and the related ratios, fail to address the tremendous variation in cost of land and tenement densities that occur in slum settlements across the zones. To make the projects viable for all, it would be desirable to tie every project to local parameters like tenement density and cost prevalent on that site. The FSI/ TDR could be worked out accordingly by ensuring that profit margins are kept within reasonable limits.

❖ Instead of the CEO of SRA making the decisions, a committee comprising PMC and PCMC municipal commissioners, MHADA CEO, NGOs/citizens/housing experts who are well versed with this issue and CEO SRA could make decisions on awarding the project. The ultimate authority can be vested with the CEO.

❖ The beneficiary families must contribute at least 20% -25% of the total cost. Our studies in Pune have shown that it is quite possible for families to service an interest in the range of Rs.500- Rs.1000 per month. Financing institutions must be linked to the projects right at the outset and the ULB must become guarantors for these loans.

Tenement size:
The study clearly demonstrates that as the size of tenements increase there is a substantial increase in TDR released under the present SRA rules. The tenement size could be increased but only 225 sq. ft of the tenement should be given free to the slum dwellers. The difference in area could be bought by the slum dwellers as per the

existing market rates. This will provide an opportunity for some of the dwellers to opt for larger area tenements.

- Loans for the poor should be tied in by negotiating with apex housing funding agencies at the outset.

❖ **Consent of the slums dwellers**

As the rules stand now it is mandatory for the slum dwellers to participate in the SRA scheme. A participatory approach will lead to a more sustainable project. Mechanisms need to be created which would allow all stakeholders to meet regularly to work out issues, which cause impediments, and bring transparency in the system. This would also help avoid victimization of stakeholders by vested interests.

❖ **Impact of High-rise rehab schemes on a slum site.**

High-rise buildings are very energy intensive. The crumbling infrastructure of the cities compound problems for especially the poor as they are worst affected when lifts don't work, electricity fails and water cannot be pumped up apart from being very hard on children and the old. The decision not to provide lifts up to six storied buildings is rather insensitive coupled with the decision to raise the maximum height to 40 meters.

As seen in the 3 representative slums, 2 slums can be re-housed on site in a G+3 structure if there is no commercial development allowed. On sites where the tenement densities are very high, slum dwellers can be given the option to relocate to other sites where extra housing stock has been created and the remaining dwellers can be housed in a G+3 structure. Hence, commercial development on the same site along with a slum re-hab component should be avoided as far as possible. *It would be prudent to note here that 40% of the city's population is in slums, which occupies less than 5% of the total land in the city. Hence commercial development in these pockets could be avoided altogether.* The city must safeguard the interest of the poor and prevent vertical slums, which would be more disastrous for the city in future. There are ample evidences of failed projects worldwide.

❖ **Create a menu of options for the poor concerning their own rehabilitation**

Making user-friendly, low-rise (G+3) housing is not easy, but with comprehensive planning for the city, it is feasible. G+3 housing design will also bring down city congestion and be more sustainable in the long-term.

Also, giving slum dwellers incentives to choose themselves for relocation, by offering them slightly larger tenements in other zones, makes for a smooth transition that is participatory and people-driven. SA believes that as long as the slums are well networked to transport and city's infrastructure, the larger houses will be an incentive for families to move, thereby decongesting some of the high-density areas especially in city center. The analysis of a lakh household already shows that it is possible to create a 22% extra housing stock spread over the zones.

❖ **Look comprehensively at housing strategies for the poor**

Innovating site-specific designs with sight on city planning will not only increase sustainable slum redevelopment, but also show how it is possible to comprehensively plan for commercial development and some necessary relocation of slum residents.

Since Pune's long-term development is in the interest of the general public, they must be informed about the implications of TDR. The first step would be a clear presentation of the SRA rules and its members. The public must understand the consequences of the system. Slum rehabilitation should not become a private pact between private developers and government officials.

With a transparent and unified system, credible arguments against a SRS have a chance to come forward. For instance, it is important that slum dwellers themselves have the actual ability to affect their own slum rehabilitation by either giving majority consent or through a formal feedback mechanism, such as an independent oversight committee.

Consent or formal feedback provides checks and balances to the current system, and makes it a participatory, people-driven approach. In order to avoid undue delays, timely information about the schemes is required and adds anyway to the long-term success of the projects. The harrowing experiences that developers may have faced in such projects (where the projects were held to ransom by vested interest of local slumlords/ politics) will also get a fair chance/hearing when all stakeholders come on board and there is sufficient transparency.

Transport and infrastructure implications of TDR and specific slum rehabilitation schemes must be studied and taken into consideration for each individual slum site. It should be mandatory for such studies to be submitted for each project where slum or other TDR is being used elsewhere in the city. Only after a thorough scrutiny of the impact of such projects on the neighborhood, and steps taken by the developer to alleviate the problems, should the authorities clear them.

With a reference to parameters for citywide slum redevelopment, it is possible to look at Pune and other urban areas comprehensively and find out how numerous SRS's would affect the landscape, aesthetic, and quality of life.

The comprehensive housing strategy for Pune's Urban Poor has to address two issues. Firstly to provide legal tenure and housing units to the urban poor already residing in the slums of Pune and secondly to generate a housing stock or resources to provide for the future urban poor's housing needs.

The JNNURM-BSUP and SRA are the two major programs that are being utilized and combinations of these with certain other incentives have been utilized to develop a comprehensive housing strategy. The SRA rules should be modified to

ensure that the burden on the city is minimized in its efforts to provide a holistic development to its poor.

Appendix 1

Appendix 2

Appendix 3

Cost analysis of Lohiya Nagar, Dandekar Pul 130 and Kasturba Gandhi Vasahat (built up area 25 sq. m.)

Sr.No.	Item	Zone A Lohiya Nagar	Zone B Dandekar Pul 130	Zone C Kasturba Gandhi
1	Total Plot Area	60718	35283	21628
2	Net Plot Area	54646.2	31754.7	19465.2
3	No of Slum tenaments on site (min 360 tene/hectare)	3240	1440	780
4	Gross built up area per tnmnt	25	25	25
5	total rehabilitation construction	81000	36000	19500
6	Built up Ratio (FAR) permitted in proportion to rehabilitation area	2.00	2.50	3.00
7	Built up Area with respect to zone ratio	162000	90000	58500
8	Gross Built up Area I.e Rehab + Addl built up.	243000	126000	78000
9	On site FSI allowed	2.5	2.5	2.5
10	On site B/up area allowed (sale + rehab)	136616	79387	48663
11	Possible sale component for construction on site	55616	43387	29163
12	Surplus (overflow) sale b/u area converted in TDR	106385	46613	29337
	Total b/u sanctioned for the scheme			
1	Rehabilitation	81000	36000	19500
2	Sale	55616	43387	29163
3	TDR	106385	46613	29337
4	Total	243000	126000	78000
	FSI Sanctioned			
1	Rehabilitation	1.48	1.13	1.00
2	Sale	1.02	1.37	1.50
3	TDR generated over and above 2.5 FSI	1.95	1.47	1.51
4	Total	4.45	3.97	4.01

	Cost incurred and Returns from the Scheme.			
1	Area of the Land	60718	35283	21628
2	Land Cost per Sq.Mtr.	5200	9600	4400
3	Total Land Cost (according to ready reckoner)	315733600	338716800	95163200
4	Transit Cost per tenement for 2 years for the existing tenements	50000	50000	50000
5	Transit Cost for 2 years for all the existing tenements	162000000	72000000	39000000
6	Total Area of Rehab. Component	81000	36000	19500
7	Cost of Construction per Sq. Ft. of Rehab. Component	9000	9000	9000
8	Total Construction Cost of Rehab. Component	729000000	324000000	175500000
9	Total Cost of Rehab. Component including land n transit cost	1206733600	734716800	309663200
10	Total Area of Sale Component	55616	43387	29163
11	Cost of Construction per Sq. Mtr. of Sale Component	15000	15000	15000
12	Total Cost of construction of Sale Component	834232500	650801250	437445000
13	Sale cost of Constructed area per Sq. mtr. of Sale Component	30000	30000	30000
14	Total Returns from constructed Sale Component	1668465000	1301602500	874890000
15	Total Net profit from constructed Sale Component	834232500	650801250	437445000
16	Total TDR released in Market (sq.mts)	106385	46613	29337
17	Cost of TDR per Sq. mts	35000	35000	25000
18	Total Net profit from Sale of TDR Component	3723457500	1631463750	733425000
19	Extra TDR generated as per tenemenr density	13662	0	0
20	Total Cost of extra TDR	478154250	0	0

21	Total Revenue generated by Builder	5870076750	2933066250	1608315000
22	Cost incurred Rehab+sale component+transit accomodation+land cost	2,040,966,100	1,385,518,050	747,108,200
23	If FSI 2.5 is completely built, TDR released in market zonewise (sqmts.)	120046	46613	29337
24	Value of TDR released	4201611750	1631463750	733425000
25	Value of TDR released + profit made from commercial sale	5035844250	2282265000	1170870000
26	If builder chooses not to exploit commercial component, then TDR (sq.mts)	175662	90000	58500
27	Value of TDR released	6148154250	3150000000	1462500000

Appendix 4

Cost analysis of Lohiya Nagar, Dandekar Pul 130 and Kasturba Gandhi Vasahat (built up area 35 sq. m.)

Sr.No.	Item	Zone A Lohiya Nagar	Zone B Dandekar Pul 130	Zone C Kasturba Gandhi
1	Total Plot Area	60718	35283	21628
2	Net Plot Area	54646.2	31754.7	19465.2
3	No of Slum tenaments on site (min 360 tene/hectare)	3240	1440	780
4	Gross built up area per tnmnt	35	35	35
5	total rehabilitation construction	113400	50400	27300
6	Built up Ratio (FAR) permitted in proportion to rehabilitation area	2.00	2.50	3.00
7	Built up Area with respect to zone ratio	226800	126000	81900
8	Gross Built up Area I.e Rehab + Addl built up.	340200	176400	109200
9	On site FSI allowed	2.5	2.5	2.5
10	On site B/up area allowed (sale + rehab)	136616	79387	48663
11	Possible sale component for construction on site	23216	28987	21363
12	Surplus (overflow) sale b/u area converted in TDR	203585	97013	60537
	Total b/u sanctioned for the scheme			
1	Rehabilitation	113400	50400	27300
2	Sale	23216	28987	21363
3	TDR	203585	97013	60537
4	Total	340200	176400	109200
	FSI Sanctioned			
1	Rehabilitation	2.08	1.59	1.40
2	Sale	0.42	0.91	1.10
3	TDR generated over and above 2.5 FSI	3.73	3.06	3.11
4	Total	6.23	5.56	5.61
	Cost incurred and Returns from the Scheme.			

1	Area of the Land	60718	35283	21628
2	Land Cost per Sq.Mtr.	5200	9600	4400
3	Total Land Cost (according to ready reckoner)	315733600	338716800	95163200
4	Transit Cost per tenement for 2 years for the existing tenements	50000	50000	50000
5	Transit Cost for 2 years for all the existing tenements	162000000	72000000	39000000
6	Total Area of Rehab. Component	113400	50400	27300
7	Cost of Construction per Sq. Ft. of Rehab. Component	9000	9000	9000
8	Total Construction Cost of Rehab. Component	1020600000	453600000	245700000
9	Total Cost of Rehab. Component including land n transit cost	1498333600	864316800	379863200
10	Total Area of Sale Component	23216	28987	21363
11	Cost of Construction per Sq. Mtr. of Sale Component	15000	15000	15000
12	Total Cost of construction of Sale Component	348232500	434801250	320445000
13	Sale cost of Constructed area per Sq. mtr. of Sale Component	30000	30000	30000
14	Total Returns from constructed Sale Component	696465000	869602500	640890000
15	Total Net profit from constructed Sale Component	348232500	434801250	320445000
16	Total TDR released in Market (sq.mts)	203585	97013	60537
17	Cost of TDR per Sq. mts	35000	35000	25000
18	Total Net profit from Sale of TDR Component	7125457500	3395463750	1513425000
19	Extra TDR generated as per tenemenr density	13662	0	0
20	Total Cost of extra TDR	478154250	0	0
21	Total Revenue generated by Builder	8300076750	4265066250	2154315000

22	Cost incurred Rehab+sale component+transit accomodation+land cost	1,846,566,100	1,299,118,050	700,308,200
23	If FSI 2.5 is completely built, TDR released in market zonewise (sqmts.)	217246	97013	60537
24	Value of TDR released	7603611750	3395463750	1513425000
25	Value of TDR released + profit made from commercial sale	7951844250	3830265000	1833870000
26	If builder chooses not to exploit commercial component, then TDR (sq.mts)	240462	126000	81900
27	Value of TDR released	8416154250	4410000000	2047500000

Appendix 5

Cost analysis of slums in Pune City (built up area 25 sq. m.)

Sr.No.	Item	Zone A Zone A, 13 slums	Zone B Zone B, 55 slums	Zone C Zone C, 145 slums
1	Total Plot Area	160079	762540	2007978
2	Net Plot Area	144071.1	686286	1807180.2
3	No of Slum tenaments on site (min 360 tene/hectare)	11556	30243	60662
4	Gross built up area per tnmnt	25	25	25
5	total rehabilitation construction	288900	756075	1516550
6	Built up Ratio (FAR) permitted in proportion to rehabilitation area	2.00	2.50	3.00
7	Built up Area with respect to zone ratio	577800	1890188	4549650
8	Gross Built up Area I.e Rehab + Addl built up.	866700	2646263	6066200
9	On site FSI allowed	2.5	2.5	2.5
10	On site B/up area allowed (sale + rehab)	360178	1715715	4517951
11	Possible sale component for construction on site	71278	959640	3001401
12	Surplus (overflow) sale b/u area converted in TDR	506522	930548	1548250
	Total b/u sanctioned for the scheme			
1	Rehabilitation	288900	756075	1516550
2	Sale	71278	959640	3001401
3	TDR	506522	930548	1548250
4	Total	866700	2646263	6066200
	FSI Sanctioned			
1	Rehabilitation	2.01	1.10	0.84
2	Sale	0.49	1.40	1.66
3	TDR generated over and above 2.5 FSI	3.52	1.36	0.86
4	Total	6.02	3.86	3.36

	Cost incurred and Returns from the Scheme.			
1	Area of the Land	160079	762540	2007978
2				
3	Total Land Cost (according to ready reckoner)	1797077800	6763805400	12925419800
4	Transit Cost per tenement for 2 years for the existing tenements	50000	50000	50000
5	Transit Cost for 2 years for all the existing tenements	577800000	1512150000	3033100000
6	Total Area of Rehab. Component	288900	756075	1516550
7	Cost of Construction per Sq. Ft. of Rehab. Component	9000	9000	9000
8	Total Construction Cost of Rehab. Component	2600100000	6804675000	13648950000
9	Total Cost of Rehab. Component including land n transit cost	4974977800	15080630400	29607469800
10	Total Area of Sale Component	71278	959640	3001401
11	Cost of Construction per Sq. Mtr. of Sale Component	15000	15000	15000
12	Total Cost of construction of Sale Component	1069166250	14394600000	45021007500
13	Sale cost of Constructed area per Sq. mtr. of Sale Component	30000	30000	30000
14	Total Returns from constructed Sale Component	2138332500	28789200000	90042015000
15	Total Net profit from constructed Sale Component	1069166250	14394600000	45021007500

16	Total TDR released in Market (sq.mts)	506522	930548	1548250
17	Cost of TDR per Sq. mts	35000	35000	25000
18	Total Net profit from Sale of TDR Component	17728278750	32569162500	38706237500
19	Extra TDR generated as per tenemenr density	0	0	0
20	Total Cost of extra TDR	0	0	0
21	Total Revenue generated by Builder	19866611250	61358362500	128748252500
22	Cost incurred Rehab+sale component+transit accomodation+land cost	6,044,144,050	29,475,230,400	74,628,477,300
23	If FSI 2.5 is completely built, TDR released in market zonewise (sqmts.)	506522	930548	1548250
24	Value of TDR released	17728278750	32569162500	38706237500
25	Value of TDR released + profit made from commercial sale	18797445000	46963762500	83727245000
26	If builder chooses not to exploit commercial component, then TDR (sq.mts)	577800	1890188	4549650
27	Value of TDR released	20223000000	66156562500	113,741,250,000

Appendix 6

Cost analysis of slums in Pune City (built up area 35 sq. m.)

Sr.No.	Item	Zone A Zone A, 13 slums	Zone B Zone B, 55 slums	Zone C Zone C, 145 slums
1	Total Plot Area	160079	762540	2007978
2	Net Plot Area	144071.1	686286	1807180.2
3	No of Slum tenaments on site (min 360 tene/hectare)	11556	30243	60662
4	Gross built up area per tnmnt	35	35	35
5	total rehabilitation construction	404460	1058505	2123170
6	Built up Ratio (FAR) permitted in proportion to rehabilitation area	2.00	2.50	3.00
7	Built up Area with respect to zone ratio	808920	2646263	6369510
8	Gross Built up Area I.e Rehab + Addl built up.	1213380	3704768	8492680
9	On site FSI allowed	2.5	2.5	2.5
10	On site B/up area allowed (sale + rehab)	360178	1715715	4517951
11	Possible sale component for construction on site	-44282	657210	2394781
12	Surplus (overflow) sale b/u area converted in TDR	853202	1989053	3974730
	Total b/u sanctioned for the scheme			
1	Rehabilitation	404460	1058505	2123170
2	Sale	-44282	657210	2394781
3	TDR	853202	1989053	3974730
4	Total	1213380	3704768	8492680
	FSI Sanctioned			
1	Rehabilitation	2.81	1.54	1.17
2	Sale	-0.31	0.96	1.33
3	TDR generated over and above 2.5 FSI	5.92	2.90	2.20
4	Total	8.42	5.40	4.70

	Cost incurred and Returns from the Scheme.			
1	Area of the Land	160079	762540	2007978
2				
3	Total Land Cost (according to ready reckoner)	1797077800	6763805400	12925419800
4	Transit Cost per tenement for 2 years for the existing tenements	50000	50000	50000
5	Transit Cost for 2 years for all the existing tenements	577800000	1512150000	3033100000
6	Total Area of Rehab. Component	404460	1058505	2123170
7	Cost of Construction per Sq. Ft. of Rehab. Component	9000	9000	9000
8	Total Construction Cost of Rehab. Component	3640140000	9526545000	19108530000
9	Total Cost of Rehab. Component including land n transit cost	6015017800	17802500400	35067049800
10	Total Area of Sale Component	-44282	657210	2394781
11	Cost of Construction per Sq. Mtr. of Sale Component	15000	15000	15000
12	Total Cost of construction of Sale Component	-664233750	9858150000	35921707500
13	Sale cost of Constructed area per Sq. mtr. of Sale Component	30000	30000	30000
14	Total Returns from constructed Sale Component	-1328467500	19716300000	71843415000
15	Total Net profit from constructed Sale Component	-664233750	9858150000	35921707500

16	Total TDR released in Market (sq.mts)	853202	1989053	3974730
17	Cost of TDR per Sq. mts	35000	35000	25000
18	Total Net profit from Sale of TDR Component	29862078750	69616837500	99368237500
19	Extra TDR generated as per tenemenr density	0	0	0
20	Total Cost of extra TDR	0	0	0
21	Total Revenue generated by Builder	28533611250	89333137500	171211652500
22	Cost incurred Rehab+sale component+transit accomodation+land cost	5,350,784,050	27,660,650,400	70,988,757,300
23	If FSI 2.5 is completely built, TDR released in market zonewise (sqmts.)	853202	1989053	3974730
24	Value of TDR released	29862078750	69616837500	99368237500
25	Value of TDR released + profit made from commercial sale	29197845000	79474987500	135289945000
26	If builder chooses not to exploit commercial component, then TDR (sq.mts)	808920	2646263	6369510
27	Value of TDR released	28312200000	92619187500	159,237,750,000

Appendix 7

Urban Layouts, Densities and the Quality of Urban Life

Urban planning in Mumbai has been systematically dismantled over the last few decades by successive regimes in Maharashtra. The planners themselves are not clear about the space needed for public uses. Hence, when they talk about turning Mumbai into Shanghai, they are only considering an increase in the floor space index but not the public areas. This study introduces two new concepts to help understand and evaluate urban layouts: the public ground area per capita and the buildable plot ratio. Using these concepts, it analyses how the variations of the configuration of private and public spaces affect densities and the working of urban areas. The paper also disagrees with the proposed government policy for Dharavi of resettling slum-dwellers in situ, in free housing paid for by new occupants in additional floor space on the same site.

SHIRISH B PATEL, ALPA SHETH, NEHA PANCHAL

The government of Maharashtra (GoM) plans to redevelop Mumbai's Dharavi, Asia's largest slum. It also plans to further intensify occupation in Mumbai by increasing the floor space index (FSI). It was decided many years ago that the minimum amount of residential floor space should be 5 sqm per capita (25sqm built-up area (BUA) for a family of five members) by stipulating this as the minimum size of apartment in its slum rehabilitation schemes. What has never been specified is how much space there should be per capita outside the house. In particular, how much area per capita do we need for roads and footpaths, schools and hospitals – never mind playgrounds and recreation spaces which are being steadily nibbled away in Mumbai. Urban planners themselves are not clear about the space needed for public uses. In any case they are in serious disarray since the entire process of urban planning has been systematically dismantled over the years by GoM.

This study introduces two new concepts to help understand and evaluate urban layouts: the public ground area (PGA) per capita and the buildable plot ratio (BPR). We examine the relationship between six parameters: the public ground areas needed per capita for roads, footpaths and public amenities; the BUA of floor space consumed per capita for homes or jobs; the proportion of exploitable, buildable plot areas to the whole area of a locality (BPR); both net and gross densities; and FSI. The relationship between these is expressed in general terms. But their particular values can also be extracted and compared for different, existing localities around the world. Hopefully, this will lead to conclusions about the range of values within which each parameter must fall to achieve a desired quality of urban life. And these parameters can also be examined in the context of any specific proposal, such as that being put forward for Dharavi, to see how well or badly each such new proposal compares with other areas already existing in other cities where the level of comfort or congestion is already known.

I

Every person living in an urban area experiences a variety of spaces. We place these in three categories:

(a) *Private spaces*: This includes home, which means spaces private to one's family and friends; and includes shared private spaces which one shares with one's neighbours. These may be built-up (staircases, landings) or open (the compound of one's building). The usefulness of the open space for the occupants of the building varies depending on the shape of the space, and whether parking in it is allowed or not. When you have the "island" kind of layout, where the building forms an island on the plot and the open space is all around the perimeter, if parking is allowed and the perimeter is essentially the driveway, the common private open space is of little use to the residents except as a parking facility. If you have a "courtyard" type of layout, where the built form encloses a large enough courtyard, this can form a useful common space for interaction between residents, particularly if vehicles are not allowed in the courtyard. We also include in the count of private spaces any areas that are semi-private, like clubs or restricted-access swimming pools, which represent space shared with friends and like-minded people.

So private space may be either built-up or open to sky, and with varying degrees of privacy.

(b) *Public spaces*: These are shared with a wider public, people one does not necessarily know. Here the spaces may be one of the following: (i) Built-up spaces, for hospitals, schools, police stations, the fire brigade, electric sub-stations and other common amenities; (ii) open for recreation (parks and playgrounds); (iii) open for pedestrian circulation (footpaths); (iv) open and reserved for bicycles (bicycle paths); (v) open for vehicular circulation (local roads); and (vi) open for parking.

So here again, as with private space, public spaces may be either built-up or open to sky.

(c) *Arterial transport spaces*: These are the transport arterials of the city, and include railway tracks and stations, expressways or arterial roads and busways. Some roads may be partly arterial (carrying the through traffic) and partly local (including for local circulation, side parking and footpaths). For such a road, normally one would assume one lane on either side as being for local circulation. If side parking is allowed, another lane is excluded, from one or both sides as the case may be. The rest of the road width is arterial transport space.

Arterial transport spaces may or may not be open to sky. Underground railway systems in particular add a network of transport services below the ground in multiple levels in a form which facilitates crossings. Above ground also transit spaces can be in multiple levels; witness the spaghettis of flyovers we see in so many cities.

Our interest for the moment is in the configuration of private and public spaces, and how variations in these affect densities and the working of the urban area. The relationship with transport spaces is a separate matter with its own complexities which we will not deal with here. Transport spaces eventually translate into transport capacities. All we note in passing is that transport capacities are related to the numbers of persons to be carried, and therefore, to densities (persons per square kilometre) in the areas served.

We should also note that urban planning and in particular, planning of particular urban layouts when we get down to detailed area planning, is concerned with precisely this relationship between private and public spaces; and that the various kinds of controls imposed on development on the private plots, whether by way of FSI or otherwise, are intended to control the densities in the area.

II
Private Spaces

The amount of built-up floor space consumed per capita will vary from one country to another, and within a city will vary from one locality to another depending on what people in that locality can afford.

Table 1 shows the built-up area for some localities in Manhattan, New Delhi and Mumbai's Island City for which we have been able to obtain information. For Mumbai the ranges of BUA for residential and commercial use are quite similar. If we assume the two are identical, the average works out to 7.5 sqm per resident and per job. The lowest value is about 2.5 sqm per resident and per job in parts of the G/North Ward (which includes Dharavi).

One important caveat needs to be recorded here. This is that in calculating the foregoing parameter of BUA per capita we are assuming that all the population in a locality is housed in built-up residential or mixed-use accommodation in the locality. No account is taken of the area occupied by those residing in the commercial or industrial or institutional buildings, because this information is not available. The error on this account may be trivial, but we should note that it is in the direction of under-estimating the residential BUA per capita. More serious, however (again, for want of information), is the exclusion of the BUA of slums. In Mumbai, with half the population resident in slums, this could lead to a serious underestimation of the residential BUA per capita. If, for example, we were to assume that a slum home occupies 10 sqm for a family of five members, that is, 2 sqm per person, and that the Island City has a slum population of 50 per cent, the figures for BUA would go up by 1 sqm per capita on the average, with a higher number for those localities that have a larger-than-average slum population.

For Manhattan we should note that the BUA is 63.7 sqm per capita, nearly nine times the average for Mumbai. When our politicians justify increasing the FSI in Mumbai by comparing it to New York, we need to remind them of the comparative contexts and the very different requirements of floor space per capita. For the same level of crowding, New York's FSIs of eight

and 11 need to be divided by nine to arrive at the values that would correspond to Mumbai's much lower level of floor consumption per capita.

III
Public Spaces

Residents in a city need a variety of spaces whose use they share with other, unknown members of the public. These include space for: (i) common amenities, (ii) recreation, and (iii) foot-paths, roads and public parking.

We collectively call such spaces PGA. It would seem the notion of PGA per capita is a new concept, being mooted here for the first time. We find it particularly interesting and useful.

Let us first look at some planning standards for an idea of what the PGA per capita for common amenities only should ideally be. This is exclusive of amenities on common private spaces, and strictly restricted to spaces shared with the general public.

Table 1: Built-up Area (BUA) Per Capita

Locality	Area Ha	Residential BUA sqm Per Capita	Commercial BUA sqm Per Job
New York[5]			
CD-5 (Manhattan Midtown, the CBD, primarily commercial)	423.5	67.3	32.1
CD-8 (upper east side, primarily residential, the most crowded in Manhattan)	512.9	63.7	42.5
New Delhi[6]			
Sundernagar, Bapa Nagar and Kaka Nagar	45.4	98	na
Gol Market	328	21.7	na
Raghubir Nagar and Vishal Enclave	375	25.2	na
Lajpatnagar	143	18.3	na
Mumbai[7]			
A-South	334.7	5.8-6.28	8.5-9.9
A-Mid	345.1	19.6-29.06	10.1-12.2
A-North	245.8	6.3-25.08	3.2-5.3
B	246.3	1.5-10.78	20.8-53.5
C	212.6	1.4-11.25	3.9-23.4
D-East	210.1	3.7-11.79	1.8-10.6
D-West	261.9	25.7-29.72	4.4-25.6
D-North	260.8	13.7-19.17	3.9-20.2
E-East	229.2	13.3-21.84	23.9-40.9
E-Mid	242.8	4.0-7.43	5.7-20.6
E_West	204.5	4.6-7.63	1.9-7.3
F/South-W	210.1	5.9-9.53	1.9-8.1
F/South-NE	157.6	5.0-5.78	4.8-7.6
F/South-SE	336.5	2.9-4.42	10.3-15.7
F/South-NW	150.6	4.5-7.73	4.7-13.9
F/North-NW	474.8	15.1-19.64	4.5-15.7
F/North-E	412.5	4.3-5.27	3.8-10.2
F/North-S	295.4	4.1-5.22	3.9-10.4
G/North-N	239.1	1.7-2.43	0.4-5.0
G/North-SE	214.9	2.8-4.32	0.6-2.6
G/North-W	277.7	6.2-10.57	1.5-9.0
G/South-N	290.7	6.3-8.69	1.7-4.0
G/South-E	287.8	3.5-5.94	2.7-5.9
G/South-W	300.6	4.8-6.34	9.4-12.8
Island City (sum of the above)	6442.1	5.8-9.62	4.2-10.2

Notes: 1 The entries for Mumbai show two numbers bracketing a range for the values of residential BUA/resident and commercial BUA/job. The reason is that the information available on BUA in each locality is for residential buildings, commercial buildings, and "mixed residential + commercial". In such mixed-use buildings the exact proportion between the two uses is unknown. So we have taken such buildings as either entirely residential or entirely commercial. In both cases this provides the upper value of the range of BUA. The lower value of the range excludes all mixed-use buildings.
2 Mumbai's municipal wards are in some cases too large for analysis of the type shown above to be useful. They have, therefore, been broken up into smaller units of roughly 2-3 sq km in area each (see map).

Map Showing Subdivision of Mumbai's Wards

The information is in Table 2. It will be seen that if we exclude the area to be provided for sports activities, by Indian standards, the area for common amenities works out to about 10 sqm of ground area per capita.

In regard to the community open spaces (recreation areas), the standards vary widely. The international norm is four acres per 1,000 population, equivalent to 16 sqm per person. The National Building Code specifies a minimum of 3 sqm per person (for low income housing), in addition to 3 sqm per capita for sports, making 6 sqm in all. The Urban Development Plans Formulations and Implementation Guidelines[1] specifies 13 sqm. The total, for amenities plus public recreation areas would thus be 10+6 = 16 sqm per capita according to the National Building Code for low income housing, and 10 +13 = 23 sqm per capita according to the UDPFI.

Finally, what is the area needed per capita for roads and footpaths? Obviously, this will depend on car ownership and on whether public parking is allowed on the streets or not. It will also depend on whether part of the road surface is to be taken out of the reckoning as belonging properly instead to what we call "transit space", that is, used by traffic going through the locality to destinations beyond. Our question here is, what is the footpath space we need per capita, and what is the road space per capita (excluding transit space) needed for circulation and separately for public parking? Oddly enough, it seems urban planners have never explicitly addressed this question. Transportation planners can tell you footpath and road capacities in terms of throughput per metre width, with different values for one-way and two-way movements, but not how wide the footpaths or roads

need to be to adequately serve a specified number of residents or job holders in the area.

For the information we need, we must, therefore, turn to an examination of existing localities around the world. We try to select crowded localities, and determine for each the physical characteristics that interest us. The information we have been able to collect is shown in Table 3.

In Mumbai's Island City, we notice that 'A-South' has very low PGA. This is a peculiar ward with extensive military installations. There is much free space within the compounds, and much of military life is lived entirely within these large private open spaces. Elsewhere, we notice that the road and footpath space is least in 'C' Ward of Mumbai at 3 sqm per capita, whereas the average for the whole of the Island City is over 6 sqm for roads and footpaths alone. Amenity and open spaces for the Island City are abominably poor and total less than 2 sqm per capita, whereas by any reasonable standard as seen earlier the figure on these two accounts alone should be not less than 16 sqm.

In Manhattan, we see that road and footpath space in the worst districts is in excess of 7 sqm per capita, with an average of 11.42 sqm. Note that Manhattan is served by a subway railway system, and hence, while car ownership may be higher, the pressure on roads and footpaths is correspondingly reduced. If we consider total PGA, Mumbai's daytime worst of 2.59 sqm per occupant in G/South-N is the same as Manhattan's worst in CD-5 (2.6 sqm), and Mumbai Island's daytime average of 6.46 sqm is twice as bad as Manhattan's average (13.4 sqm).

We have no details for Shanghai, but a recent paper[2] reports an increase between 1990 and 2003 in private living space from 6.6 sqm to 13.8 sqm per capita, in green space from 1.02 sqm to 9.16 sqm, and in road space from 2.28 sqm to 12.3 sqm. That is, excluding the PGA for amenities for which we have no information, the PGA for roads, footpaths and open spaces is 21.46 sqm per capita, not far from New York's night-time average of 24.4 sqm, and over 2.6 times Mumbai's night-time average of 8.19 sqm. When our politicians talk glibly of turning Mumbai into Shanghai, has anyone heard them say anything about increasing public areas? The only talk is of raising FSI. That, as we shall see, by adding numbers to the population will only reduce the PGA per capita and make living conditions outside the house even worse than they are already.

Table 2: Standards for Common Public Amenities

Standards for	National Building Code of India 2005 m^2/capita	UDPFI# Guidelines, August 1996 m^2/capita
Education	5.13	5.29
Healthcare facilities	2.07	0.84
Socio-cultural facilities	0.59	0.56
Distribution services	0.04	0.04*
Police, civil defence and home guards	0.436	0.37
Fire	0.08	0.05
Telephone, telegraphs, postal and banking	0.1	0.1*
Shopping	1.41	1.9
Religious activity	0.5	
Electrical sub-station	0.17	0.17*
Transport	0.11	0.11*
Cremation/burial ground	0.13	0.13*
Total for common public amenities excluding open recreation spaces:	10.266	9.56
Sports activity	3.0	
Open space (for LIG housing)	3.0	

Notes: # UDPFI = see note 1.
   * Guesswork.

So what is the minimum PGA we should provide when we re-plan an area like Dharavi? Notice that we are not aiming at raising standards to a new level, as we would, if we were serious about emulating Shanghai. We are seeking a rock-bottom minimum for acceptable livability of permanent reconstruction. From a review of what exists elsewhere, it would seem we should provide not less than 3 sqm per capita for roads and footpaths (excluding transit space), and an additional 2 sqm per capita on the ground for common amenities. Zero for recreation. So this is not an ideal. It is a lower limit we should not transgress: a total PGA of 5 sqm per capita.

IV
Buildable Plot Ratio

How a city is laid out when it first starts affects the way it works forever thereafter – unless, as with Baron Haussmann supported by Napoleon in the middle of the 19th century an old city like Paris can be blasted through to make way for wider boulevards and a completely changed new layout. The Harappan cities were carefully laid out, but not, as far as we know, ever recast along altered lines. Their gridiron plan had a fundamental logic that many subsequently founded cities have instinctively adopted, most notably Manhattan when it was first laid out in the early 19th century. Here too there has been no change, no departure from the early layout. The temporary city of the Kumbh Mela is also laid out every 12 years in the dry bed of the Ganges at Allahabad on a gridiron plan: the area is divided into compounds, within which people build their ground-floor accommodation, either tents or shacks, which open onto streets that emerge onto still wider streets that lead to the pontoon bridges that connect to the banks of the river.

What interests us here is not the particular pattern of the layout, whether gridiron or not, but the proportion of the total area that is devoted to living accommodation as compared to the proportion that is devoted to circulation, plus the proportion that is devoted to any other public use, such as a temple or a kitchen and dining area for free meals in the Kumbh Mela, or a hospital

Table 3: Public Ground Area (PGA) in Different Localities in Different Cities

City and Locality	Area Ha	Public Amenities (sqm per resident)	Open Spaces (sqm per resident)	Roads and Footpaths (sqm per resident)	Total PGA (sqm per resident, night-time)	Total PGA (sqm per occupant, day-time)
New York (Manhattan)						
(Wall Street) CD1	445.3	40.6	3.3	32.0	76.0	6.5
(Greenwich Village) CD2	402.1	7.3	0.7	16.0	24.0	13.4
(Lower East Side) CD3	456	3.1	3.0	8.7	14.8	19.0
(Chelsea) CD4	591.9	18.4	6.5	21.1	46.0	23.5
(Midtown) CD5	462.5	6.9	10.9	35.6	53.3	2.6
(East Midtown) CD6	386.8	4.1	3.0	8.7	15.8	11.5
(Upper West Side) CD7	596.9	3.1	6.8	7.1	16.9	23.3
(Upper East Side) CD8	560.1	3.0	2.6	7.5	13.1	13.2
(West Harlem) CD9	426.1	5.9	7.5	13.8	27.2	31.8
(Central Harlem) CD10	397.4	3.7	4.3	12.1	20.1	24.2
(East Harlem) CD11	627.3	6.5	23.5	7.3	37.3	39.1
(Washington Heights) CD12	763.5	3.6	13.4	9.8	26.8	33.5
Total (including Central Park)*	6,116	5.8	7.2	11.4	24.4	13.4
New Delhi						
Lajpatnagar	143				6.5	
Gol Market	328				33.4	
Raghubir Nagar and Vishal Enclave	375				19.91	
Sunder Nagar, Kaka Nagar and Bapa Nagar	45.4				111	
Mumbai (Island City)						
A-South	334.7	0.09	0.75	2.89	3.74	3.94
A-Mid	345.1	1.10	7.84	32.65	41.59	8.06
A-North	245.8	2.86	11.42	46.71	61.00	6.36
B	246.3	0.09	0.12	11.82	12.03	13.20
C	212.6	0.09	0.28	3.01	3.39	2.99
D-East	210.1	0.15	0.07	3.69	3.91	2.54
D-West	261.9	0.25	2.08	5.13	7.46	9.13
D-North	260.8	0.35	0.49	3.24	4.08	4.25
E-East	229.2	0.30	3.04	23.83	27.16	24.09
E-Mid	242.8	0.54	1.48	3.43	5.45	6.34
E-West	204.5	0.48	0.18	4.96	5.63	4.74
F/South-W	210.1	0.89	0.47	7.06	8.42	6.89
F/South-NE	157.6	0.31	0.09	9.14	9.54	10.41
F/South-SE	336.5	0.61	0.21	11.11	11.93	13.06
F/South-NW	150.6	0.63	0.78	3.55	4.97	5.08
F/North-NW	474.8	1.21	1.47	10.58	13.26	12.91
F/North-E	412.5	4.94	0.04	4.09	9.07	11.64
F/North-S	295.4	4.04	0.46	7.32	11.82	14.87
G/North-N	239.1	0.23	0.36	3.40	3.99	5.09
G/North-SE	214.9	0.21	0.14	4.79	5.13	3.69
G/North-W	277.7	0.33	0.98	5.30	6.61	5.46
G/South-N	290.7	0.48	0.28	3.50	4.26	2.59
G/South-E	287.8	0.22	0.13	4.10	4.45	3.16
G/South-W	300.6	5.54	4.17	11.05	20.77	19.01
Island City Total:	6442	0.96	0.85	6.38	8.19	6.46

Notes: * The area of Central Park has been distributed proportionately among the surrounding districts that touch it (CD4 to CD11).
  1 The last column shows total PGA per daytime occupant. The ratio between this value and the total PGA per night-time resident will be the same for total PGA as well as for the individual constituents of PGA.
  2 The footpath and road space in each locality have been computed assuming that nothing is to be removed to account for transit space. This is not correct, and more precise work would require this adjustment.

or school or park in a built city. We call this the buildable plot ratio (BPR). Included in the area of buildable plots are all plots on which residential or commercial or industrial or mixed-use activity is permitted. Excluded are roads and footpaths, parks and playgrounds as well as plots that accommodate a public service such as fire services or police stations or hospitals or schools, even if such public services are profit-making. The BPR also is a concept that has been developed for this study.

The comparison of different localities is shown in Table 4.

New York's most crowded localities are said to be CD-5 (Midtown), which is the central business district, and CD-8 (Upper East Side) which is one of its most crowded residential areas. Both have a BPR of just under 54 per cent, whereas the average for all Manhattan is just over 41 per cent. New Delhi, for the four localities for which we have information, has values ranging from 40 per cent for the swanky areas of Sunder Nagar, Kaka Nagar and Bapa Nagar, to 69 per cent for the much more crowded Lajpatnagar. Mumbai's average for the Island City is nearly 63 per cent, with the more crowded areas at over 78 per cent. So Mumbai's average as well as its highest BPR values are about one and a half times Manhattan's corresponding figures. Why the higher values of BPR should give a greater sense of crowding will become clearer in the subsequent sections.

Table 4: Buildable Plot Ratio (BPR) in Different Localities

City and Locality	Buildable Plot Ratio (Per Cent)
New York Manhattan	
CD1	41.3
CD2	44.4
CD3	46.5
CD4	34.9
CD5	53.8
CD6	48.6
CD7	44.8
CD8	53.9
CD9	31.3
CD10	50.0
CD11	32.7
CD12	26.8
Manhattan Total	41.2
New Delhi	
Lajpatnagar	69
Gol Market	49
Raghubir Nagar and Vishal Enclave	54
Sundar Nagar, Kaka Nagar and Bapa Nagar	40
Mumbai	
A-South	88.9
A-Mid	35.2
A-North	24.5
B	46.1
C	67.7
D-East	69.6
D-West	76.2
D-North	78.4
E-East	71.7
E-Mid	61.7
E_West	52.7
F/South-W	59.8
F/South-NE	55.8
F/South-SE	74.0
F/South-NW	71.4
F/North-NW	62.8
F/North-E	62.8
F/North-S	49.5
G/North-N	71.4
G/North-SE	66.7
G/North-W	61.9
G/South-N	78.8
G/South-E	75.0
G/South-W	38.6
Island City	62.6

V
Floor Space Index

The FSI, called the floor area ratio (FAR) in most cities, is the ratio of built-up floor space on a plot to the total area of the plot. The FSI applicable to plots in a locality is often specified as part of the building control regulations, and can be strictly controlled. It is an important instrument in defining the amount of floor space that can be built in a locality, which therefore, indirectly, controls the number of people who can live or work there. It does not have to be uniform across all plots in the locality, but often is in India, usually out of laziness on the part of the urban planner (or, possibly, because the functions of the urban planner have been pre-empted and taken over by a bureaucracy that loves the blanket uniformity of rules). Uniform FSI across large urban tracts leads to a monotony of the urban landscape which is both deadening and completely unnecessary.

Table 5 compares FSI in various localities around the world. Notice that the residential floor space consumed in Mumbai's
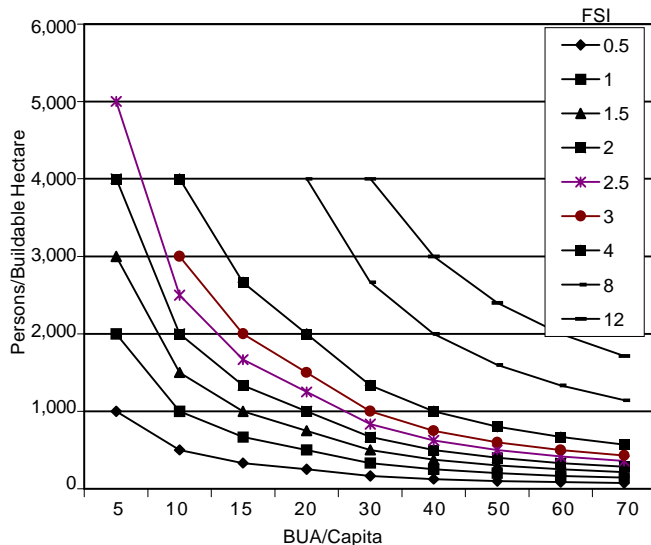
Table 5: FSI is in Various Localities around the World

City and Locality	FSI	Residential Floor Consumption (sqm per capita)	Commercial Floor Consumption (sqm per capita)
New York Manhattan			
CD-5 residential	11	67.3	
CD-5 commercial	17		32.1
CD-8 residential	7	63.7	
CD-8 commercial	8		42.5
New Delhi	(Actual values)		
Lajpatnagar	1.5 to 3	18.3	
Gol Market	0.74 (permissible 1.5)	21.7	
Raghubir Nagar and Vishal Enclave	2.25 (max)	25.2	
Sundar Nagar, Kaka Nagar and Bapa Nagar	0.7	98	
Mumbai			
A-South	0.72	6.04	9.2
A-Mid	3.83	24.33	11.2
A-North	4.31	15.69	4.33
B	1.81	6.14	37.2
C	2.08	6.13	13.7
D-East	1.78	7.75	6.2
D-West	1.36	27.71	15.0
D-North	1.55	16.44	12.2
E-East	0.63	17.57	32.4
E-Mid	1.43	5,72	13.2
E_West	2.02	6.12	4.6
F/South-W	1.53	6.12	5.0
F/South-NE	0.87	5.39	6.2
F/South-SE	0.28	3.71	13.0
F/South-NW	0.94	6.12	9.3
F/North-NW	1.14	17.37	10.1
F/North-E	0.49	4.78	7.0
F/North-S	0.67	4.66	7.2
G/North-N	0.32	2.07	2.7
G/North-SE	1.18	3.56	1.6
G/North-W	1.30	8.38	5.3
G/South-N	0.87	7.50	2.9
G/South-E	1.21	4.72	4.3
G/South-W	0.99	5.57	11.1
Island City	1.21	7.71	7.2

Notes: 1 For Mumbai, the FSI values are for total built floor space, for all uses. The floor consumption per capita (BUA/capita) is the average residential value for the locality assuming (arbitrarily) that 50 per cent of the "mixed residential and commercial" floor space is residential and 50 per cent is commercial.
2 Mumbai currently has FSI limits of 1.33 in the Island City and 1.0 in the suburbs. The FSI values shown for some parts of the Island City are higher than the current limit of 1.33 for historic reasons – these are parts of the old city that were built up before the limit of 1.33 came into force (partly in 1964, fully in 1971).

Figure 2:

Plot Area = 1 Hectare
Buildable ratio 50 per cent
Footprint = 33 per cent
of plot

PGA = 5 sqm per capita
BUA = 5 sqm per capita
1 cylinder = one family of five

50 per cent

50 per cent

3 Floors
Plot FSI = 1.0
Global FSI = 0.5

Population = 1,000
Net Density = 2,000 persons/ha
Gross Density = 1,000 persons/ha

Island City averages 7.71 sqm per capita; in Manhattan for the two districts for which we have information, CD-5 and CD-8, it ranges from 63.7 sqm to 67.3 sqm per capita, that is, eight and a half times higher than Mumbai's. No wonder Manhattan needs higher FSIs, in the range of 7 to 17 as compared to Mumbai Island City's average of 1.2.

We now turn to the relationship between the various parameters we have looked at so far: the private space, expressed as the BUA per capita; the public space, expressed as the PGA per capita; the buildable plot ratios (BPR); and FSI. To interconnect these and study their inter-relationships we find we need one additional pair of parameters and these relate to densities.

VI
Densities

Densities in an urban area are expressed as the number of persons/sq km of the locality, or a hundredth of that, which is persons/ha, a smaller and less of a mouthful of a number. It will be different at night, when only the residential population of the locality is present (night-time densities), and in the daytime when job-holders and visitors (including shoppers) will be added but some of the residents may be out of the locality (daytime densities). Densities can be expressed as overall or gross or global densities, that is, over the entire area of the locality; or they can be densities on the buildable plot areas, sometimes called net densities. For residential localities the night-time density is often expressed as dwelling units per hectare (DU/ha), because this is a parameter that could be controlled by building regulations, and this again can be DU/gross hectare, or DU/ buildable hectare. Multiplying it by the average size of household for any locality gives a reasonable indication of residential people density in that locality. Much of the confusion in understanding the urban planning arises from this plethora of descriptive parameters.

Let us begin by looking at Figure 1 that relates net density (persons per buildable hectare), FSI and the BUA per capita:

We notice straight away for that for any given net density, say 2,000 persons per buildable hectare, if the BUA is 5 sqm/capita we need an FSI of only 1.0. This is a point on the extreme left
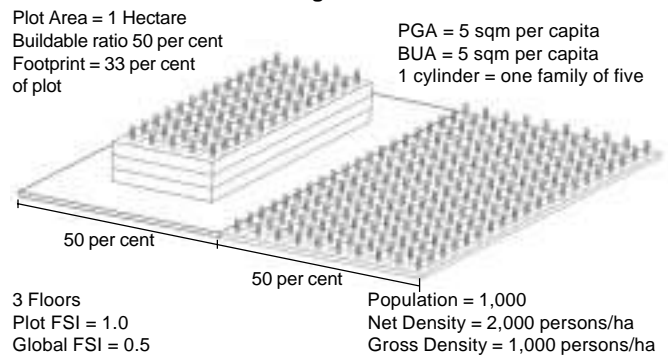
of the graph. Consider a 1-hectare buildable plot. With 2,000 people living on it, at 5 sqm/person they will require a built-up area of 10,000 sqm, which is the area of the plot (FSI 1.0). If the footprint of the building were to occupy a third of the plot (a common practice), then everyone could be accommodated in a G+2 building.

However, if the people in that city required 65 sqm/capita of accommodation, as they do in Manhattan, for a density of 2,000 persons per net buildable hectare you would be at a point near the extreme right of the graph. You would need to build 1,33,000 sqm, to do which you would need an FSI of 13.3. On a one-third of the plot footprint that would mean a building of 40 floors.

Figures 2 and 3 illustrate these examples.

In both cases the net density of 2,000 persons per buildable hectare is exactly the same. That is, the crowding on the ground, when people are outside their plots, would be the same, although in one case people are living in G+2 buildings, and in the other case, they are living in buildings of 40 floors. The difference is that in one case they have apartments whose size is 5 sqm per capita (Mumbai), and in the other case 65 sqm per capita (Manhattan).

Now let us look at Figure 4 that relates net density (persons per buildable hectare), the PGA per capita and the BPR:
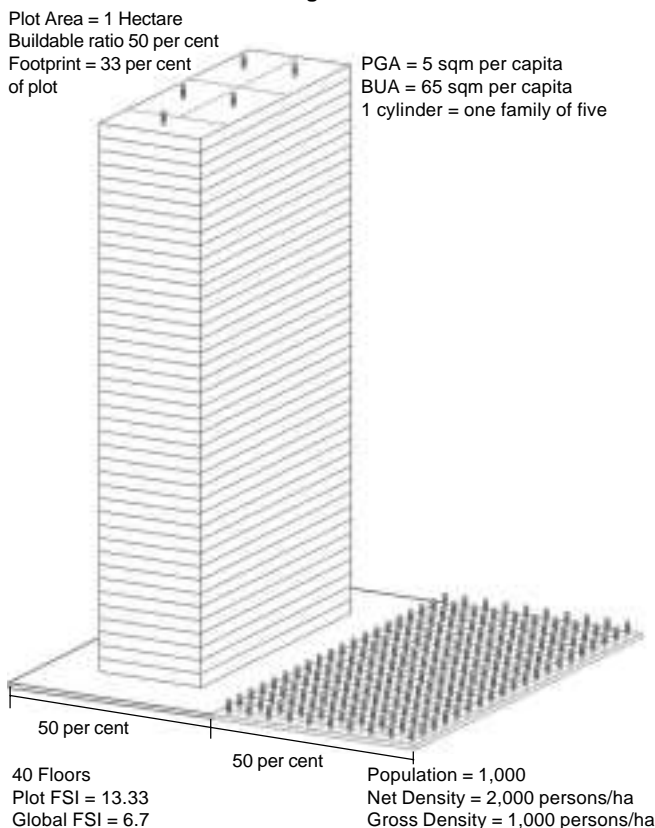
We see from Figure 4 that for any given net density, say 2,000 persons per buildable hectare, if we want to enjoy a higher PGA per capita we have to reduce the BPR. If the PGA per capita is to be as low as 5 sqm, the rock-bottom minimum we prescribed above for Mumbai, then for 2,000 persons per buildable hectare we need a BPR of 50 per cent – that is, one hectare of PGA (devoted to roads and public amenities, with zero for open spaces) for every hectare of buildable plot area. If we want still higher densities we have no option but to further reduce the BPR, to 40 per cent (for 3,000 persons per buildable hectare) or 30 per cent (for 4,666 persons per buildable hectare). The higher net densities will, of course, require higher FSI (Figure 1), and hence taller buildings.

Table 6 sets out densities in various localities in Manhattan, New Delhi and Mumbai.

In Figure 5, note that the Y-axis of net densities of persons per buildable hectare can be trivially converted to net dwelling units per hectare (Du/ha) using the information appropriate to the city. Mumbai has an average of five persons per DU, New York's Community District 8 has 1.78 persons per DU.[3] When comparing localities in different cities, it is useful to look at DU/ha, not just FSI.

Finally, let us look at gross densities – that is, persons per overall hectare, including the buildable plots, the roads, the public

Figure 3:

Plot Area = 1 Hectare
Buildable ratio 50 per cent
Footprint = 33 per cent
of plot

PGA = 5 sqm per capita
BUA = 65 sqm per capita
1 cylinder = one family of five

50 per cent

50 per cent

40 Floors
Plot FSI = 13.33
Global FSI = 6.7

Population = 1,000
Net Density = 2,000 persons/ha
Gross Density = 1,000 persons/ha

Figure 4: Net Density Depends on Public Ground Area (PGA)
(Sqm/Capita)

Figure 5: Dwelling Units (DU)/Buildable Plot Hectare

amenities and the open spaces (but excluding transit spaces). This figure is important because it determines urban travel demand as well as its geographical spread. We want to know in particular whether there is an upper limit on the number of people that can live and work in a fixed amount of land area – a question incidentally that the judges of Mumbai's High Court have asked but which no one has answered: what is the "carrying capacity" of the city?

On Figure 6 can be seen spots that correspond to particular localities in particular cities. All are localities that are a few square kilometres in size – that is, each locality is large enough that it should have its proper share of schools, medical facilities, recreation spaces and all other amenities.

A, B and C wards and Charkop are in Mumbai. The Sunder Nagar spot incorporates Kaka Nagar and Bapa Nagar. Raghubir Nagar in Delhi includes Vishal Enclave.

In addition, shown on the graph are horizontal lines that correspond to the densest localities in Tokyo (Nakano-ku), New York (Upper East Side, also called CD8), Hong Kong (Kwun Tong) and Shanghai (Nanshi). The exact spots for Tokyo's, Hong Kong's and Shanghai's worst localities will fall somewhere on the corresponding horizontal line, depending on more precise information regarding buildable plot ratios (this information is currently not available to the authors). Dharavi is in Mumbai, reputedly Asia's largest slum, and here again while redevelopment is in the offing there is no information as to what the buildable plot ratio will be. Notice that Dharavi's reconstruction is being planned for night-time densities that are more than double anything so far experienced anywhere in the world.
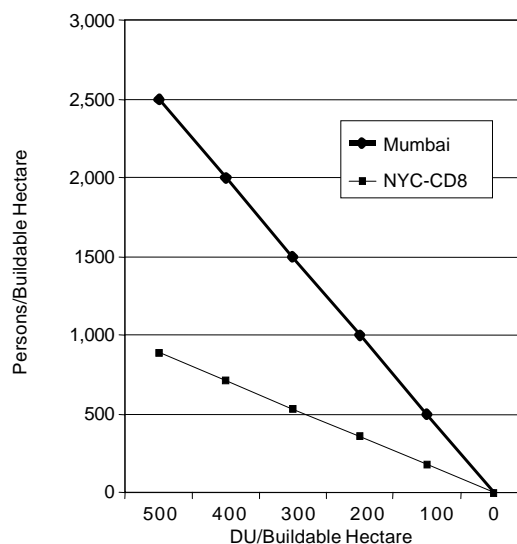
The relationship between buildable plot ratio and gross density is linear. The surprising feature is that because PGA per capita is the determining constraint, densities fall as the buildable ratio increases. This seems counter-intuitive: one might normally expect that the more area there is for building on, the more people you can have in the locality, but the opposite is true. This will become clearer from the diagrams that follow. Note that jacking up the FSI does not help. It puts too many people on the plot, with a consequent unacceptable fall in the PGA per capita. An increased FSI only helps if the number of people remains the same, but each consumes more floor space. This is useful for individuals (if they can afford the extra floor space) but it cannot raise the densities in the area.

Figures I.1 to I.6 in Annexure 1 illustrate a variety of development possibilities for different values of PGA and BUA per capita.

Figure 6: BPR and PGA Determine Gross Densities
Gross Density Depends on Public Ground Area (PGA) sqm/capita

Delhi Lajpatnagar
Delhi Gol Market
Delhi Raghubir Nagar
Delhi Sunder Nagar
New York-CD5 night-time
New York-CD5 daytime
New York-CD8
Mumbai A-mid night-time
Mumbai A-mid day-time
Mumbai B Ward
Mumbai C Ward
Mumbai Charkop
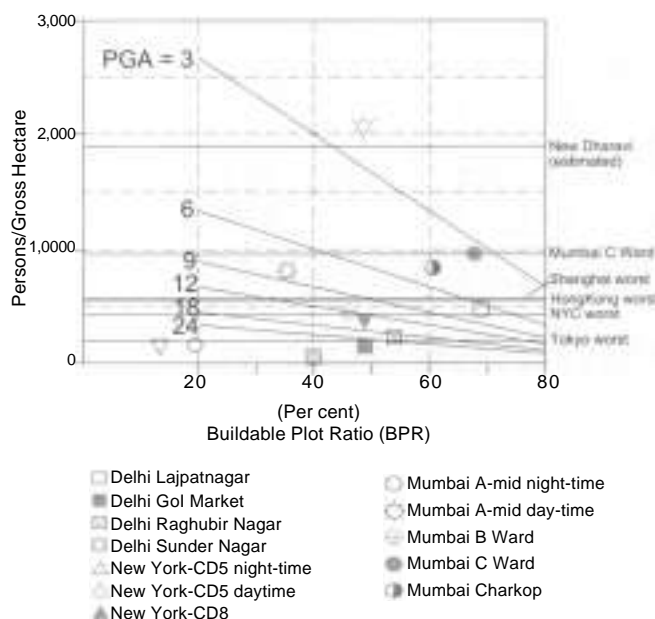
The interesting information we can extract from Figure 6 is that if we adhere to a minimum PGA value of 6 sqm per capita, (that is, our rock-bottom minimum of 5 sqm as set out above + 1 sqm per capita for recreation), and a low BPR of 40 per cent – anything less would make for a strange-looking city, but perhaps, that is what the future holds – we find the gross density is 1,000 persons per hectare, or 1,00,000 per sqkm. This is probably the limit of "carrying capacity". And to this, of course, must be added any transit spaces we need for the city – the area occupied by such transit spaces is extra.

VII
Dharavi

From Figure 1 we find that to get 2,500 persons per buildable hectare on the plots (corresponding in Mumbai at five persons per household to 500 DU/ha, the maximum permissible by the National Building Code) we need an FSI of less than 1.5. A higher FSI is meaningful only if the amount of floor space consumed per capita increases to 10 sqm or 15 sqm. Given levels of affordability in Mumbai, this seems unrealistic.

This apparently startling result, that we can accommodate a low-income population in a high-density settlement with an FSI below 1.5, should be confirmed with an independent calculation. Such a computation is shown in Annexure 2, Table 2.1.

VIII
All Together Now

The three graphs in Figures. 1, 4 and 6 can be brought together and positioned in a way in which their axes are shared. Having found a point on any one graph, one can then move to the next graph orthogonally to find the corresponding point there. Each of the six parameters we are working with can be seen in terms of its relationship with the others. Fiddling with a single one, like FSI, which is what the GoM seems to be keen on doing,

without looking at the rest only invites a worsening of the way the city works.

These are complex graphs that need to be studied as a related group. They show the intricate relationship between BPR, net and gross density, PGA, BUA and FSI and can be extended to the incidental conversion from persons/buildable hectare to dwelling units/buildable hectare.

Of these six parameters, the BPR is probably what is first determined by the urban planner as he sets out his roads and other public spaces. What is interesting is that some cities seem to have BPR consistently around 45-50 per cent (New York) while others show a typical range of 60-70 per cent (Mumbai). Delhi has a particularly wide range, from 40-70 per cent.

The second parameter, not under the planner's control, is BUA per capita. This depends on affordability. It will vary from city to city, and from one income group to another. So in any city, for any income group, or specified mix of income groups, the BUA per capita will be known. Now if FSI is specified, as it is in so many cities' building regulations, this will determine both densities and the PGA per capita. Raising the FSI will raise the densities and lower the PGA.

Table 6: Net Densities in Various Localities Around the World
(Persons/Buildable Hectare)

City and Locality	Night-time Net Density	Daytime Net Density
New York Manhattan		
CD1	187	2,195
CD2	522	938
CD3	775	606
CD4	424	829
CD5	177	3,647
CD6	725	990
CD7	776	565
CD8	718	709
CD9	839	719
CD10	539	447
CD11	573	546
CD12	1,020	818
Manhattan Total	606	1,107
New Delhi		
Lajpatnagar	778	
Gol Market	491	
Raghubir Nagar and Vishal Enclave	342	
Sundar Nagar, Kaka Nagar and Bapa Nagar	141	
Mumbai		
A-South	334.5	317
A-Mid	441.7	2,280
A-North	511.1	4,899
B	973.2	886
C	1,408.1	1,592
D-East	1,119.3	1,722
D-West	418.1	341
D-North	673.7	647
E-East	145.5	164
E-Mid	1,137.3	977
E_West	1,601.6	1,901
F/South-W	977.7	1,195
F/South-NE	829.9	760
F/South-SE	294.5	269
F/South-NW	805.5	787
F/North-NW	446.1	458
F/North-E	653.0	509
F/North-S	861.7	685
G/North-N	1,003.1	786
G/North-SE	2,090.8	2,905
G/North-W	929.3	1,124
G/South-N	630.3	1,037
G/South-E	874.0	1,232
G/South-W	765.6	836
Island City	765.8	970

Figure 7: Relating All Six Parameters of BPR, FSI, PGA, BUA and Net and Gross Densities
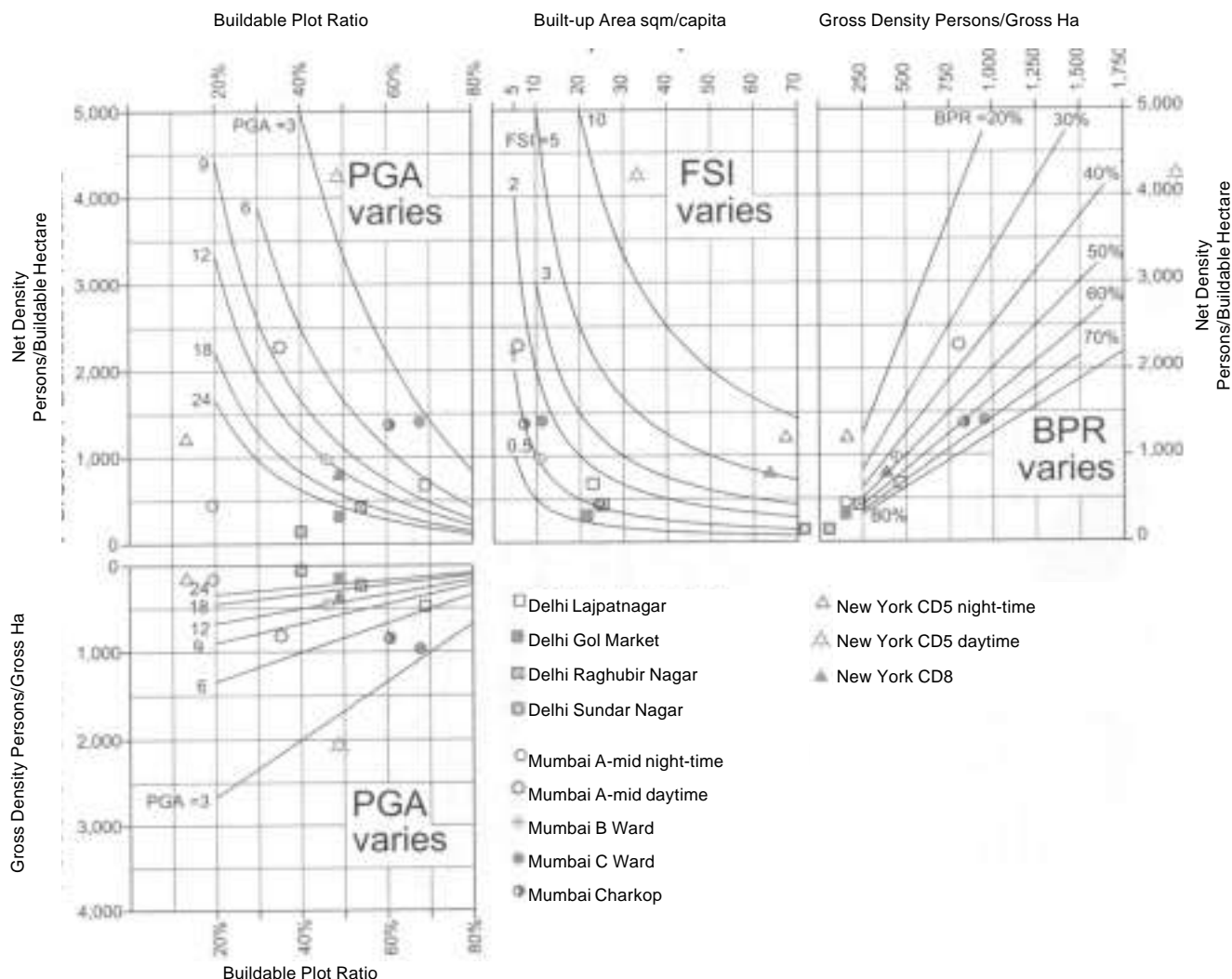
Another way of understanding the relationships is to see them as expressions. When computing night-time densities we count residents only, while for daytime densities we count the number or residents, plus the number of jobs in the locality, minus the number of residents that are employed – a moment's reflection will confirm that whether they are employed within or outside the locality makes no difference in computing the daytime count. We also distinguish between gross densities (calculated over the entire area of the locality) and net densities (calculated over the area of buildable plots only):

We see that, whether night-time or daytime:

Net Density = Gross Density/BPR ... (1)

Gross Density * PGA per capita = (1 – BPR) ... (2)

Net Density * BUA per capita = FSI ... (3)

IX
Future Work

Despite the occasional digression to discuss Dharavi, the foregoing analysis is quite general and applies to work on urban layouts and urban planning wherever it is conducted. Some intriguing possibilities of future research that occur to us are the following:

(a) All of us have experienced urban localities around the world that we particularly enjoy. On the graphs of Figure 7 it would be interesting to identify "zones" that contain within them the localities we especially like. By contrast there will be other zones where the feel of the locality is either that it is not urbane enough – too wide open perhaps, as in much of central New Delhi – or that it is oppressively overcrowded. Associating different kinds of the qualitative "feel" of an area with different parts of the graphs would be useful for urban planners when designing new layouts or planning the reconstruction of older areas.

(b) We have too few examples of existing city localities on the graphs. It would be interesting to see, for example, where the Quartier Latin in Paris figures on the graphs – ideally, two points, one before and the other after, the large-scale demolition and reconstruction by Haussmann. So also the cities of southeast Asia, and other cities in India and China.

(c) So far we have not studied transit space and its relationship with the layouts of urban localities. These graphs, and in particular, the limits they suggest on densities, should be very useful in the long-term planning of urban transport systems. When mapping trip generation and trip attraction, it would be important to take into account the income level of both source

and destination – there might in fact be different travel demand maps of the city for different income groups. For example, the city map of where poor people live and where they work would be quite different from where the rich live and where they work and where they go for recreation – and transport systems, with the preferred mode of transport given in each case, need to take this into account.

(d) The principal problem currently confronting all our cities is the drift towards the physical segregation of economic classes. Residential areas are increasingly limited to housing one economic group or another (not to mention segregation by religion). Every day the rich move in their private vehicles from one private space to another private space, moving through transit space, and never experiencing the public spaces of the city. The spate of special economic zones (SEZs) being added around our cities will create new enclaves of the rich, demanding connectivity between them and the areas where the rich are employed. The poor will be increasingly segregated and confined to ghettos of the poor, as we see happening already, for example, in the rehousing of slum-dwellers, all lumped together, in one large scheme in Chandivali in Mumbai. The challenge before administrators and urban planners is to devise ways in which the city can be continued, and extended, since grow it must in the foreseeable future, in a way that preserves the mixed-income quality of neighbourhoods, with public ground areas shared by all. If this is neglected, and the city becomes income-segregated, with gated communities for the rich and ghettos for the poor, we can expect the same rise in criminal activity and lack of safety on the streets that is already a part of the everyday experience of so many cities in the developing world.

X
Conclusions

We have developed the notions of PGA per capita and BPR to improve our understanding of urban layouts and help us determine how well or badly any particular layout will work for people. It emerges from the study of a few crowded urban localities around the world that there is a bandwidth of minimum public ground area required within which any planned urban area must fall if it is to attain an acceptable level of operational comfort. With rising economic prosperity, we should also anticipate that the demand for PGA will rise, and this should be kept in mind when preparing a city's redevelopment plans.

The FSI cannot be understood or tinkered with in isolation. It has to be seen in particular in the context of the occupancy of floor area per capita. In Manhattan's most crowded residential district, CD-8, the BUA of floor space is 63.7 sqm per capita. In Mumbai's Island city, the BUA averages 7.7 sqm per capita. The same number of people residing in a four-storeyed building in Mumbai would require a 33-storied building at Manhattan's standards of occupancy. So when we are told Manhattan's FSI ranges from 7 to 17, a comparison with Mumbai requires a reduction in these FSI values proportionately according to BUA per capita. Mumbai's corresponding values would be FSI 0.85 to 2.1.

The FSI of four being prescribed for Maharashtra Housing and Area Development Authority's (MHADA) schemes for resettling slum-dwellers cannot work except with a BPR of 20 per cent (see Figure 1.4) – that is, the buildable plot occupies no more than one-fifth of the total land area: or, to put it another way,

the buildable plot under MHADA's scheme is also served by four times its area in the immediate neighbourhood to be turned over for use in roads, footpaths, schools, hospitals and other amenities.

Increasing FSI in wealthy and in poor localities have completely different connotations. An increase in FSI in a wealthy locality may essentially mean an increase of floor consumption per capita. In a poorer neighbourhood it would mean increasing the density of the locality, which in turn, would lead to a severe pressure on infrastructure resources, public amenities, open ground spaces and road and footpath crowding. Hence, an increase in FSI for rehabilitation projects (meant to house the poor) needs to be approached with the utmost caution as there is a danger of making the area dysfunctional.

Urban planning in Mumbai has been systematically dismantled by successive regimes in Maharashtra over the last few decades. If Mumbai is to become an international finance centre, or compete even remotely in terms of quality of urban life with Shanghai, it needs to learn the appropriate lessons from Shanghai. Shanghai city in 1990 had average road area per capita of 2.28 sqm and public green area per capita of 1.02 sqm. By 2003, it had increased average road area per capita more than fivefold to 12.3 sqm and public green area per capita more than ninefold to 9.16 sqm.[4] Thus the road areas and green spaces have been dramatically increased and not decreased in Shanghai during its development. Mumbai likewise needs to rethink the planning of its urban areas in detail, area by area, locality by locality. Generalised rules issuing from a centralised bureaucracy will get us nowhere.

The "carrying capacity" of urban land, packed as much as possible with a PGA of 6 sqm per capita, is 1,00,000 persons per sqkm, plus the area needed for transit space. This is with a BPR of 40 per cent. If the BPR is 70 per cent, a more likely figure in Mumbai, the "carrying capacity" for a PGA of 6 sqm per capita falls to 50,000 per sqkm. If the PGA is a more comfortable 12 sqm per capita, with a 50 per cent BPR, we can have 41,667 persons per sqkm, and if we have a PGA corresponding to Manhattan's 24 sqm per capita and 50 per cent BPR we could house a little over 20,000 people per sqkm.

Dharavi is said to already house a population in excess of 1,00,000 per sqkm. In the light of the foregoing the conclusion we are forced to is that it is not workable to crowd Dharavi further with additional occupants. The GoM policy of resettling slum-dwellers in situ, in free housing paid for by new occupants in additional floor space on the same site, is not workable in Dharavi. We need a different policy to address Dharavi's situation. Simply applying the old policy will not work.

If the projected numbers demand more crowding than 1,00,000 per sqkm, the correct response is not a further degradation of essential public areas but that you need to focus on increasing land supply. This can be done in Mumbai by building more bridges to the mainland to augment land availability; or by converting land that is under inappropriate use such as salt manufacture in the heart of an urban agglomeration; or by cutting unnecessarily lavish allocations for use by a port whose activity should be declining – in all these cases it makes more sense to convert metropolitan land use to the more urgent demand of housing people and jobs and providing both with sufficient land for the necessary essential amenities. EPW
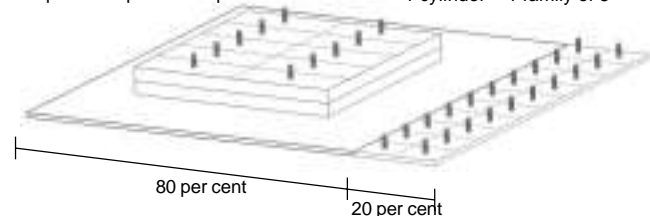
Email: shirish@spacpl.com

Figure I.1

Plot Area = 1 Hectare
Buildable Plot Ratio 80 per cent
Footprint = 33 per cent of plot

PGA = 20 sqm per capita
BUA = 50 sqm per capita
1 cylinder = 1 family of 5

80 per cent   20 per cent
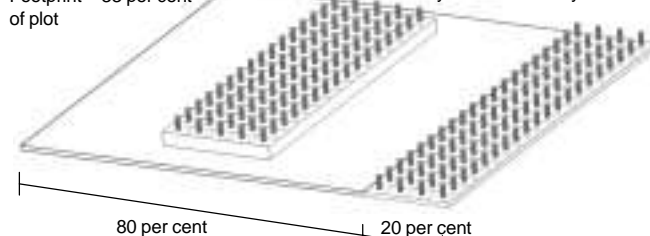
2 Floors
Plot FSI = 0.675
Global FSI = 0.5

Population = 100
Net Density = 125 persons/ha
Gross Density = 100 persons/ha

This diagram shows a generous 20 sqm per capita of PGA, and a BUA of 50 sqm per capita, typical of a wealthy locality. We could have everyone living in G+1 buildings, and a gross density of 100 persons per hectare. Plot FSI is 0.675 as shown on the left.

Figure I.2

Plot Area = 1 Hectare
Buildable Ratio 80 per cent
Footprint = 33 per cent of plot

PGA = 5 sqm per capita
BUA = 5 sqm per capita
1 cylinder = 1 family of 5

80 per cent   20 per cent

1 Floors
Plot FSI = 0.25
Global FSI = 0.2

Population = 400
Net Density = 500 persons/ha
Gross Density = 400 persons/ha

Here we have PGA and BUA both 5 sqm per capita, low values typical of poor and crowded localities in Mumbai. With a buildable plot ratio of 80 per cent everyone can be accommodated in ground floor construction, with a gross density of 400 persons/hectare. Note the plot FSI is only 0.25 (see bottom left).

Figure I.3

Plot Area = 1 Hectare
Buildable Ratio 20 per cent
Footprint = 33 per cent of plot

PGA = 20 sqm per capita
BUA = 50 sqm per capita
1 cylinder = 1 family of 5

20 per cent   80 per cent
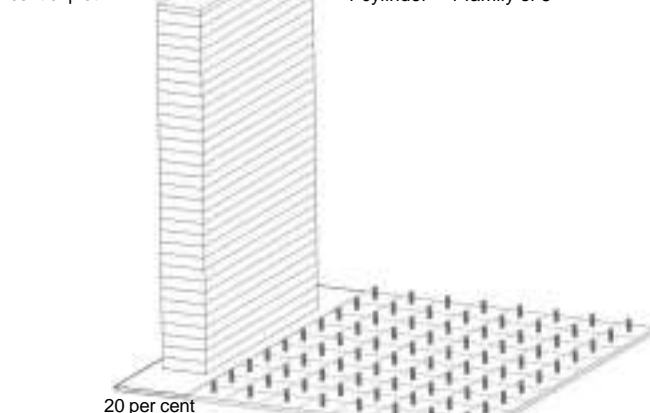
30.5 Floors
Plot FSI = 10.0
Global FSI = 2.0

Population = 400
Net Density= 2,000 persons/ha
Gross Density = 400 persons/ha

Now, without altering PGA of 20 sqm or BUA of 50 sqm of Figure I.1, that is, with no change in amenities or facilities we could have four times as many people in the area (and correspondingly, more compact transport system), but people would be living in 30-storeyed rather than G+1 buildings. Note the plot FSI on the left, now 10.

Figure I.4

Plot Area = 1 Hectare
Buildable Plot Ratio 20 per cent
Footprint = 33 per cent of plot

PGA = 5 sqm per capita
BUA = 5 sqm per capita
1 cylinder = 1 family of 5

20 per cent   80 per cent
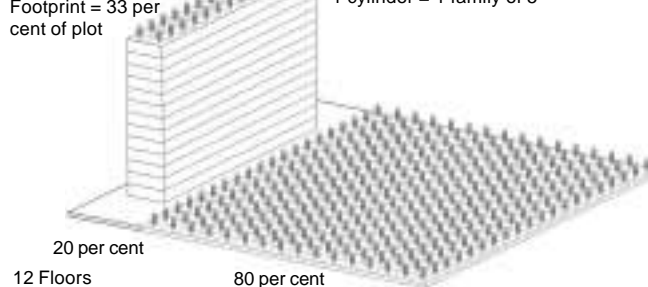
12 Floors
Plot FSI = 4
Global FSI = 0.8

Population = 1,600
Net Density= 8,000 persons/ha
Density = 1,600 persons/ha

Again, comparing with Figure I.2, with no change in PGA of 5 sqm or BUA of 5 sqm per capita, by reducing the buildable plot ratio to 20 per cent we can accommodate four times as many people at a gross density of 1,600 persons/hectare, in buildings of G+12. The plot FSI 4, which is what GoM is prescribing, but without saying the BPR should be 20 per cent, that is, there should be four times as much public area as the area of plots under FSI is four.

Figure I.5

Plot Area = 1 Hectare
Buildable Plot Ratio 43 per cent
Footprint = 33 per cent of plot

PGA = 5 sqm per capita
BUA = 5 sqm per capita
1 cylinder = 1 family of 5

43 per cent

57 per cent
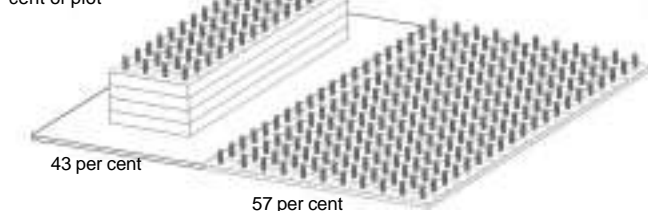
4 Floors (G+3)
Plot FSI = 1.33
Global FSI = 0.57

Population = 1,144
Net Density = 2,666 persons/ha
Gross Density = 1,144 persons/ha

If we insist that we want walk-up accommodation, without lifts, restricted to G+3 only, we get a reasonable buildable plot ratio of 43 per cent for PGA and BUA both of 5 sqm per capita. The gross density achieved is 1,144 persons/hectare. The plot FSI is 1.33.

Figure I.6

Plot Area = 1 Hectare
Buildable Plot Ratio 60 per cent
Footprint = 66 per cent, 50 per cent and 33 per cent of plots for (a), (b) and (c), which are 2,000, 1,333 and 2,667 sqm, respectively

PGA = 5 sqm per capita
BUA sqm/capita = (a) 5, (b)10, (c)20, (d) 30 per capita for 1/3, 1/3, 1/6 and 1/6 population
1 cylinder = 1 family of 5

60 per cent

40 per cent
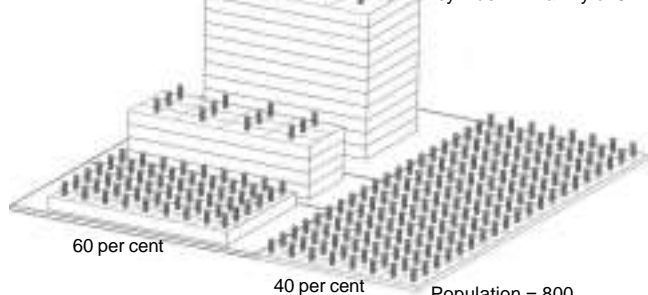
(a)G Floor, (b) G+3, (c) S+7
Plot FSI = (a) 0.67,(b) 2.0,(c) 2.33;
Plot areas: (a) 2,000 sqm, (b) 1,333 sqm, (c) 2,667 sqm
Global FSI = 1.07

Population = 800
Net Density=1,333 pph
Density = 800 persons/ha

Yet another possibility is a mixed-income development, with PGA for all set at 5 sqm/capita, but BUA varying from 5 to 30 sqm/capita. The gross density is 800 persons/hectare. The plot FSI varies from 0.67 to 2.33.

Annexure 2: Computations for Dharavi –
High Density with Low FSI

In the computation below we have assumed 6 sqm per capita for PGA, and 6 sqm per capita BUA, each value 20 per cent higher than the minima specified by us (PGA) or specified by GoM (BUA).

Table 2.1: Low-income High-Density Settlement Fits in G+3

Theoretical area of total settlement	10,000 sqm
PGA for roads, schools, etc	6,000 sqm
Buildable plot area at 40 per cent	4,000 sqm
Built-up floor space with FSI 1.5	6,000 sqm
Number of dwelling units at 30 sqm/DU	200
Population housed at 2,500 per buildable hectare	1,000
Density of dwelling units (DU/ha of buildable plot area) = 200/4000 * 10000 = maximum permitted by National Building Code =	500
G+3 buildings with 6,000 sqm floor area require 1,500 sqm plinth area, so the footprint on a 4,000 sqm plot is	37.5 (per cent)
Terrace area 1,500 sqm for 1,000 residents gives terrace area per resident of	1.5 sqm, which can be used for activities that require the sun

We should note the limitation of the development. This is that we can house 1,000 persons per gross hectare, which is 1 lakh per sq km. The entire area of Dharavi (Mumbai's largest slum) of 217 ha can thus hold 2.17 lakh people, with a minimum of amenities and not much else. This is less than the number said to be already living there – which ranges from 2,50,000 to 6,00,000 depending on who is lecturing. The notion that they can all be provided with free housing, financed out of the sale of additional construction on the same site, is simply not workable because the area cannot cope with an additional population – there will not be enough PGA and circulation will stop.

Annexure 3: Parameter Relationships

RBPA	=	Residential buildable plot area
CBPA	=	Commercial buildable plot area (includes industrial)
PGA	=	Public ground area
RBUA	=	Residential built-up area
CBUA	=	Commercial built-up area
R	=	number of residents
E	=	number of residents who are employed
J	=	number of jobs

1 Buildable plot ratio:
a Night-time = RBPA/(RBPA + PGA)
b Daytime = (RBPA + CBPA)/(RBPA + CBPA + PGA)
2 Global densities (gross):
a Night-time = R/(RBPA + PGA)
b Daytime = (R + J – E)/(RBPA + CBPA + PGA)
3 Buildable plot densities (net):
a Night-time = R/RBPA
b Daytime = (R + J – E) /(RBPA + CBPA)
4 Note that net density = Gross density/(buildable plot ratio)
5 DU/buildable hectare = Buildable night-time plot density/household size
6 FSI:
a Residential = RBUA/RBPA
b Commercial = CBUA/CBPA
7 Built-up area per capita:
a Residential = RBUA/R
b Commercial = CBUA/J
8 Total land area (excluding transit area) = RBPA + CBPA + PGA

Notes

1 UDPFI = Urban Development Plans Formulation and Implementation Guidelines, Ministry of Urban Affairs and Employment, Government of India, New Delhi.
2 Gao Guofu, president, Shanghai Chengtou Corporation, 'Functional Positioning and Approaching Path Design of Investment and Financing for Urban Infrastructure Development in Shanghai', Plenary Session VI: The Missing Link: Sustainable Municipal Finance, Hanoi, Vietnam, November 24-26, 2004.
3 New York Community District 8 data from: http://www.nyc.gov/html/dcp/pdf/lucds/mn8profile.pdf
4 Gao Guofu, op cit.
5 NYC data on email from Shampa Chanda, Director of Citywide Planning, Planning and Pipeline Development, NYC Housing Preservation and Development. Also from: http://www.nyc.gov/html/dcp/pdf/lucds/mn5profile.pdf, for CD-5, and similar sites for other districts of Manhattan.
6 New Delhi data from Yogita Lokhande and Nilesh Rajadhyaksha, Sem I, Integrated Planning Studio, 2005-06, School of Planning and Architecture, New Delhi.
7 Mumbai physical data from Biond, a Mumbai-based GIS software company. For information regarding job locations we are indebted to P R K Murthy, Chief, Transport and Communications Division, Mumbai Metropolitan Region Development Authority.

Glossary

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