



DEVELOPING LAND & REAL ESTATE MARKETS

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The case of the Mumbai Metropolitan Region

Importance of land in city economy

Land is one of the fundamental inputs to the urban economy. However, land is not only an input to private productive processes but also to social overheads - roads, parks, schools and the like. Urban land has therefore been a subject matter of public policy. Some of the crucial problems that the urban India faces today like extremely inadequate shelter opportunities, inadequate land for provision of social facilities and lack of resources for local infrastructure are ingrained in the present land policy (or the lack of it). Although provision of infrastructure helps increase the land values, the private land market tends not to provide adequately for infrastructure like roads, parks, schools, hospitals etc. This lead to "inefficient" land use patterns. Further the legal private land market for variety of reasons tends not to cater to the low-income sections resulting in "inequitable" distribution of land and shelter opportunities

Characteristics of land

It would be useful to note characteristics of urban land in some more detail.

- Every parcel of land has unique location,
- Though quantity of land per se is finite, it is possible to increase the supply of urban land by providing urban infrastructure,
- But for provision of urban infrastructure, land itself is one of the essential inputs,
- Urban land cannot be treated as pure public good because exclusive occupancy rights inevitably emerge. This implies that market in urban land cannot be eliminated; and
- Because of these characteristics economic and environmental externalities reflect in the land price.

These characteristics of land justify policy intervention in respect of urban land to achieve the "efficiency and equity" objectives mentioned above.

Rationale for intervention

In India, the rationale for policy intervention in the urban land market was first articulated by the Urban Land policy Committee (Ministry of Health) appointed by Government of India in 1965. In terms of following land policy objectives.¹

- To achieve optimal social use of urban land,
- To make land available in adequate quantity, at the right time and for reasonable prices to both public authorities and individuals;
- To encourage co-operative community effort, and bonafide individual builders, in the field of land development, housing and construction,
- To prevent concentration of land ownership in a few private hands and especially to safeguard the interest of the poor and under-privileged sections of the urban society.

¹ Report of the Task Force on Planning of Urban Development, Planning Commission, Government of India, 19833.

In addition a commonly held objective is;

- To use land as a resource for financing urban development by recouping the unearned income, which otherwise accrues to private landowners.²

The report of the Committee on Land Policy observed that to realise the objectives "there is no escape from large scale public acquisition if the question of guiding urban development or the provision of adequate housing and other facilities is to be tackled effectively". It further argued, that "large scale advance acquisition of land would really be in the interests of the society as a whole. It is by far the best, and perhaps the only way to put an end to speculation in land, and to capture subsequent increases in land values. These surpluses, were realised by the public authorities should benefit the community in more ways than one"³. Thus the

² Draft Five year Plan 1978-83, Planning Commission, Government of India.



dominant theme of the land policy was large-scale public ownership of land, to achieve both equitable allocation and resource mobilisation.

However, the Task Force on Planning of Urban Development appointed by the Planning Commission in 1983³ recognising the importance of private land market, rephrased the objective 4 mentioned above in the following words:

“to widen the base of land ownership specially to safeguard the interests of the poor and under-privileged sections of the urban society and proposed the following two additional objectives

6. To encourage socially and economically efficient allocation of urban land, such that urban development is done in a resource conserving manner and that the magnitude of land used is 'optimal';
7. To promote flexibility in land-use in response to changes resulting from a growing city. It would be instructive to see how this rationale has reflected in the legal and regulatory framework.

Legal and Regulatory framework

Land

Evolution of legal framework dealing with “land” would provide the background for appreciating how city planners have approached land as a part of their plans.

Constitutional provisions

The Indian Constitution has undergone significant changes in its outlook toward land and property as outlined below.

Article 19 (f) of the Constitution recognised “to acquire, hold and dispose of property” as one of the fundamental rights. For acquiring any property therefore, the principle of compensation at market price was adopted. While the Directive Principles of

State Policy (article 39 (b)) require that the “ownership and control of the material resources of the country are so distributed as best to subserve the common good; that the operation of the economic system does not result in the concentration of wealth and means of production to the common detriment”.

The 25th amendment of 1972 made any legislation claiming to subserve the Directive principle non-justiciable. “Notwithstanding anything contained in Art. 13, no law giving effect to the policy of the State toward securing all or any of the principles laid down in Part IV, shall be deemed to be void on the ground that it is inconsistent with, or abridges any of the rights conferred by Art. 14 or 19, and no law containing a declaration that it is for giving effect to such policy shall be called in question in any court on the ground that it does not give effect to such policy.” This amendment further replaced the word 'compensation' by the word 'amount' in Art 31 (2) and the adequacy of the amount was made non-justiciable.

By the 44th Amendment of 1978, Article 38 (2) has been added which states that, “The State shall, in particular, strive to eliminate inequalities in status, facilities and opportunities, not only amongst individuals, but amongst groups of people residing in different areas or engaged in different vocations”. The amendment also deleted the fundamental right “to acquire, hold and dispose of property” and reduced it to only a legal right.

The 25th amendment of 1972 is of crucial significance, as legislation enacted thereafter provided for taking over of land, at less than market price or at a nominal “amount”.

Land Acquisition Act, 1894

The Act enables compulsory acquisition of land needed for public purposes and for Companies. After the amendment of 1984, the expression 'public purpose' includes, the provision of village sites, land for town planning, for planned development, residential purposes, schemes sponsored by

government and for locating public offices.

The Act requires that the market value of land be awarded as the compensation for compulsory acquisition. Market value of the land is determined on the rates prevailing at the date of the publication of the notification. (under Section 4). In addition to the market value of the land, an amount of 12% per annum on such market value for the period commencing on and from the date of the publication of the notification under Section 4, in respect of such land to the date of the award or the date of taking possession of the land, whichever is earlier and a solatium of 30% on such market value in consideration of the compulsory nature of acquisition is also payable. Declaration of Intended Acquisition (under Section 6) has to be made within one year from the date of the publication of the notification under Section 4. The award has to be made (under Section (11) within a period of two years from the date of the publication of the declaration and if no award is made within that period the entire proceedings of the acquisition lapse. The amount of compensation to be awarded for the land acquired under the Act is principally based on the market value of land at the date of the publication of the notification under section 4 (section 23 (1)). However, Section 24 clarifies that while awarding the amount of compensation, increase in the value of the land likely to accrue from the future use is not to be taken into consideration.

Although the Act prescribes the market value as the principle of determining compensation, in practice it is based on the registered values of transactions. These are known to be less than the real market price due to the prevalence of parallel economy in the land and real estate market particularly in the urban areas. Attempts of acquisition almost invariably get embroiled in long drawn litigation.

Town Planning Act

State Town Planning Acts clarify the “public purpose” and enable use of Land Acquisition Act 1894 for compulsory acquisition of land. For example

Maharashtra Regional and Town Planning Act 1966 (by its Section 125) clarifies that 'any land required, reserved or designated in a Regional Plan, Development Plan or town planning scheme for a public purpose or purposes including plans for any area of comprehensive development or for any new town shall be deemed to be land needed for a public purpose within the meaning of the Land Acquisition Act, 1894. Under the Act, after the publication of a draft Regional plan, a Development or any other plan or town planning scheme, acquisition of land can proceed under the provisions of the Land Acquisition Act 1894. On receipt of application from the Appropriate Planning Authority, the State Government has to make a declaration in the Official Gazette, in the manner provided under Section 6 of the LA Act, 1894. The declaration so published is deemed to be declaration under Section 6 of the LA Act, 1894. However, such declaration cannot be made after the expiry of three years from the date of publication of the draft plan.

Compensation is determined on the basis of the market value prevailing on the dates as described below;

1. where the land is to be acquired for the purposes of a new town, the date of publication of the notification constituting or declaring the Development Authority for such town;
2. where the land is acquired for the purposes of a Special Planning Authority, the date of the publication of the notification of the area as an undeveloped area; and
3. in any other case, the date of publication of interim or the draft plan or town planning scheme.

If a declaration is not made within three years of publication of the draft plan, then fresh declaration has to be made and that date is to be used for determining the market value and compensation. The recent amendments to the Act allow compensation to be paid in the form of Transferable Development Rights.

The Act also allows the owner to serve a purchase

³ Land in Metropolitan Development Some Policy Issues by L. Menezes; proceedings of Seminar on Land Development, April, 1982, Times Research Foundation.

⁴ Planning Commission, 1983 op. cit.

notice to the Appropriate Planning Authority, if land is not acquired within ten years from the date of the final plan. If lands are not acquired within six months from the date of the service of such notice, the reservation, allotment or designation is deemed to have lapsed, and the land is deemed to be released from such reservation, allotment or designation. The land then becomes available to the landowner for the purposes of development permissible in the case of the adjacent land under the relevant plan.

Town Planning Schemes

The oldest method of bringing about planned development by reconstitution of large agricultural plots into serviced urban plots, with minimum of compulsory acquisition, is the Town Planning Schemes. The Mumbai Town Planning Act, 1915 provided for the 'Town Planning Schemes' (TPS). These provisions have continued in the Maharashtra Regional and Town Planning Act, 1966, (MR & TPA). The basic rationale of TPS is that with the reconstitution of plots, and provision of roads and open spaces, the land, price considerably appreciates. The total value of the land therefore increases even if some land is lost for roads and open spaces. The landowners are therefore expected to join the scheme. According to the provisions of the MR & TP Act 1966, TPS can be prepared by the planning authority for the purpose of implementing the proposals of a final Development plan. The cost of the TPS is to be financed by recouping 50% of the "betterment" which is defined as the difference between the value of Final Plot after TPS implementation and value of Original Plot before TPS implementation.

Slum Improvement Act. 1971

Slum Areas (Improvement, Clearance and Redevelopment) Act, 1971 enacted following a model legislation prepared by the Government of India, declare that the execution of any work of improvement of any slum area or building in such area or redevelopment of clearance area is deemed to be a public purpose. The State Government on representation of the Competent Authority can

acquire the land for such purposes. The amendment of 1984 to Maharashtra Act allows the State Government to transfer the lands so acquired by way of lease to Co-operative Housing Societies of the slum dwellers.

The compensation under this Act is not at the market rate. But the method of determining the "amount" is laid down. In case of the Maharashtra Act it is 60 times the net average monthly income actually derived from such land during the period of the five consecutive years immediately preceding the date of publication of the notice for acquisition.

Similar provisions enabling acquisition of land at less than market price by laying down the method of determining the "amount" but at 100 times the monthly income are found in other legislation such as Mumbai Metropolitan Region Development Authority Act, 1975, and the Maharashtra Housing and Area Development Act, 1976

Urban Land Ceiling Act 1976

This was perhaps considered to be the most "progressive" piece of legislation. The principal objectives of the Act were;

- Preventing the concentration of urban land in the hands of a few persons and speculation and profiteering thereby,
- Bringing about an equitable distribution of land to subserve the common good.

Section 3 of the Act specifies that persons are not entitled to hold vacant land in excess of the ceiling limit. Section 4 (1) specifies the ceiling limits applicable to different categories of urban agglomerations depending upon their population ranging between 2000 sq.m. to 500 sq.m. The agglomeration is defined to include an area within a radius of 3 to 8 km. depending again on the population size.

On filing of returns by landowners and after the notification under Section 10 (1) by the Competent Authority the land in excess of the limit is deemed to

have been acquired by the State Government under Section 10(3). In case of lands, (Section 11(1)(a)) where there is income, compensation is paid equal to 8-1/3 times the net average yearly income of last five years preceding the date of notification under Section 10(1). In case of land, (Section 11(1)(b)) which has no annual income, the maximum compensation is Rs. 10 per sq.m. for lands situated in categories A or B and Rs. 5 per sq.m. for categories C and D. The competent Authority is entitled to fix the amount lower than the above. In no case, the total amount of compensation exceeds Rupees Two lakhs under Section 11(6). Furthermore, the landowner is entitled to get only Rs. 25,000 in cash or 25% of the total amount whichever is less. The balance amount is payable by negotiable bonds redeemable after 20 years duration carrying 5% interest from the date on which the vacant land is deemed to have been acquired under Section 10 (3).

The Act did not achieve the objectives for which it was enacted. On the contrary it had some counterproductive results. The scarcity of land that was not affected by the Urban Land Ceiling increased the land prices. The process of obtaining exemptions helped rent seeking behaviour and made the land market more oligopolist. The Union Government in 1999 therefore repealed the Act, though it continues to prevail in Maharashtra.

Legislative Control on Closure of Industries

Apart from the legislation directly affecting urban land, there have been some legislative controls, which have had, indirect but significant impact on land market. For example, industries cannot be closed without following a long drawn out procedure. (As is commonly said there is no exit clause). Although these were introduced to protect the labour against indiscriminate retrenchment, it has finally resulted in large tracts of land under the old textile mills in the heart of the city remaining outside the land market. Government attempted to seek a partial solution through the development control regulations in 1991 by allowing redevelopment of textile mill land after allocating 1/3 land to public

housing agency and 1/3 for open spaces. During the real estate boom some redevelopment took place under this dispensation.

Real Estate

Rent Control

Rent Control in most Indian cities was introduced during the two World Wars as a temporary measure. However, it still survives in many cities. A comprehensive legislation of rent control was introduced in Mumbai in 1948 called the Bombay Rents, Hotel Rates and Lodging House Rates Control Act 1947. This legislation froze the rents to their 1940 level for all buildings rented at that time. In case of other buildings, courts were empowered to determine the standard rent. The 1986 amendment has prescribed 15% p.a. as the return on investment for arriving at the standard rent. Such standard rent once determined cannot be increased. The Act also provides for protection of tenants against eviction and transfer of tenancy through inheritance. Such rent control obviously affects the investment in rental housing. This is on account of the fact that;

- A fixed rate of return on investment cannot be competitive with other avenues for investment,
- Once rented the asset loses its liquidity in the market and
- Capital appreciation of assets cannot be realised by the investor.

Where the properties were already rented when the rent control was brought in, the landlords lost their interest in the upkeep of the buildings. In Mumbai the problem of over 16000 buildings constructed prior to 1940 became so serious that the state, in 1969 had to accept the responsibility of carrying out the repairs and reconstruction of such buildings. (Without being particularly successful in this endeavour).

Apart from direct impact on the shelter sector, Rent Control has had serious impact on the city's ability to raise resources. Property tax has been the principal tax related to land and buildings. This tax according to provisions of municipal acts is levied on the annual rateable value, which is to be determined on the basis



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2008 THE BOOM CONTINUES

Experts are unanimous in their forecast for 2008. The upward surge will continue. **Archana Rao** reports

IT'S BEEN one long wait for the fence sitters who have been waiting for a sharp dip in real estate prices. Realty rates went through the roof in 2005 and continued on a consistent upward trajectory in 2006, leaving the tentative buyers ruining the lost opportunities. After the scorching two-year rally, mid-2007 was the only time when a major fall was in the air; thanks to the collective impact of rising interest rates and steep prices. But the builders held onto the prices and the fall never came.

In a matter of just three months — from October to December 2007 — the realty mar-

ket has again firmed up considerably and a host of fundamental factors are pointing towards a continued boom in the year 2008. "The real estate prices in prime areas of Mumbai like South Mumbai, Powai, Chembur and the western suburbs will continue to rise in 2008," said Niranjana Hiranandani, managing director of Hiranandani Constructions, adding that unless there is a sharp increase in supply in the peripheral areas like Navi Mumbai and Thane, the prices in these areas too will remain firm next year.

ULCRA IMPACT

Contrary to the notion that the scrapping of Urban Land (Ceiling and Regulation) Act will lead to a fall in real estate prices and open the gates for affordable mass housing, the real estate fraternity believes that it is still early times for the impact of ULCRA repeal to be witnessed.

"Though the repealing of ULCRA will have a psychological impact on real estate prices and keep it under

check to a certain extent, it will not translate into reduced rates unless there is a substantial increase in the supply of housing stock," said Pranay Vakil, chairman, Knight Frank India. Repealing of ULCRA is just one positive step and genuine affordable housing for the middle class will be a reality only if the state government takes a fast-track approach in bringing in housing reforms.

HOUSING REVOLUTION

Much like the Green Revolution of the 70s that transformed the country's agriculture sector, the real estate industry is hoping for a Housing Revolution to be kicked off in 2008. "Maharashtra and Mumbai are poised for a housing revolution and if the government takes the right initiatives, affordable housing will be a dream-come-true for middle-class buyers," said Hiranandani, adding that steps like single-window clearances, expedited permissions, adopting of township policy and extension of incentives for mass

housing will be a huge contribution on part of the government for creation of an affordable housing stock. Another big development expected in 2008 is the implementation of the Housing Policy Act.

"The bill has been tabled in the Assembly and if it becomes an Act in 2008, it will bring about a sea change in the way business is done in Mumbai," added Vakil. From mandatory mention of carpet area to strict norms in favour of the consumer, the Housing Policy Act will usher in a new set of ground rules.

REIT HERE, RIGHT NOW

Another major development related to real estate sector that is expected in 2008 is the official entry of Real Estate Investment Trusts (REITs). "We are waiting with bated breath for SEBI to issue clear guidelines on real estate mutual funds and real estate investment trusts (REITs). The day this avenue is opened for the retail investor, it will transform the ownership pattern of real estate in the country," said Vakil, citing the example of America, where over 700 REITs jointly own a major component of the realty stock.

"While the ownership of big real estate properties will move from individuals to institutions, a retail investor will be able to enter the REIT for units of as less as Rs 10,000," he said. REITs commenced operations in India only last year allowing venture capitalists with a minimum investment of Rs 1 crore to enroll, with the entry barrier now coming down to Rs 1 lakh.

SECTORAL GROWTH

Even as residential properties are tipped to appreciate in 2008, prices of commercial property are also likely to see a sharp rise in the forthcoming year. Irrespective of the location, office spaces are likely to witness apprecia-

tion across the city, right from Cuffe Parade, the southern commercial tip of the city to the office complexes in Goregaon-Malad on the northern outskirts. The sharpest rise in the commercial sector is likely to be witnessed in the island city, with the average rate for premium office spaces hovering between Rs 20,000 to 30,000 per sq ft.

"The entire stretch from Nariman Point to Worli is in high demand among the corporate houses and new business entities. Both sale price as well as rentals are expected to see a marginal hike in 2008," said SG Maheshwari of Maheshwari & Maheshwari, a leading broking firm in South Mumbai. Commercial and office property in the prime suburban areas of Powai, Malad, Chembur, Navi Mumbai and Thane are also likely to witness an upswing in 2008.

INVESTOR OUTLOOK

While real estate prices are likely to remain firm in the Mumbai metropolitan region next year, they have already reached a point where investors can expect little by way of appreciation from current levels. And with prices in even Tier-II cities reaching saturation levels, experts advise investors to explore new destinations that promise good returns on investment.

"Hot destinations of this year are not assuredly the best options for 2008. It will bring its unique set of emerging investment destinations with it," said Anuj Puri, chairman & country head, Jones Lang Lasalle Meghraj.

According to Puri, the hot investment centres for next year are Visakhapatnam, Vadodara, Nashik, Indore, Dehradun, Guwahati and Chandigarh. "Each of these centres offer unique opportunities, either in terms of residential potential or commercial growth and are likely to witness good growth in the coming year," he predicted.

of annual rent for which the land or building might reasonably be expected to be let from year to year. However, this principle has been grossly distorted because of the provisions of rent control legislation and none of the objectives of the land taxation can be achieved by the present practice of property tax.

Revenue Generation

The revenue generation on account of property tax despite phenomenal increase in property prices in Mumbai has been virtually stagnant in real terms.⁵

Inequitable incidence

The rateable value is linked to standard rent, which cannot be revised. This has meant that the new properties in distant locations, which have a lower market value, pay more taxes than those older properties having higher market value. Furthermore, as the rateable value (the tax base) is stagnant and distorted, the tendency has been to impose additional levies. In case of Mumbai the total tax rate has risen to over 85% of the rateable value. But for the frozen rateable value this could have been considered expropriatory. However, it needs to be noted that with frozen taxbase, every increase in tax rate makes the incidence of tax in absolute terms more inequitable.

Capturing Land Value Gains

If the rateable value truly reflects the market rent, property tax can capture the land value gains. However, due to linkage of rateable value with standard rent this has not been possible. But, this does not mean that land value gains are not realised. The 'key money' shared by the owner and tenant, the rents charged by tenant to sub-tenant are all forms of realising the land value gain by private owners and tenants. However, none of this accrues to the State. Property tax related to true market rents also acts as the moderator of real estate market⁶. The buyer would tend to deduct the discounted present value

⁵ Draft Regional Plan for Mumbai Metropolitan Region, 1996-2011; Mumbai Metropolitan Region Development Authority, Mumbai 1996.

⁶ The Impact of Property Taxation on Housing Value and Rents; R. Dusansky in Journal of Urban Economics, Volume 10 Number 2 September 1981

of expected tax payments from the price he is prepared to pay for real estate. This may keep real estate prices under check. However, with frozen taxes such consideration does not affect real estate prices in Mumbai and rise in prices is fully captured by the developers.

Optimal allocation of land

The frozen property tax has provided an incentive for some obsolete land use to continue in the high value areas. Where changes in users have occurred, the benefits have been fully shared between the owner and the original tenant. Although distortions in property tax have prevailed for over four decades precious little has been done to correct the distortions. The municipal finance commission (Municipal Finance Commission, 1974) had recommended “delinking of rateable value from standard rent”. Various committees and commissions (for example Economic Administration Reforms Commission, Govt. of India, 1982 and National Commission on Urbanisation, Govt. of India, 1988) have concentrated on rent control reforms for improving the housing market, but very little attention has been paid to property tax reforms with a view to using it as an effective instrument of land policy. Some practical efforts have been made to liberate the property tax from the clutches of controlled rent in Andhra Pradesh and Patna.⁷

Concomitant with rent control reforms, improvement in property tax management is also necessary. It should however be noted that common opposition to realistic assessment of rateable value is based on the assumptions that tax rates will continue at the existing (expropriatory) level. Any systematic reforms will therefore involve both correct assessment of rateable value and rationalisation of tax rates.

Town Planning Act: Master Plan or Development Plan

The town planning acts apart from providing for land acquisition also provide the statutory basis for city

master plans or the development plans as they are called in the Maharashtra Regional and Town Planning Act. These development plans typically provide for land use zoning, density zoning and FSI zoning for a twenty-year period along with reservation of plots of land for “public purposes”, which will be acquired. The basic rationale for such zoning is to ensure “health and safety” and to balance demand and supply of infrastructure services.

Development Control Regulations

Development Control Regulations form an integral part of development plans. The principal component of DCRs relate to the use of provisions in various land use zones, density zoning in terms dwelling units permitted per unit area and the maximum permissible ratio of floor space to plot area or FSI.

The Case of Mumbai Metropolitan Region

It would be interesting to review the case of Mumbai with this background of policy and regulatory framework in respect of policies and regulations adopted at the local level.

Town Planning Schemes

The earliest strategic response (1930-1960) was essentially driven by the objective of bringing about orderly development. Taking recourse to the legal provisions, about 3,000 ha. of land was brought under development through Town Planning Schemes in Mumbai. However, the legal procedure - particularly the procedure to settle ownership disputes in the absence of a good land title system - was found to be extremely long drawn out. The system of levying betterment was also fraught with litigation and did not yield adequate resources for infrastructure in an inflationary setting. Despite being conceptually attractive, TPS has proved to be procedurally very cumbersome. The average time taken for completion of a TPS in Maharashtra has been 15 years. Moreover, as they are essentially plot reconstitution schemes they do not explicitly provide land for the poor.⁸ These TP Schemes are no longer in vogue in Mumbai

⁸ Land Pooling and Readjustment Scheme. A Tool for Planned Urban Development; J.G. Keskar and H. D. Kopardekar, All India Institute of Local Self- Government, Mumbai 1984.

Regional Plan 1973 and New Mumbai

The first Regional Plan of Mumbai Metropolitan Region prepared during 1967-70 did not explicitly spell out a land policy. The land policy issues were discussed as a part of housing or new town development strategies. The recommendations of this Regional Plan⁹ summarised below reflect the dominant thinking of the period:

- (a) In the absence of any land use zoning, every piece of land competes with every other for claiming the floating value for the most remunerative use. Land use zoning must therefore be strictly resorted to, to localise floating values for different purposes and to ensure that adequate and suitable lands would be available for housing at the price level of housing lands.
- (b) The price of residential land must somehow be maintained at a level at which it would be suitable for middle and low-income housing. The only way in which this could be done would be by taking resort to public control of lands by their bulk acquisition. Short of acquisition, no other measures are possible to make available adequate supply of land for low-income group housing at the right price.
- (c) The entire development value of all lands would have to be frozen. But until that is done, bulk acquisition of large areas by a public authority would be the only course available within the framework of the existing laws. This would ensure that land required for the housing of low income group people, can be subsidised from the profits realised from the sales of other types of land, namely, industrial and commercial lands and housing lands sold for higher income group housing, and
- (d) Leasehold tenure is preferred to freehold tenure as leasehold tenure enables effective control on use of land through restrictive covenants and provides rights of revision of lease rent.

⁹ Regional Plan for Bombay Metropolitan Region 190-1991, Bombay Metropolitan Regional Planning Board, Government of Maharashtra. 1973.

The Regional Plan prepared for the Mumbai Metropolitan Region during 1967-70 recommended the development of a new town of 2 million population across the harbour of Mumbai as a counter- magnet to Mumbai. Large-scale land acquisition was recommended as a key strategy. This was based on the consideration that large scale public ownership of land is essential for bringing about rapid and orderly development of land, recouping land value gains on account of infrastructure development which would otherwise accrue to private land owners and for helping the poor through cross subsidies and differential pricing.

In 1970 City and Industrial Development Corporation of Maharashtra a Government owned company was established as a New Town Development Corporation for developing Navi Mumbai. In the same year 16,600 ha. of private land was notified for compulsory acquisition. By 1993, 14,105 ha. of land has been acquired and 1501 ha. leased out. CIDCO adopted a policy of developing the new town as a series of nodes of 100,000 to 150,000 population.

CIDCO was able to generate surplus resources in Vashi even after providing for housing to low income group population.

However, large-scale land acquisition by paying legal compensation alone became increasingly difficult. The farmers felt that CID CO was realising high prices at their cost and demanded a share in the proceeds. It was finally agreed that 12.5% of the original land in the developed form would be returned to the landowners at Rs. 5 per sq.m. plus twice the acquisition price.

The experience of this attempt to have large-scale public ownership of land indicates:

- That public ownership of land alone cannot promote development of a new town which was to attract growth away from Mumbai
- When the real estate market is buoyant it, seems

⁷ Property Tax Innovation in India; Chetan Vaidya, Community Consulting International, New Delhi 1996

to help finance infrastructure investment. However, when the economy and the real estate are in recession, the land owning agency has to face a severe financial crunch

- Despite public ownership of land affordability of serviced land cannot be assured and appearance of slums cannot be avoided.

Guided Land Development Schemes

Realising the limitations of the large-scale compulsory acquisition of land, MMRDA attempted a Guided Land Development (GLD) Scheme for Kalyan Growth Centre that was a variation of Land Readjustment Scheme. Its main objectives were to ensure:

- Fair return on investment to the private owner/developer:
- A relatively large proportion of serviced sites for allotment to low income families: and at the same time,
- Recover at least part of off-site infrastructure cost for the public agency.

The responsibility for assembling land, preparing the layout and developing the on-site infrastructure according to the guidelines is cast on the private developers. Further the developers are required to make available certain number of small plots for low-income beneficiaries at a fixed price to public agencies. In this process, the question of recovering the cost or of equitably distributing the betterment are totally circumvented. Such a scheme was considered to be possible as the land was notified for compulsory acquisition and the GLD was seen as an opportunity offered to landowners to develop their land in a manner that assures reasonable return on land.

However, as the Land Acquisition proceeding itself was abandoned the GLD could not be put into practice.

Participatory process of Land Development - Oshiwara District Centre

Apart from Bandra-Kurla Commercial Complex,

BMRDA had planned to develop a district centre on a 100 ha. land at Oshiwara in the western suburbs of Mumbai. The district centre was planned to accommodate offices, commercial establishments and business services along with cultural and recreational activities and residential areas. However, here the land was in private ownership. The main concern here was to bring about desired development in a planned manner. MMRDA therefore used land acquisition procedure in notional measure, and agreed to return the land to original owners if they were prepared to undertake the development according to the plan and also financially contribute towards off-site infrastructure development. Such an approach is however extremely sensitive to real estate market. Though some land was assembled in this fashion through the initiatives of developers, no construction has yet commenced even after seven years of sanctioning of the plan.

Towards market oriented approach

The Revised Regional Plan, 1996-2011 for Mumbai Metropolitan Region does not propose large-scale compulsory acquisition and development by public agencies as the only way of achieving land policy objectives. The present practice of land use planning is observed to be excessively detailed in terms of allocation of land use over a twenty-year period. This not only becomes inflexible but also landowners whose land comes under "public use" resist such designation or connive in unauthorised use. Thus the planning process turns out to be counterproductive. In the Regional Plan therefore it is proposed that in the fringe areas only a structure plan showing arterial road network and critical land use be prepared. The land development should be left to the market. But the process should be guided by a system of incentives by way of bonus FSI.

- land assembly : it is necessary to assemble fragmented holdings to prepare proper layouts with provisions for local roads and open spaces.
- land for social/community facilities : The need for these facilities changes with scale of

development. Presence of such facilities also improves real estate prices in the vicinity. Given the incentives, market would respond by allocating land for these facilities or even developing these

- land for low income households : If a certain proportion of land is developed in the form of small plots and are handed to public agencies at a predetermined price, bonus FSI could be used on the remaining plots.

In this system as the real estate prices increase the market would respond willingly providing land for public uses instead of resisting it.

The Plan argues that with some variations, a similar approach could be used for bringing about planned renewal. Most central cities are characterised by individual buildings on small plots with poor road layout, inadequate parking and other facilities. Incentives that promote plot assembly, improved layouts and facilities within the framework of a broad plan can be introduced. The Plan has been only recently approved. It is not therefore possible to evaluate this approach.

It would thus be observed that though the national and state legislative framework was oriented toward an increasingly stronger intervention in the land market, the planners in Mumbai were forced to realise that such measures are unlikely to work. They therefore tried to use market-oriented policies to the extent feasible within such legal framework.

Some Innovative Approaches

The large-scale public ownership of land was of course not applicable in case of Mumbai. Here the master plan had to rely upon the acquisition of land for "Public Purpose". The master plan - called the Development Plan - sanctioned in 1967, proposed a detailed land use plan including road network and reservations for schools, parks, hospitals and such other facilities for a 20-year period. The land under

¹⁰ Development Control Regulations for Greater Mumbai, 1991; Government of Maharashtra

such reservations was supposed to be compulsorily acquired (eminent domain), and remaining land was allowed to be developed according to the zoning provisions of the master plan. No attempt was made to recover any betterment that would accrue on account of development of reservations. However, compensation payable under the law was seen to be lower than the true market price (mainly due to strong prevalence of parallel economy in land and real estate market) by the landowners. Attempts were made to delete such reservations through a political process or unauthorised development of such land.

Acquisition of reserved plot

Mumbai has been seeking innovative alternatives to compulsory land acquisition along with private financing of public infrastructure. According to the Development Plan 1967, and the Development Control Rules of Greater Mumbai, the development right on the land reserved for roads could be transferred by the land owner to his remaining land if he agreed to hand over the land to local authority free of cost and free of encumbrances. This principle has been extended further in the Development Control Regulations 1991¹⁰ in the form of Accommodation Reservation and Transfer of Development Rights.

Accommodation Reservation

The land owner can develop the facility for which the land is reserved (such as a library), hand it over to the Municipal Corporation free of cost, and then utilise the development right equivalent to the full permissible FSI for his own purposes. In case of Mumbai, this measure is likely to succeed, as land prices are several times higher than construction cost. But where land prices are not that high or are less than the construction cost such a measure is unlikely to succeed.

Transfer of Development Rights

Where the land has to be exclusively put to reserved use or where no building construction is possible, as in case of a garden the regulations allow the land owner to transfer his Development Rights elsewhere

if the land in question is surrendered to municipal corporation free of cost and free of encumbrances.

In both these cases if the landowner does not come forward, the right to compulsorily acquire the land is retained by the Planning Authority. In fact for this reason the landowners are expected to agree to transfer their development rights from high value area to generally low value area on one to one scale, without any weightage for the price differential. The success of the scheme depends upon the real estate market. Reduction in real estate prices in Mumbai during 1994-96 has also led to shrinking of market for transferable development rights.

Redevelopment of already developed areas

Slum Redevelopment

The Development Control Regulations for Greater Mumbai, 1991 attempted rehabilitation of the slum dwellers by providing incentive development rights. The essential feature of the scheme is that if an investor agrees to provide free dwelling units of 20 sq.m. each to slum dwellers he will be granted incentive development rights equivalent to floor area constructed for re-housing the slum dwellers. Such incentive development rights can be used at the site of the slum rehabilitation such that the total FSI does not exceed 2.5 (as against the normal 1). The residual development rights that cannot be used at the same site can be used as transferable development rights.

Reconstruction of Dilapidated Buildings

As brought out earlier the government has accepted the responsibility for repairs and reconstruction of nearly 2000 rent controlled tenanted buildings in Mumbai. Government has recently decided to invite private investment in reconstruction of such buildings. The investor will have to provide dwelling units of at least 20 sq.m. free of cost to existing tenants. He will then be entitled to 50% of the floor space required for rehabilitation of existing tenants as the bonus FSI.

Floor space Index - FSI

It would thus be seen that instead of reforming the basic legislative framework which is within the domain of the State or National Government. The tendency of late has been to use FSI as the main policy instrument to influence land and real estate market. This is apparently because FSI related policies could be adopted without any legislative changes. It should therefore be of interest to see the evolution of FSI in this fashion in some detail, and also to analyse its limitations.

Uncontrolled building construction gives rise to a variety of problems. Concerns regarding poor light and ventilation, inadequate water and sanitation facilities and also the structural safety of buildings has lead many municipalities and government to adopt building codes to control, guide and monitor building construction. Building bye laws of Mumbai used the parameters like ground coverage, maximum height, light angle, height in relation to width of the road to control the volume of built up area on a given plot of land. In 1964 the concept of Floor Space Index (FSI) was introduced for the first time in the Development Control Rules (1964 DCRs) of Mumbai formulated under the then Bombay Town Planning Act 1955. With the emergence of reinforced cement concrete and high-speed lifts, control of building volume through the parameters mentioned earlier was seen to be too restrictive. Instead FSI was seen to be flexible as it only specified the ratio of total floor space (on all storeys) to the plot area. This gave architects adequate flexibility in designing individual buildings. This simple physical ratio, however, soon acquired many connotations: some explicitly stated some imputed. It would be interesting to sketch this growing complexity since 1964.

The 1964 DCRs prescribed the highest FSI for the Nariman Point reclamation of 4.5 based on the dual rationale that high land and property prices and high cost of construction (piling etc. in the reclaimed land) justify higher FSI. However, in already developed areas like Colaba and Marine Drive FSI of 2.45 which was a product of earlier set of DCR was maintained.

Surprisingly, however, for more densely built up areas like Kalbadevi, Girgaon, Mandvi FSI of 1.66 was prescribed as against the consumed FSI of over 3. This was perhaps because by specifying lower than existing FSI, planners expected redevelopment of these areas at lower densities. For areas around Worli, Dadar and Sion FSI of 1.33 was assigned. This was perhaps with a view to allowing one additional floor where buildings were constructed according to earlier rules with 1/3 ground coverage and 3 storeys (implicit FSI of 1). For the rest of Greater Mumbai, FSI of 1 was adopted. In fact this legacy of 1/3 ground coverage explains why FSI of 1, 1.33 and 1.66 were chosen. Later in 1991 for the Island City of Mumbai uniform FSI of 1.33 was adopted.

Environmentalists love to believe that FSI is an effective technique of the town planner that can achieve a balance between the development and available or planned infrastructure - water, sanitation, roads, schools, parks etc. Sometimes it is also elevated as a technique of containing the development within the carrying capacity of the environment. Heated debates therefore ensue whenever a proposal to increase FSI is moved. First of all it should be realised that cities do not grow because of higher FSI or stop growing because of lower FSI. Surprisingly, however, this modest tool in the hands of a city engineer has acquired a status of public policy that is presumed to have capacity to serve many goals. It would be instructive to see how this happened.

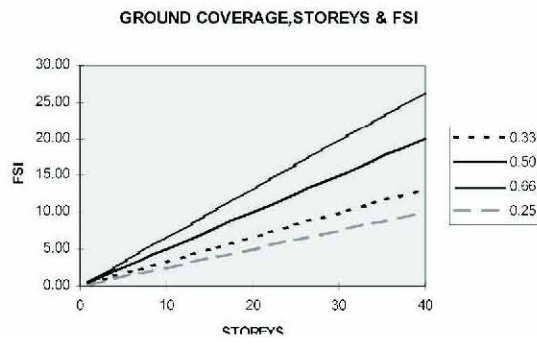
Within five years of introduction of FSI, a major deviation had to be granted. Many rent controlled tenanted buildings in the Island City were in dire need of repairs as the land owners had chosen to neglect these assets which did not yield them any returns. In 1969 the Government decided to step in and constituted what was called Bombay Building Repairs and Reconstruction Board. The Board could not have reconstructed these buildings within the stipulated FSI and at the same time accommodated all the existing tenants. The Board was allowed 2.4 times the permissible FSI. This was the first casualty to FSI as an instrument to shape the city pattern

particularly in terms of bringing about "decongestion".

As conceived in 1964, FST was based on an assumption that the city's land is divided into two domains. The domain where buildings can be constructed within permissible FSI and the domain where no building can be constructed. The land from the second domain if in private ownership will have to be compulsorily acquired under the Land Acquisition Act 1894. However, a minor exception, was introduced in the early 70s when FSI was assigned to road land and was allowed to be used on the adjoining buildable plot, if the road land is given free of cost and free of encumbrances to the municipal authority. This was for the first time that FSI was used as a way of attaching "Development Rights" to land which according to the plan was not supposed to have any and granting them as transferable rights in lieu of monetary compensation for land acquisition.

The second Development Plan of Mumbai proposed to extend this principle, for acquiring land reserved for public purposes like schools, parks and gardens and was called Transfer of Development Right. This has been codified in the 1991 DCRs. By this, though the division of city land into two domains mentioned earlier became blurred, the development right was still tied to land. The 1991 DCRs went a step further and proposed what is called accommodating reservation. Simply stated a landowner whose land is reserved for a school can offer to build the school free of cost for the municipality and still retain his entire development rights at the permissible FSI at the same location. This is for the first time development rights were brought out of the "thin air" not related to land in any fixed proportion. This was the beginning of FSI becoming a public policy tool in the hands of the state not confined to land. The 1991 DCRs also allowed twice the permissible FSI to schools, star hotels and institutional buildings on payment of premium related to market price of land. Thus FSI also acquired the colour of a public finance mechanism.

Chart 1

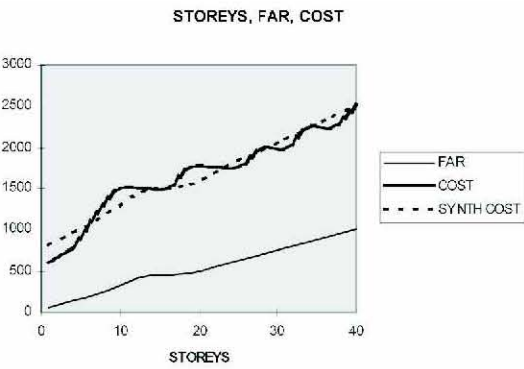


Offering extra FSI or development rights is now being seen as a panacea for many urban problems - obtaining land for public purpose, providing free houses to slum dwellers and the tenants of old rent controlled buildings and generating financial resources. There are in fact six types of TDR or incentive FSI currently available.

- Road TDR
- Reservation TDR
- Slum TDR
- Heritage TDR (to help preservation of Heritage buildings)
- Dilapidated Buildings incentive FSI
- Schools, Hospitals and Hotel incentive FSI

These measures appeared credible when real estate prices were increasing unabated. However, the recent slump in the market has exposed the limitations of these approaches. In deciding the receiving zones for the TDR, planners had tried to see that the TDR flows from congested areas to relatively low-density areas. The TDR have in practice flowed from low-density low price areas to high price areas. This has implied that land for public use has become available where there is no pressure of development to areas, which are under pressure of development. Moreover, the TDR is being used on existing buildings by sacrificing the setbacks required for light and ventilation, provision of parking or the adequacy of road width to support development of resultant intensity.

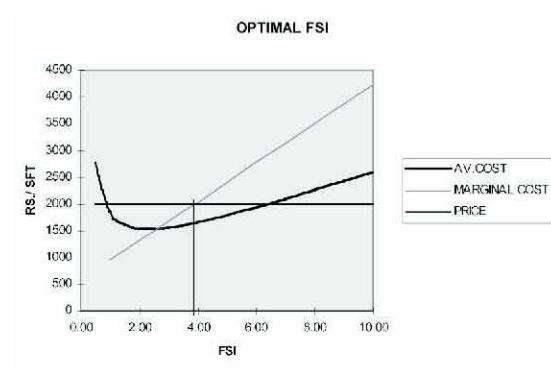
Chart 2



Fundamentally, FSI though initially seen as a physical planner's tool of controlling extent of built-up area on a given plot, has emerged as an instrument of intervention in the real estate market. To examine it in that perspective, it would be instructive to first understand the rationale of investment decisions of a real estate investor. The investors are also of two types. Those who are driven by the use value in self-use and those who are driven by the urge to maximise the exchange value. Both the investors coexist in a city. The process that leads the urge to maximise exchange value takes over the satisfaction in use value seems to be a complex phenomenon. Pedder Road and Juhu in Mumbai or Prabhat Road in Pune have seen slow conversion from bungalows to apartments spread over decades. Even after the FSI was increased not everybody craved to reach the maximum permissible FSI. However, it is relatively simple to seek explanation of an investor's behaviour that intends to maximise his returns in real estate investment by taking recourse to micro economic theory.

As is obvious this rational investor would be interested in maximising his returns as distinct from minimisation of cost or investment. In case of real estate development, particularly in the context of FSI, we therefore have to consider behaviour of both cost and price. First the cost. It is obvious that the cost of

Chart 3



construction is related to number of storeys. But FSI is not directly related to number of storeys. The relationship depends upon the ground coverage which in turn depends upon the development control rules regarding the setbacks. The relationship between number of storeys and FSI is shown in Chart 1 for a range of ground coverage. If ground coverage of 0.5 were achieved, 6 storeys would give an FSI of 3. This is the pattern in Marine Drive or Ballard Estate. But present set back regulations do not permit (and also the plot size and configuration) attaining such proportion of ground coverage. The cost of construction is obviously related to the number of storeys and not directly to the FSI. This is probably a step function with average cost increasing significantly with addition of lifts, refuge floors, fire fighting equipment, resistance to wind pressure and seismic forces, cost of haulage of materials etc. Neither an analytic nor a statistical exposition of relationship between storeys and cost of construction is available. However, in Chart 2 such a relationship is depicted without claiming great degree of certainty. The chart also shows a smoothened cost curve based on the stepped function assumed in the chart.

Chart 3 then represents the average cost of construction plus cost of land per sq.ft. of floor space at various levels of FSI, the marginal cost and the property price. In this chart it is assumed that the

property price will not change with the FSI, though it is possible to expect that the price will begin to decline with increase in FSI.

Micro economic theory or simple calculus will indicate that the optimal FSI for the investor will be at where the marginal cost equals the marginal price. Because at this point the returns will be maximised. (For the mathematics of such optimal FSI please Annex 1)

Use of FSI as an instrument of policy can now be examined on the basis of this Chart. Assume that on policy considerations we decide to specify 5 as the FSI. Investor will not build to that FSI as it will lower his returns. This is why some properties remain undeveloped or less developed as compared to permissible FSI. Conversely, if we specify FSI which is less than optimal, the investor will make overt or subtle efforts to attain optimal FSI. In case of Ahmedabad despite having the specified FSI of 1 actual FSI of nearly 2 to 2.5 has been documented. In case of Mumbai FSI of 1 prior to 1991 and after 1991 does not mean the same thing as the post 1991 regulations do not count staircase and balcony areas for FSI calculation.

What is paradoxical and somewhat counter-intuitive is the impact of FSI on prices. It may appear that if FSI of an individual plot is increased its land and property price may increase. However, if permissible FSI is increased across the city, the land and property prices may decrease and the optimal FSI for the investor would also reduce. On the other hand, if the FSI were reduced across the city, the land and property prices would increase. In that case the specified FSI may turn out to be sub optimal and the investors would attempt to reach the optimal FSI. Thus what influences the intensity of development is the property price and not the FSI. The policy objective if at all should therefore be to restrain excessive price rise and certainly not to have measures like very low



FSI as that would prove to be counterproductive.

Low uniform FSI

The FSI pattern first introduced in 1964 in Mumbai varied according to location attributes. FSI at Nariman Point was 4.5, at Colaba and Marine Drive 2.45, at Kalabadevi and Mandvi 1.66, Malabar Hill, Worli, Dadar and Sion 1.33 and in suburbs 1. In 1977 MMRDA attempted to restrain the FSI in the entire Island City to 1.33. This was later incorporated in the DCRs of 1991.

However axiomatic, objective of bringing about decongestion of inner city areas has led to prescription of very low FSI. Then treating FSI prescription as an inter-personal equity issue such low FSI has been prescribed for the entire city. The implications of prescribing uniformly low FSI are:

- (a) redevelopment of inner city areas is inhibited (in addition to the effect of the Rent Control)
- (b) this in turn implies unwarranted spread of the city, giving rise to longer trips and related extra cost¹¹
- (c) rent seeking behaviour amongst those who grant FSI through favourable interpretation.

In the context of such low uniform FSI, use of TDR then implies first creating an artificial scarcity which among other things would give rise to increase in price. Such a situation is then attempted to be exploited for serving various planning objectives. Apart from the rent seeking behaviour that such a policy may encourage, the seeds of long term failure are sown in the short-term success of such policies.

Developing land and real estate market

The long history of interventionist policies in terms of stronger legal power of acquiring land, detailed land use planning and restrictive FSI have not yielded the desired result as articulated in the land policy objectives. In fact nearly 50% of Mumbai's population lives in squatter settlements, less than half of the incremental housing demand is satisfied by formal housing supply, only about 15% of the reservations

made in the development plan have been realised. The city had to spread over a larger area with poor infrastructure and land for roads, parking has not kept pace with increasing ownership of private vehicles leading to increased congestion and pollution: and resource mobilisation through taxation of property has been woefully inadequate.

It is therefore necessary to consider a new strategy toward land and real estate market. The maxim of such strategy could be:

Limit planning to the essentials

The Development Plan of Mumbai is an example of too detailed a plan prepared too far in advance. Such an end state oriented plan that does not take into account the financial ability of the local government to implement it, in fact means that a large tract of land is kept out of the land market leading to its unauthorised use or increase in price of land that can be authorisedly be used. Similarly, its rigid DCRs can make legal houses unaffordable to a large section of the population. In order to avoid such adverse impact on the land and real estate market, the Development Plan has to be strategic in nature, prepared through a transparent participatory process and should be confined to land use pattern of city wide strategic significance. For example, the plan may indicate the arterial road network, location of major waste disposal sites but not of a local park or school.

Pay attention to price signals

When real estate prices in a particular area are high it needs to be considered as a market signal indicating that the location is considered to be more productive. FSI in such locations need not be axiomatically restricted. Moreover, such high value areas do not remain static. As the city grows and expands new areas of high value emerge like the suburban railway stations in Mumbai. FSI in such cases should be quickly adjusted to such signals.

Internalise through price mechanism the externalities

It is true that such high-density development would require more land and more financial resources for infrastructure improvements. Such externalities could be internalised by devising appropriate land assembly and pricing mechanism. Fragmented land ownership is one of the critical problems in obtaining land for infrastructure. Bonus FSI linked to land assembly may help provide the necessary land for infrastructure. Impact fees charged on the development may help raise capital resources for infrastructure investment.

Better yet the concept of FSI is given a go by though the regulations about setbacks for light and ventilation may be retained. The developer should be free to propose any extent of FSI. The impact of such development should be assessed as a part of the planning review; and subject to conditions of providing on site infrastructure and the payment of Impact Fee, development may be permitted. The process can be made transparent through public consultation.

Such an approach will need a shift in planning emphasis. In the present practice planning thought goes in making a 20-year plan. Thereafter granting development permission becomes a routine, administrative function based on a checklist. In the proposed procedure, application of "planning" will be required at the time of granting every major development permission. There may be apprehensions about speculative developers who may try to obtain development permission but do not actually carry out development. To prevent such speculative tendency, the permission should be valid

for a short period of say three to four years. Revalidation should be subject to additional fees being paid.

Increase supply of serviced land through infrastructure investment

While such an approach will help keep the city compact and real estate price at realistic and competitive level, it would also be necessary to expand the infrastructure services to increase the supply of serviced land particularly in case of a growing city like Mumbai.

Better Cadastres and streamlined procedures

Apart from the planning reforms proposed to help develop land and real estate market, it would also be necessary to have efficient cadastre providing up to date land information in terms of ownership, location, boundaries, assessment etc. The process of granting development permission should also be transparent, time-bound and professionally managed.

Epilogue

This brief review of land and real estate market in Mumbai very clearly indicates that the legislative and planning measures that directly or indirectly intervene in the land and real estate market have not been able to serve the avowed objectives. There is therefore need to explore ways in which land and real estate market can be allowed to operate with minimal intervention which may perhaps help achieve the policy objectives. This paper has attempted to sketch a few steps in that direction, largely in terms of new style land-use planning.

¹¹ Cities Without Land Markets; Allain Bertaud and Bertrand Renaud the World Bank 1994.

ECONOMICS OF FSI

Annex 1

- FSI (F) is a ratio of total floor area to plot area. This can also be represented as a product of ground coverage (ratio of footprint of a building to plot area) and the number of storeys.

$$F = g * n \quad (1)$$

where g = ground coverage

n = number of storeys

- Average cost of construction (Rs./m²) depends upon the number of storeys.

$$c = f(n)$$

$$c = (F / g) \text{ by substitution}$$

If g is assumed to be a constant,

$$c = 1 / g * f(F) \quad (2)$$

If the cost function is assumed to be a simple linear function,

$$c = a + bF \quad (3)$$

- Cost of land attributable to unit floor space is inversely related to F.

$$l = L * 1 / F \quad (4)$$

where l = cost of land per unit floor space

L = cost of unit land (Rs./ m²)

- If the area of plot is assumed to be unity (1 m²), floor space constructed will be F. In that case the total cost of land and construction will be:

$$\begin{aligned} T &= F * (l + c) \\ &= l * F + a * F + b * F^2 \end{aligned} \quad (5)$$

- Total revenue depends upon the real estate price (Rs./ m² of floor area)

$$R = r * F \quad (6)$$

Where R = Revenue

r = real estate price (Rs./ m² of floor space)

- Profit or return on investment P can therefore be represented as shown below:

$$P = R - T$$

$$P = r * F - l * F - a * F - b * F^2 \quad (7)$$

F at which P is maximised can be found by equating the first derivative of P to zero.

$$r - l - a - 2b * F = 0$$

$$F = (r - l - a) / 2b \quad (8)$$

However if l * F = L is treated as constant

$$F = (r - a) / 2b \quad (8a)$$

- However this is not adequate for an investor. He would also like to have a minimum rate of return.

$$R / T = > m ; R = > m * T$$

$$R - m * T = > 0$$

$$(r * F - m * l * F - m * a * F - m * b * F^2) = > 0$$

$$r - m * (l + a + bF) = > 0 \quad (9)$$

- This problem can be solved by optimising the function P in 6 under the constraint in 7. This can be solved by using a Lagrangian formulation.

$$\text{Optimise } P = r * F - l * F - a * F - b * F^2$$

subject to the condition that

$$r - m * (l + a + bF) = > 0$$

$$Z = r * F - l * F - a * F - b * F^2 - \text{lamda} * (r - m * (l + a + bF))$$

By equating partial derivatives of Z w.r.t.

F, l and lamda we get the followings;

$$\begin{aligned} dZ / dF &= (r - l - a - 2bF) \\ &- \text{lamda} * m * b = 0 \end{aligned} \quad (10)$$

$$dZ / dl = -F + \text{lamda} * m = 0 \quad (11)$$

$$dZ / d\text{lamda} = r - m * (l + a + bF) = 0 \quad (12)$$

By eliminating lamda from the equations (10) and (11) we get

$$l = 3 * b * F + a - r \quad (13)$$

Substituting it in (12) gives

$$F = ((1+m) * r - 2 * a * m) / 4 * m * b \quad (14)$$