Seven Notes on Mumbai's Growth and How to Finance It

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Draft consolidation

In 2003, a group of Mumbai citizens and businessmen produced a brief report entitled *Vision Mumbai: Transforming Mumbai into a World Class City*. This document started with the realisation that Mumbai had been losing ground, and outlined a plan, or rather of vision, to revitalize this great city. As a follow up, the Maharasthra State Government created a task force, involving the authors of *Vision Mumbai*, that is presently working on the transformation of this vision into an action plan, or as it is now often called a "business plan". The World Bank was asked to support this effort. The author participated in this support, and produced a several contributions in the process. Seven of them are regrouped here, with slight modifications in order to avoid (or rather to limit) duplication.

I –Mumbai's Growth and Investments

Definitions of Mumbai

The word Mumbai is used to designate at least three different realities. It can mean: (i) the City of Mumbai, a 67 km2 area inhabited in 2001 by 3.3 million people, (ii) Greater Mumbai, a 446 km2 area inhabited by 11.9 million people that comprises the City of Mumbai plus what is called the suburbs, or finally (iii) Metropolitan Mumbai, a 645[1] km2 area inhabited by 18.8 million people that includes in addition to Greater Mumbai the urbanized part of the adjacent Thane and Raigard districts. Table 1 illustrates these three concepts.

[1] *The area of urbanized districts in Thane and Raigard is a guestimate that should be repaced by actual numbers.*

The most relevant concept is certainly the third one, and the one we shall use when speaking of "Mumbai". A mere look at the aerial photography of the zone shows it clearly. The urbanized area extends well below the frontiers of "Greater Mumbai". It is this area of about 650 km2 that constitutes a unified (although imperfect) labor market and inputs market. To understand what is happening in Mumbai, and to define policies for Mumbai, it is this metropolitan area that should be considered.

Mumbai therefore consists of three areas that can and should be distinguished for analytical purposes. First, there is a center or core, referred to as the City. Then there is what would be called a first ring in the rest of the world, and which is called here the "suburbs". Then, there is a second or outer ring, consisting of the urbanized areas of Thane and Raigard districts. This is shown in Table 1.

Table 1 – Three Definitions of Mumbai, 2001

	Area (km2)	Population (M)	Employment (M)
Center ("City")	67	3.3	1.6
First ring ("Suburbs")	378	8.6	1.0
Outer ring (Thane and Raigard)	200	6.9	1.0
Mumbai (Metropolitan Mumbai)	645	18.8	3.6

A number of studies and documents –and people– mean "Greater Mumbai" when they say "Mumbai". They tend to forget the seven million people living in the urbanized areas of the adjacent counties of Thane and Raigard. The reason is that Greater Mumbai is a political jurisdiction. It is a district of the State of Maharasthra, and a municipal corporation (the Bombay Municipal corporation or BMC), with an elected council and an appointed commissioner. Statistics are collected and available for this area, and policies are conducted in it.

The urbanized area of Thane, which is a district of the State, includes several municipal corporations, such as Thane[1] (1.3 M inhabitants), Kalyan Dombiwali (1.2 M), Biwandi (0.6), Mira Bhardar (0.5 M), Ulhasnagar (0.5 M) to the North of Grater Mumbai, and Navi Mumbai (0.7 M) to the East[2]. To produce meaningful numbers for metropolitan Mumbai, it is therefore necessary to add numbers collected for Greater Mumbai, and numbers collected for these other

[1] Thane is the name of a district, and of a corporation (which is of course part of the district)

[2] The population numbers given here refer to the 2001 Census ; the population of these corporations increases rapidly : the population of Navi Mumbai, for instance, is reported to be 1.3 M in 2005.

municipal corporations or for the urbanized area of Thane district.

It follows that there is no political institution to analyze, discuss, and try to solve the problems of Mumbai. The State of Maharasthra is too large for that, and it is, for good and obvious reasons, focused on its rural areas which are home to the majority of its people —and voters. The Mumbai Municipal Corporation is too small, as indicated. In that sense, there is no pilot in the Mumbai plane.

The weight of Mumbai, in GDP terms and in 2003-4, obtained by adding existing estimates of the GDP of Greater Mumbai and of the GDP of the urbanized part of Thane and Raigard, was about 11,850 Rs crores, or 27 billion US$. This is about 40% of the GDP of Maharahstra and 4% of the GDP of India[1]. How does it compare with other world cities? Table 2 is a crude attempt[2] at answering this question.

Table 2 — GDP of Mumbai and other Large World Cities, 2000

	Pop (M)	GDP (G)
Tokyo	33.3	1,436
New York	20.1	1,050
Los Angeles	15.8	617
Paris	11.0	510
London	7.3-14.7	278-500
Hong-Kong	6.8	176
Seoul	15.7	149
Mexico	18.3	149
Sydney	4.0	94
Singapore	4.0	92
Shanghai	16.7	50
Cairo	10.6	33
Beijing	13.8	27
Manila	10.4	24
Mumbai	**18.1**	**22**
Jakarta	11.0	16

Sources: Author's calculations, based on UN data for population, and national Statistical yearbooks for GDP. "London" is particularly difficult to define: the first numbers relate to the so-called "Greater London", the second to a meaningful definition of the economic agglomeration. G (giga) stands for billion (10^9). The GDP for Mumbai in 2000 has been retropolated from the data for 2003.

It suggests that the ranking of Mumbai, which is high in population terms (there are only three or four cities more populated than Mumbai in the world), remains modest in terms of GDP. A complete list of cities would include a

[1] *These ratios are guestimates and should be checked*

[2] *This Table could be updated for a more recent year, and include also purchasing power parity numbers.*

number of other American and European cities. It would show that there are at least 30 world cities with a greater output than Mumbai. Admittedly, estimates in purchasing power parities would present a somewhat different picture. And GDP is only one possible indicator of the economic importance of a city. Finally, these numbers relate to 2000, and the growth at which the GDP of these (and of other) cities varies greatly, and a 10% increase over a few years does make a great difference. In 2006, assuming the 6% growth rate discussed below, Mumbai's GDP has probably reached 32 billion US$.

Growth of Mumbai

Before thinking about the future growth of Mumbai, it might be useful to find out what the recent growth has been and where it has taken place. Part of the answer is provided by Table 3 that gives numbers for population, GDP and employment. The period covered are not exactly similar, but numbers converted in yearly increases can broadly be compared.

Table 3 - Past Growth of Mumbai, Recent Years

	(in % per year)		
	Population (1991-2001)	GDP (1993-2003)	Employment (1990-1998)
Center ("City")	0.5%	na	
First ring ("Suburbs")	2.4%	na	
Center & 1rst ring (Greater M)	1.9%	5.4%	0.1%
Outer ring (Thane & Raigard)	4.1%	7.6%	
Mumbai (Metropolitan Mumbai)	2.7%	6.2%	

Source: Calculated from Census data for population, from Economic Census for employment, and from official GDP estimates for the Greater Mumbai district by means of a regression analysis on 1994-2004 data in constant prices. GDP data for the outer ring and for Mumbai is calculated on the crude assumption that GDP per inhabitant increased in these areas at the growth rate calculated for Mumbai (3.5% per year)

The picture is relatively clear for population. The overall population of Mumbai increased by 2.7% per year over the past decade. The natural rate of growth for the same period was about 1.6% per year. In other words, net in-migration accounted for about 1.1% per year. This is about 200,000 people per year, and 2.6 million in-migrants in ten years. Differences in population growth between the various parts of the city are large although not surprising. Population increased slowly (0.5% per year) in the center (the "City"), moderately (1.9%) in the first ring (the "Suburbs"), and rapidly (4.1%) in the Thane and Raigard districts. Assuming similar rates of natural growth in the three areas, this means that the center is actually experiencing net out-migration, and that the

burden of in-migration is concentrated in the first and outer rings, particularly in the urbanized and rapidly urbanizing part of Thane and Raigard districts. There is every reason to expect that such trends will continue in the future[1].

For GDP the data available relates to Greater Mumbai only. It indicates a 5.4% per year growth rate. This can be extrapolated to Mumbai at large (metropolitan area), and suggests a 6.2% per year growth rate for the 1994-2004 period, implying a doubling of GDP in less than 12 years. These numbers are much higher than the 2.4% growth rate for "Mumbai" (meaning probably Greater Mumbai) quoted in *Vision Mumbai*. This discrepancy is explained by the difference in the periods considered (1998-2002 in *Vision Mumbai*, 1994-2004 in our analysis) and by the fact that there are great variations in the year to year growth rates recorded. This is not unusual for a large city, which is generally more cyclical than a country at large. Our procedure, based on a logarithmic regression over a 10 years period, is more realistic, and the 6.2% it produces is more representative of the growth of Mumbai in the past decade[2]. This implies an average 3.5% per cent increase in per capita GDP.

The employment data available to us[3] suggests that this relatively high economic growth rate has been accompanied by a very low employment growth rate of 0.1% per year. This suggests a very low elasticity of employment to growth (lower than 0.02). This phenomenon, which would explain GDP growth by productivity growth is not at all implausible. It would reflect a structural change, the shift from a low productivity manufacturing sector to much higher productivity tertiary sectors. It also has serious social implications. The stagnation of employment means that the ratio of jobs to population has been deteriorating. The number of jobless increased. At the same time GDP, and therefore income, increased substantially. This increase benefited people with a job and/or people with capital. Inequality must have increased substantially in Mumbai in the past decade[4].

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[1] *This analysis could and should be expanded with the data recently released on migration*

[2] *It would be interesting to compare this growth rate with that of other major Indian cities. It would also be useful to conduct a shift-share analysis with the sum of these cities to identify the structural and specific components of this growth rate.*

[3] *More can probably be found in the Economic censuses of 1990 and 1998.*

[4] *This analysis should be extended, deepened and substantiated.*

Policies for Mumbai

As stated in *Vision for Mumbai*, the output of the city should grow at a rate of 10% or more. This objective appears feasible, for at least three reasons. First, as mentioned above, the present growth rate is already at about 6%. Second, the growth potential of Mumbai is enormous. Third, there are a number of well identified artificial and policy-made obstacles that could, at least in theory, be lifted, and make it possible for Mumbai to fulfill its growth potential.

As is well-known, many supply and demand characteristics of Mumbai are favorable to its economic development. There is first the existence of a large labor market pool. There are 3.6 million jobs —and workers. The city is sufficiently compact and transportation sufficiently efficient (although it could and should be much improved) to ensure that a large share of these jobs can be accessed by these workers, making it a large effective labor market, which is a major contributor to economic efficiency and productivity[1]. The labor force is diverse and of good quality. It includes low skilled workers ready to work anywhere at very low wages (immigrants coming from the countryside), and high skilled workers with college and university training. Second, there is an ample supply of entrepreneurship. Mumbai is a city of businessmen, that values money making and has traditionally attracted risk takers from all over the country. It is probably the most cosmopolitan Indian city. Third, some key inputs such as power and water are available in reasonable quantity and quality and at reasonable prices, at least relative to many other Indian cities. Fourth, and although capital is a foot-loose production factor, the fact that Mumbai is the financial center of India facilitates the availability of capital in the city. Finally, Mumbai is the door of India. It is the main port for both imports and exports, and accordingly a natural logistics center (logistics is not only a growing sector in itself, but a major inputs for many other sectors). Mumbai is also home to main (or the second) largest airport in the country. It is and will be one of the main beneficiary of the increasing integration of India in world markets.

These favorable characteristics are reflected and summarized in the very high real estate rental and

[1] *A 60,000 persons transport survey is presently beeing completed : this will make it possible to give substance and measurement to this assertion.*

purchase prices prevailing in Mumbai. These high prices are often —quite correctly— seen as a problem for the development of the city. They can also be seen as a proof of the attractiveness of Mumbai. The people and enterprises who are ready to pay such high prices to be located in Mumbai, rather than elsewhere, do so because this location is advantageous to them.

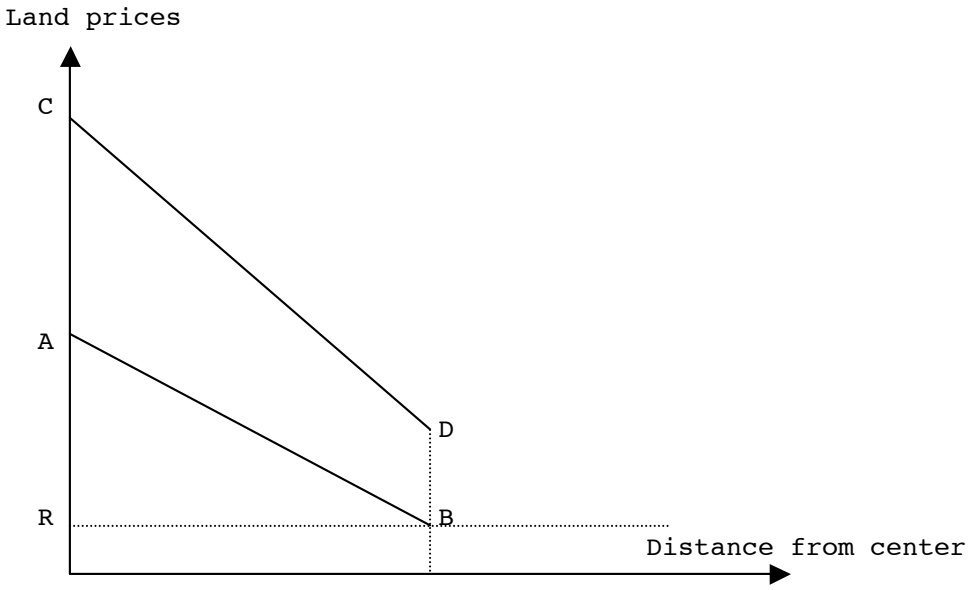
However, as is equally well-known, this growth potential is repressed by a set of land use and housing policies that (in addition to topography) restrict severely the availability of housing, commercial and industrial space —a key input into the growth process. These obstacles to growth have been clearly identified in Bertaud *et al* (2005). They include in particular severe rent controls, very low floor-space ratios (known as floor space index or FSI in Mumbai), and large frozen and unused tracts of land in prime locations. These well-meaning regulations have been introduced to protect the poor and the quality of life. They have achieved exactly the opposite. Both the incentive to build and the possibility to build have been drastically reduced. The amount of housing space per inhabitant is much lower that it could and should be in view of Mumbai's incomes, and nowhere in India is the relative importance of slums so high. The quality of housing is as bad as its quantity. Most buildings are not properly maintained. As usual, these policies-made scarcities have pushed prices up. Mumbaites, particularly the poor, pay much and get little. As usual also, these constraining regulations create powerful pressures for bribes and corruption; nobody believes that such pressures are always successfully resisted.

As is also usually the case, these constraints on the supply of build up space have resulted in a massive economic rent. It is reported that Mumbai's inhabitants spend about 30% of their income on housing. This would be about 7 billion of US$ per year, ignoring payments made for non residential uses. Since the recipients of that enormous amount do not spend much to maintain or increase the stock of built-up space, much of this income constitute a rent, not a normal rate of return on a socially desirable investment. Needless to say that this rent is very unequally distributed, and that the people who enjoy it are not strong supporters of the policies that could reduce or dissipate it.

Figure 1 offers a stylized presentation of this reality. AB is the "normal" rent gradient in a city, high in the city center (in A) and low at the city fringe (in B) where land prices are about equal to the agricultural

land price R. The total Ricardian urban rent is equal to RAB. In Mumbai, land use constraints push up the land gradient to CD. The total rent becomes RCDB. Land use constraints therefore create an artificial rent equal to ACDB, that functions like a tax on urban dwellers benefiting land owners.

Figure 1 – Mumbai Land Rent



The policies that could increase the supply of built-up space, and increase economic growth as well as citizen's welfare, are well-known. Mumbai can grow in three main ways or directions. It can grow up, if FSIs are increased, particularly in the center, to what can be found in most other large world cities. It can grow North and East, if infrastructure links are created. It can grow on itself so to say, if the non-utilized or sub-utilized lands of closed mills, harbor and navy base are developed.

The main components of a development strategy for Mumbai are not so much to introduce costly incentives to growth but rather to remove artificial obstacles to growth.

This statement does not imply that some incentives could not be useful, much to the contrary. Promoting world class universities and research centers, for instance, would undoubtedly add to the attractiveness of Mumbai. Creating a second international airport, or improving the J. Nehru Port Authority, might prevent bottlenecks in the future.

This statement does not imply that it is easy to do either. The political economy problems associated with the required changes are enormous. Changes would affect both a few very rich property owners, and millions of very poor tenants. Both groups are powerful, by virtue of their wealth in one case, and of their numbers in the other. Both will oppose change, either because they have much to lose in one case or because they believe they have something to lose in the other case (in any case, all changes, even for the better, are costly for the very poor).

Investments for Mumbai

Growth requires investments. High growth requires high investments. It seems very difficult to get meaningful orders of magnitude of what investments are presently in Mumbai[1]. Investment rates seem to be low. As one travels throughout the city, one hardly sees any cranes, unlike what can be seen in many fast developing cities. Investment in housing cannot possibly be very important, be it in maintenance and repair or in new additions to the housing stock. Investment in factories and office buildings is likely not to be massive in a city in which employment stagnates. Investment in public infrastructure is better known, and does not appear to be massive either.

It is easier to produce very crude estimates of what would be required to generate a 10% or a 15% GDP growth rate in Mumbai. We can associate a 25% rate of investment with a 10% GDP growth rate, and a higher 35% rate of investment with a 15% GDP growth rate, and construct the following Table 4.

[1] *Additional work should be done on that topic. The activity of the construction sector should yield useful insights. Most construction work contributes to gross capital formation, although the reverse is not quite true. But the numbers available in published statistics on « construction » are ridiculously low, and cannot reflect the effective importance of the construction sector. More work would be necessary to find out where constructions activities and workers are hidden.*

Table 4 — Investment Needs for Mumbai, 2006-2020

	GDP 10%/year (G US$)	Investments 25% of GDP (G US$)	GDP 15%/year (G US$)	Investments 35% of GDP (G US$)
2006	32	8	32	11
2007	35	9	37	13
2008	39	10	42	15
2009	43	11	49	17
2010	47	12	56	20
2019	110	28	197	69
2020	121	30	226	79
Total 2006-2020	1017	254	1522	532

Source : own calculations. G (giga) stands for billion (10^9)

Table shows that in the first case (10% GDP growth rate, investment rate of 25%), yearly investment needs would amount to 6-9 billion US$ in the coming years and increase to more than 20 billion US$ at the end of next decade. The total amount of investment required over the 15 years period considered amount to about 200 billion US$. These numbers sound impressive. They are five times greater than the 40 billion US$ cited in the *Vision Mumbai* report (for a not clearly specified period of time). Yet they are conservative. A 25% investment rate is moderate: it is lower than the present investment rate of India as a whole, not to mention Chinese cities or provinces investment rates which are in the 40%-45% range. As a matter of fact, the numbers in the second case (15% GDP growth rate and 35% investment rates) are probably closer to what is desirable, yet feasible.

Financing Mumbai's Investments

The investments to be done in Mumbai are of three different types: investments in housing, investments in productive capital, and investments in infrastructure. Not enough is known on what the relative importance of these types of investments is or should be. Based on an earlier study (Prud'homme 1977) of the French case (admittedly a foundation of dubious relevance) let us assume that productive capital accounts for 50% of total investments, housing investments for 30%, and infrastructure for 20%.

Half the investment flows would therefore consist of productive investments in factories, office buildings, commercial space and related equipment. It can and should be financed by private enterprises without too many difficulties. These investments are revenue producing. Some might be financed by foreign direct investments, but the bulk of it will be financed out of profits or of bank loans.

The other half of the investment flows consists of housing and infrastructure, that have to be financed by a combination of public and private sources.

Potential scope of public financing — Public financing can come from several sources: local governments, i.e. municipal corporations, and the entities they control; the State of Maharhastra government; the government of India. Some people would add: international institutions, although it must be kept in mind that they merely lend or donate money to governments. It is not likely that the government of India can be expected to invest much in housing or infrastructure in Mumbai. Nor will the government of Maharasthra. The latter is heavily indebted, and its expenditures represent about 140% of its revenues. It cannot spend much more. And if it could, it would naturally favor expenditures in the countryside, where about 80% of the people (and the voters) live, and where incomes per capita are 2 or 3 times lower than in Mumbai. One could try to argue that because Mumbai pay significant taxes to the State, investing in Mumbai to increase its output and therefore its taxes paid to the State, might make sense from a revenue point of view for the State of Maharasthra. But this argument, even if it were true, would probably not carry much political weight.

The bulk of public financing for housing and infrastructure will therefore come from the municipal corporations, and in particular from the most important of them, the Municipal Corporation of Greater Mumbai (MCGM)[1]. Its simplified budget is presented in Table 5.

[1] *It would be necessary to present in a similar form the budgets of the six major corporation of Thane district*

Table 5 – Municipal Corporation of Greater Mumbai Budget, 2003-4

	Rs crores	US$ M
Revenues :		
Taxes	3604	819
Octroi	2380	541
Property tax	1223	280
Charges (water & sewerage)	724	164
Subsidies from the State	274	62
Other, including borrowing	1780	405
Total, revenues	6382	1450
Expenditures :		
Salaries & pensions	2422	550
Debt service	490	111
Capital expenditures	1146	260
Other	2317	527
Total, expenditures	6382	1450

Sources and notes : include budgets A (general budget), B (properties), E (education) and G (water supply and some other)

The MCGM is presently investing less than 0.3 billion US$. Taking into account the municipal corporations of Thane district might increase that number to 0.4 billion. This is less than 10% of housing and infrastructure investment needs, ignoring the existing backlog. It is difficult to see how this number could substantially be increased. Non capital expenditures are probably difficult to reduce; and it would be even more difficult to increase taxes.

There are only two local taxes, and both are “bad”, although for different reasons. The most important one (accounting for about 2/3 of total taxes), octroi, is a tax based on the value of goods entering the jurisdiction. Trucks are actually stopped as they enter the city, their cargo summarily examined and its value crudely assessed. The main cost of the tax is the delay it imposes on deliveries. In addition, the process invites arbitrariness and corruption. Nobody thinks of increasing the burden of octroi: the question is rather whether it should be abolished, and if so by what tax could it be replaced.

The property tax is in principle a rather good local tax, in the sense that it does not distort too many decisions. But it is a tax difficult and costly to administer. Assessing the changing rental or capital values of millions of properties is no easy task. This general, world wide, difficulty is compounded in the case of Mumbai by rent control and the many land use regulations in force. In a sense, the property tax is another casualty of excessive regulations. Property tax assessment also invites corruption. It is reported that the property tax base is very unequally assessed, varying

greatly between the center (the “City”) and the first ring (the “Suburbs”), between new and old buildings, between residential and non-residential properties. As a result assessed values bear no relationship to actual values. Two properties of a similar rent (or value) can be assessed at values differing from 1 to 100. Assuming that the average value of the housing stock is 4 times annual income, and that residential properties contribute 2/3 of the tax proceeds, the property tax would represent 0.25% of the value of residential properties on average. This is not excessive by international standards. But the property tax is widely perceived as an unfair or unjust tax. It is always difficult to increase a tax, particularly a tax paid by many taxpayers; but it is next to impossible to increase an unjust tax. This does not mean that one should not attempt to improve the property tax, much to the contrary. The current proposal to change the definition of the tax base from rental value to capital value is perfectly reasonable, although not too much should be expected from it (in principle, if not always in practice, rental values and capital values only differ by a factor λ which is constant for all properties). But it will be difficult and lengthy to introduce. No significant increase in tax proceeds should be expected in the coming years.

One is left with the conclusion that municipal finance, and with it public finance, will be grossly inadequate to finance housing and infrastructure investments needs of about 4 to 5 billion US$ now, to be increased rapidly to much higher levels. One is therefore forced to look in the direction of private sector financing.

Potential scope of private sector financing — Fortunately, the picture is not so dark on the private sector side. The constraints that are the cause of many of Mumbai’s growth problems are also the solution to these problems. The thirst for floor space is so great that people and enterprises in Mumbai are ready to pay very high prices for it. They are ready to pay prices much higher than the cost of providing this floor space, even if one includes infrastructure investments in this cost. It follos that there are developers willing to make the required housing and infrastructure investments because there is a market for it. The planned bridge connecting the center (the City) to the south of Navi Mumbai is an excellent example of this. This bridge costs about 1 billion US$. The demand for residential and commercial floor space in the area to the south of Navi Mumbai is such that the sale of constructed floor space in this area

will cover construction costs of both the floor space and the bridge —plus an unknown profit to the developer. This is the reason why there are developers ready to build the bridge, provided they are allowed to build floor space in this area and to put a toll on the bridge.

Another way to put it is to say that the massive present economic rent can and should be mobilized to finance the housing and infrastructure investments that will contribute to reduce or eliminate it.

The development strategy outlined above —develop the city up, North and East, and on itself— therefore appears self-financing. The private sector is ready to do it, and to provide the housing and infrastructure that should be part of this development. Financing investments is not a major problem.

This financing strategy, however, is not without raising some difficulties. Five can be mentioned and briefly discussed.

First, it puts a heavy burden on planning and planners. It is easy to say that more land should be developed and that developers that want to do the job should be allowed to. It is much more difficult to conduct this process in practice. Developers cannot be left entirely free to decide what they will offer in terms of layout, densities, uses mix, infrastructure. One should not go from the present excessive constraints to a complete absence of constraints. Then, developers must be selected by competitive bidding processes as transparent as possible. Finally their work must be monitored and in certain cases redressed. This is a delicate work that requires technical and political skills that may or may not be present. Very few (if any) politicians, or administrators or planners, as they are now, seem fully prepared for such a task. In addition, the geographical scope required would be larger than the existing jurisdictions; But these are governance problems rather than financing problems.

Second, this raises the question of whether some public bodies could not or should not be able to play the role of developers. The answer is: yes. As a matter of fact, it is already happening. CIDCO has developed Nova Mumbai very much along those lines. MMRDA (Mumbai Metropolitan Regional Development Agency) is at the same time a traditional planning agency, involved in the preparation of a master plan, and a developer, that has successfully developed housing and commercial estates in

the North East of the first ring (the “Suburbs”) and accumulated substantial benefits at that. MSRDC (Municipal State Road Development Corporation) builds and operate roads, such as the Western sea highway (for about a billion US$) on a commercial basis, that is with toll financing, without asking for government subsidies. Parastatals therefore can be created and operate like private enterprises. The real issue is whether they are as efficient and innovative as private enterprises, and who will control and monitor them. The notion that MMRDA be at the same time a planning agency that prepares “good” plans, and a development agency that makes money at implementing them, might create conflicts of interests. Here again, the problem is a governance problem.

Third, is there not an alternative, which would be that municipal corporations tax heavily land profits associated with private developments, and then spend the money thus collected on infrastructure and possibly housing investments ? In theory, this alternative would make sense. In practice, it is doubtful that a sufficiently efficient tax system (implying a quadrupling of existing taxes) could be developed, and not sure that the money thus collected would actually be spent on infrastructure projects, and/or be spent efficiently.

A fourth issue is what would happen in the medium term with the strategy suggested. In the first year, because of the present demand for space, it will be easy to make people pay for infrastructure. But as time passes, the very success of this strategy will reduce the pressure on prices (it is indeed one of its objectives). Will not this make it more difficult to pursue this strategy? If there were no growth, this is certainly what would happen. But with the rapid growth (that this strategy will contribute to ensure) will ensure that the demand for built up space continues to be high, and to provide the financing required for the continuation of this virtuous circle.

Finally, it should be clear that this strategy will not bring a solution to all the present problems of Mumbai, and in particular to the slum problems. Market mechanisms, even when monitored and orientated by enlightened governments or regulators, cannot be expected to achieve everything. Strong social policies are required to redress the present alarming situation, and to mitigate the negative impacts of rapid economic change.

Conclusions

In conclusion, it appears that a 10% GDP growth rate for Mumbai is perfectly feasible and sustainable. It requires primarily the unlocking of the growth potential of the city, by alleviating the dramatic pressure that exists on floor space supply for both households and businesses. This requires in turn regulatory changes and massive investments in infrastructure and housing. It is not realistic to expect that these investments will be financed by "government". None of the three levels of government (the Union, the State and the municipal corporations) will be able to do so. Fortunately, most of the floor space construction needed to unlock Mumbai will generate sufficient income to finance the necessary housing and infrastructure investments.

II - Of FSIs, Crowding and Densities[1]

Mumbai's planners, politicians, journalists and citizens are rightly preoccupied with the use of scarce land in the city, the small size and high price of housing, the scarcity of available open spaces, road and public transport congestion, or the image of the city. They tend to see FSIs as a —or as the— solution to these very real problems. This belief is vastly exaggerated. It is based upon the view that FSIs control densities and crowding. This view is simplistic to the point of being mistaken. In reality, the concept of density is different from the concept of crowding, which is different from the concept of FSI, not to mention the fact that legal FSIs are different from actual FSIs.

Density =/ Crowding =/ Legal FSI =/ Real FSI

These notions, however, are interrelated. This note explores these notions and their relationships.

Density - Density is defined as the number of people living in an area divided by the size of this area:

$$\text{Density} = \text{people}/\text{land area} \qquad (1)$$

It is often defined in inhabitants per hectare. It is not an unambiguous concept, particularly for inter-city comparisons, because different definitions of "people" and of "land area" can be, and are in practice, utilized. The

[1] Prepared with Alain Bertaud, December 2006

numerator, “people” can refer to residents only (residential density), or to workers (employment density), or even to both (total or combined density). The denominator, “land area”, can refer to the built-up land only, excluding streets, parks, schools or railways, or to the total land are, including all of the above. The combination of these various concepts produces at least six different definitions of density.

In addition, density, however defined, can and should be calculated for different parts of the urban area, since it differs greatly from one part to the other. What we have therefore for a given city is a distribution of densities. An average can be calculated, of course. But it can be misleading. A city with a uniform density of 100 people/ha and consequently an average of 100 people/ha, is very different from a city that would have a density of 40 on half the land and a density of 160 on the other half, although it would have also an average density of 100. Density maps give a less misleading picture of density realities.

It follows that questions like: is the density of Mumbai greater or lower than the density of New York? or even: is the density of Mumbai to-day higher or lower than the density of Mumbai twenty years ago? do not call for simple answers. What can be done meaningfully, provided similar concepts are used, is to compare density patterns for New York and Mumbai, or for Mumbai in 2005 with Mumbai in 1985.

This being said, legitimate debates about desirable densities can and do take place. High densities might be economically efficient, but more demanding in terms of transport infrastructure, and socially less agreeable, although there are people who prefer high density areas to low density areas. The only thing that can be said for sure is that diversity in density patterns is desirable.

Crowding — Crowding is defined as the number of people per area of build-up floor.

$$\text{Crowding} = \text{people/built-up floor} \qquad (2)$$

The inverse of crowding is the amount of built-up-floor (in m2) per person. In Mumbai, this number is about 4: each inhabitant lives, on average, on 4 m2 of built-up-area.

As in the case of density, the notion of “people” can refer to residents (residential crowding) or to workers

(employment crowding), or to both. But it is worth noting that the notion of "built-up-floor" is much less ambiguous than the notion of "land area", particularly for residential purposes.

It follows that comparisons of intercity or inter-temporal crowding (or its inverse, floor space per inhabitant) are much more meaningful than comparisons of densities.

Crowding also differs from density in normative terms: less is unambiguously better. There is no debate on that. Everybody wants to have more square meters to live on. (People do face a trade-off between less square meters in a prime location and more square meter in a not-so-good location, and also between housing consumption and non-housing consumption, but this is a different matter). Reducing crowding in Mumbai would indeed improve welfare in the city.

FSI — FSI (floor space index) is defined as the built-up area divided by the land area on which the building is erected.

$$\text{FSI} = \text{built-up area}/\text{land area} \qquad (3)$$

Since it consists of m2 divided by m2, it is a ratio, not a unit; for this reason in many countries it is called floor-space ratio rather than index. FSIs can be defined for a land plot, or for a larger area, or for the city at large. In India "plotted FSI" refers to the ratio between the floor area built on an individual plot and the land area of the plot on which this floor is built; "global FSI" refers to the ratio between the total floor area built in a neighborhood and the land area occupied by this neighborhood (including streets, open spaces, etc).

A key distinction must be established between legal or formal FSIs on the one hand, and actual or real or effective FSIs on the other hand. Formal FSIs can be, and are, a legal constraint: it is not permissible to built beyond a FSI of 3 means that the owner of a 100 m2 land is not allowed to build more than 300 m2 of floor space. But he is not obliged to build that much, and he may find it appropriate to build only 200 m2 of floor space, thereby creating a real FSI of only 2. The map of formal FSIs need not coincide with the map of real FSIs. Actual FSI in Mumbai is often higher that legal FSI.

Relationships between density, crowding and FSIs — There are no strong reasons to expect densities, crowding

and FSIs to go hand in hand, and to increase, or decrease simultaneously. Combining (1), (2) and (3) produces:

$$\text{Density} = \text{Crowding} * \text{FSI} \quad (4)$$

$$\text{Crowding} = \text{Density} / \text{FSI} \quad (5)$$

Equation (5) shows that, for a given density (a given number of people living in an area), low FSIs will imply high crowding, and reducing FSIs will contribute to increase crowding, ie to decrease the amount of floor space per inhabitant. This very much what has happened in Mumbai in the past fourty years. Particularly low legal FSIs over the years have led to particularly high crowding.

Equation (4) shows that densities will decline if crowding decreases (for a given FSI). Crowding will decline if additional land is developed to provide additional floor space and if people's income increases. Equation (4) also shows that density can decline even if FSIs increase: this will happen if and when crowding decreases faster than the increase in FSIs (this has been the case in Shanghai during the last 20 years).

Suppose that crowding = 0.25 (people per m2 of built-up floor), and FSI = 1 (built up floor/built up land area), this will produce a density of 0.25 per m2 of built up land, a situation not very different from what can be found in many parts of Mumbai. With a constant FSI, a 50% decrease in crowding will lead to a 50% decrease in density. Let us now assume a doubling of the FSI (to 2) and a division by three of crowding (to 0.08): this will result in a density of 0.16, a 36% decline.

An increase in FSIs will necessarily lead to a decrease in crowding. This is because of price effects. An increase in FSIs means an increase in the supply of housing floor. All other things equal, it will lower housing prices per m2. This in turn will induce people to utilize more square meters of housing, which means (by definition) decreasing crowding.

Whether this positive impact of increased FSIs on density will be stronger than the direct negative impact of increased FSI on densities is not sure. It mostly depends upon two factors: the development of additional floor space in the rest of the agglomeration, and the increase in households income. The faster the GDP growth and the household income growth associated with it, the greater the demand for additional floor space per person

and the pressure to reduce crowding (and therefore densities). The more additional floor space is developed, the greater the pressure on unit housing prices, and the greater the consumption of floor space per person and the decline in crowding.

One must also note that if the impact of increased FSIs on densities is uncertain, the impact of increased FSI on crowding is certain, and positive.

To conclude, keeping FSIs low is not a sure way of keeping densities low, and can even contribute to raise them, but it is a safe way of keeping crowding high, a most undesirable outcome.

FSIs have a different, useful, function. They can have a very useful instrument to achieve other goals, such as protecting the urban landscape or creating a (supposedly) desirable physical homogeneity. Their use should be restricted to such goals.

III- Taxes paid by Metro Mumbai[1]

This note is an attempt to estimate the fiscal contribution of Mumbai to the budgets of the Union, of the State of Maharahstra, and of Mumbai's local governments, and how this contribution would be affected by different growth scenarios. Mumbai here is defined as the metropolitan region comprising Mumbai district (Greater Mumbai), and the urbanized part of Thane and Raigard districts, inhabited by 22 million people, with a GDP of 130,000 Rs crores (30 billion US$). It represents about 22% of the population of the State and 2.2% of the population of India, but 37% of the GDP of the State and 4.7% of the GDP of India, and, as we shall see, contributes larger shares of the taxes pocketed by the State and by the Union. The magnitude of these taxes is first estimated for 2005, then projected to 2020 under different GDP growth scenarios.

Overview of the tax system

Mumbai households and enterprises pay taxes to the three levels of government: to local governments (that is mostly to seven municipal corporations), to the State, and to the Union. The eleven most important taxes are shown in a simplified fashion in Figure 1.

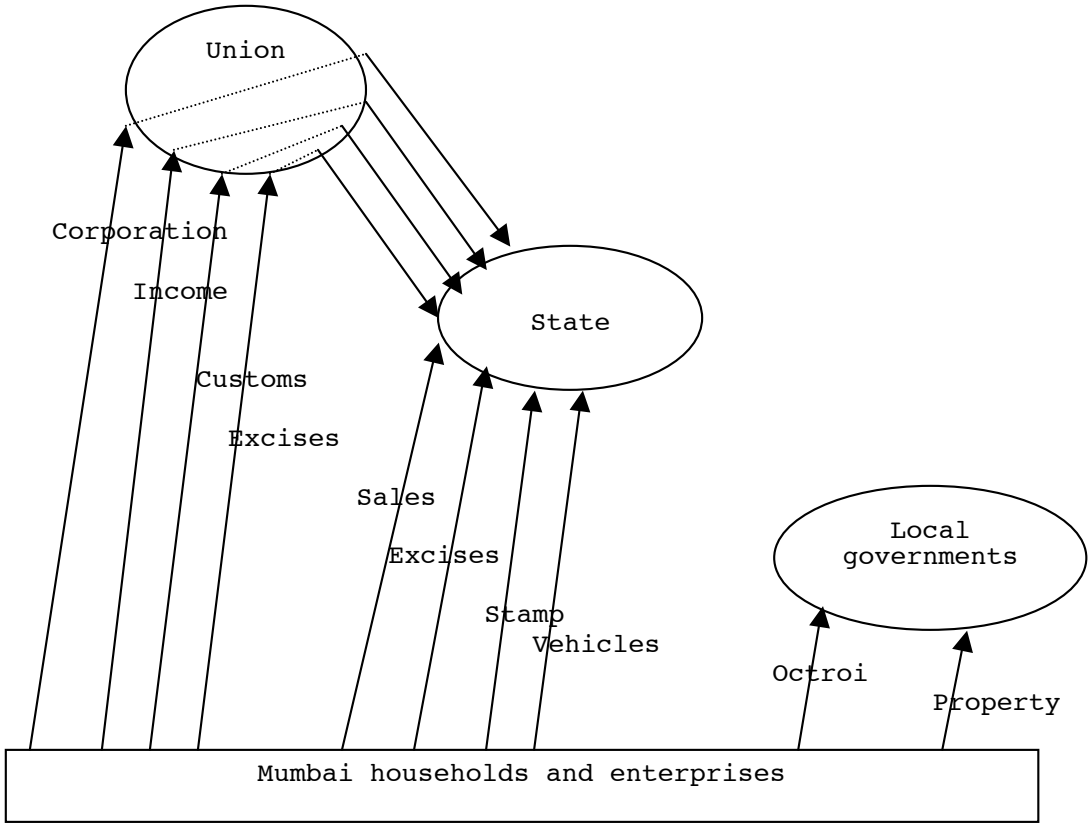
[1] Prepared in February 2006

There are four main taxes paid to the Federal budget:

- *Excise duties*, assessed on specific goods, which are in principle consumption taxes, but which are in practice collected at production sites.

- A *corporate income tax*, assessed on the benefits of corporations, and collected at the place where the headquarters of the corporation are located. The amount of tax paid in a place, for instance in Mumbai, does not reflect at all the "contribution" of that place, since the burden of a corporate income tax is shifted to its customers, to its workers, and to its owners —all of whom who may be located in the entire country (and even abroad).

Figure 1 — Main Taxes Paid by Mumbai Households and enterprises



- *Custom duties*, which are obviously collected at ports of entry, such as Mumbai, but which cannot be considered as contributed by the place where they are collected.

- A *personal income tax*, assessed on the income of each household. By and large, what is paid in a particular location can be assumed to be borne by the people and households of that location.

Although these four taxes are Federal taxes, the rate of which is decided by the central government, and the bulk of which accrues to the Union budget, a certain share of the amount collected in the State is actually sent back to the State budget, and appears in its account under the name of "Share in Central Taxes". In reality, however, the Maharashtra "share" of a given Federal tax, such as the personal income tax, is independent of the amount of personal income tax collected in Maharashstra. It is a share of the personal income tax collected in India, whiwwch is allocated to the various States by means of an allocation formula produced by the Finance Committee.

There are five main State taxes decided by the State of Maharahstra, and collected by its services[1].

- The *sales tax* is by far the most important one. It is a cascading tax, imposed upon sales, at rates that vary with the type of good or service considered (from 0% for bread to 35% for diesel oil, with 4% the most common rate). This sales tax is presently being replaced by a value-added tax that will be a Federal tax, a share of which will be sent back to the State.

- The *stamps duties* are taxes paid on the sale of immovable properties. The tax base is the sales value. The rate, which used to be 8% [Check] has been recently [When?] reduced to 5%.

- The *State excise tax* (not to be confused with the Union Excise tax) is a mostly a tax on alcohol production, particularly "country liquor" (28% of total proceeds), "Indian made foreign liquor" (37%) and beer (15%). It is collected at the production sites, not at the place of consumption.

- The *electricity duty* is a tax on electricity consumption.

- The *vehicles tax* is a tax assessed on the registration of vehicles and on the ownership of commercial vehicles.

[1] They are presented here in decreasing order of importance for the State of Maharasthra.

Table 1 indicates the relative importance of these taxes for the State of Maharasthra (not the contribution of Mumbai to these tax proceeds). For the State, the picture is dominated by the Sales tax, which accounts for 53% of its tax resources, and 42% of its total resources. The substitution of the sales tax by the value-added tax is going to be a major change.

Table 1 — Nine Most Important Tax Resources of the State of Maharashtra, 2004-2005

	Rs crores	Million $	Share
Share of Union taxes			
Excise tax	1,136	258	3%
Corporate income tax	1,049	238	3%
Custom duties	700	159	2%
Personal income tax	570	129	1%
State taxes			
Sales tax	16,890	3,834	42%
Stamps duties	3,375	766	8%
State excise tax	2,600	590	6%
Electricity duty	1,290	293	3%
Vehicles tax	1,155	262	3%
Other taxes & non-tax revenues[a]	11,629	2,639	29%
Total revenue receipts	40,394	9,169	100%

Source : *Economic Survey of Maharashtra 2004-5*, p.T-5
Note : [a]Of which other taxes account for 3,340 Rs cr, and grants in aid from the Central government for 3,548 Rs cr.

In addition, Mumbai households and enterprises pay taxes to the local governments in which they live or are registered. There are two main local government taxes in Mumbai: octroi and property tax. In addition, people pay, for a smaller amount[1], water and sewerage charges, which could be seen a hybrid of pure taxes and of pure user fees. They can be called user fees when the charge is actually based on water actually consumed (and metered), which is often the case in the Mumbai Metropolitan corporation; and even when they are not because the proceeds are ear-marked for water and sewerage services. But when water charges are not based on water consumption (because water consumption is not metered), and are assessed on the property tax base [Check that this is the case], then water charges can be called a tax.

Octroi is an *ad valorem* tax paid on goods entering a local government territory. Trucks are actually stopped on the road, their cargo is inspected, its value is assessed and the tax is paid. For rail cargo, a similar valuation

[1] In the case of Mumbai Municipal corporation, water and sewerage charges represent in 2004-5 about 20% of octroi plus property tax

and tax payment is done at the rail station where goods are unloaded. Both economically and administratively, octroi is widely recognized to be a bad tax. Economically, it distorts competition, it imposes delays and costs on transportation, and in many cases it doubles the sales tax and/or excise taxes. Administratively, it invites arbitrariness in assessment, tax evasion and corruption. It has been abolished in most Indian States, but not in Maharashtra. But it is a high yield tax.

The *property tax* is a tax levied on the rental values of structures, at rates that vary with the type of structure and which are much higher for non-residential property than for residential property, and also in some areas than in other areas. It is reported that the bulk [How much exactly? Find additional data on that] of the property tax is paid by non-residential properties. There are proposals to replace the present system by a system based on the capital value of structures. In theory, this should not make much difference. In a well-functioning market, there is a ratio λ of rental value to capital value which constant for all properties. The proposed change of tax base would therefore imply a change of tax rate: a multiplication by λ. But Mumbai is not a well-functioning market for real estate, and the proposed change might make significant differences that would be worth exploring. The present effective tax rate obtained by dividing the effective value of properties in Mumbai by the effective property tax proceeds in Mumbai is 0.17%. It is low by international standards.

Table 2 — Two Most Important Tax Resources for Mumbai Local Governments, 2004-5

	Rs crores	Million $	Share
Taxes			
Octroi	3,035	227	
Property tax	1,515	343	
Total taxes	4,550	570	
Non tax resources			
Water & sewerage charges	772	175	
Other	1,436	326	
Total revenues	5,503	1,249	

Sources & notes [The numbers given are base on data for Mumbai Corporation for 2004-5, and for data on the four largest other corporations of Thane district for 1999-2000. These numbers could be greatly improved with fresher data for the other corporation]

Estimates of the taxes borne by Mumbai

For local government taxes, it is easy to find out what is borne by Mumbai households and enterprises. It is

equal to what is actually collected in the MMR area: 5,500 Rs cr, or 1.2 billion US$.

It is more difficult to know what share of the various taxes paid to the Sate of Maharashtra is borne by Mumbai. For the Sales tax, we do have an estimate of what is collected in Mumbai metropolitan area: 74% of what is collected in the entire State[1]. The State sales tax is collected at both the retail and production level. What is paid at the retail level is borne by Mumbai. What is paid at the production level, on intermediary goods, and services is in part borne by outsiders, but the reverse is also true, namely that Mumbai enterprises pay a share of sales taxes paid elsewhere. We can assume that the two cancel each other out, and therefore that the amount collected in MMR is representative of what is borne or contributed by MMR. 74% of 16,900 Rs crore are 12,890 Rs crore, or 2.8 billion $. For the stamps duties, which are imposed on localized land and housing sales, the amount collected in the Mumbai Metropolitan Region, 2,363 Rs cr (or 0.5 billion $) is representative of what is borne by the MMR.

For the vehicles tax and the State excise tax, the contribution of the MMR must be estimated. The total State vehicles tax was allocated to MMR pro-rata the ratio of cars and taxis in the MMR to cars and taxis in the State, Which is equal to 65%. This produces a contribution of 694 Rs cr (157 M $). For the excise tax on liquor, a more complicated procedure was utilized. We estimated, for the entire State, over the 1994-2004 period[2], the income elasticity of the liquor tax yield: is equal to 3.3. When per capita income increases by 10%, per capita tax yield increases by 33% (all in constant prices terms). We assume that this elasticity calculated over time holds over space. Knowing that per capita income in the MMR is 114% greater than per capita income in the rest of Maharashtra, this means that per capita liquor tax contribution in the MMR will be 342% (or 4.3 times) greater than per capita liquor tax in the rest of the State. This makes it possible to apportion the State tax between MMR and the rest of the State. It turns out that MMR contributes 55% of the tax, or 538 Rs cr (122 M $). For the electricity duties, we have assumed a ratio equal to the ratio

[1] The numbers are 14,939 Rs cr for MMR and 20,288 Rs cr for the State ; they refer to the Sales tax plus some other taxes such as a professional tax, but the ratio can be assumed to be valid for the sole sales tax.

[2] The calculation assumes that the tax rates hav e remained constant over the period.

calculated for vehicles [This last ratio could and should be improved]

Table 3 regroups these estimates. The share of MMR is calculated as the weighted average of the share of the five taxes. Tables shows that Mumbai Metroipolitan regions contributes yearly about 18,000 Rs cr or 4 billion US$ in taxes to the State of Maharashtra budget. This represents about 70% of the tax resources of the State.

Table 3 – Contribution of MMR to Maharashtra Taxes, 2004-5

	State taxes (Rs cr)	MMR share (%)	MMR taxes (Rs cr)	(M US$)
Sales tax	16,890	74[a]	12,440	2,827
Stamp duties	3,375	70[b]	2,363	537
State excise tax	2,600	55[c]	1,430	325
Vehicles tax	1,155	65[d]	694	157
Electicity duty	1,290	65[e]	838	190
Total	25,310	70	17,765	4,037

Sources and notes : MMR = Mumbai Metropolitan Region. [a]Calculated from collection data on a slightly larger than sales tax concept. [b]Calculated on collection data for a total slightly different from the one utilised here. [c]Calculated through the income elasticity of the tax (itself estimated from a time series) applied to the difference between per capaita income in MMR and rest of of the State. [d]Ratio of cars registered in the MMM and cars registered in the State. [e]Assumed to be equal to the share estimated for vehicles [Could and should be improved] .

It is more delicate, but not impossible, to estimate the fiscal contribution of Mumbai to the Government of India budget. The data available for the personal income tax (the amount collected in MMR) can be taken to be representative of MMR's contribution for this tax. We only found data for 1999-2000. In that year, 18% of the national income tax was collected in MMR. Assuming this ratio holds for 2004-5, and applying it to the tax collected nationally in 2004-5, produces an MMR contribution of about 9,200 Rs crores, or about 2 billion US $. The same procedure is applied for the Union excise tax. A ratio of 11.3% is estimated, which yields a contribution of about 11,400 Rs crores, or 2.6 billion US $.

Allocating the corporate income tax is difficult. Data on collection is obviously not significant, and is ignored here. The corporate income tax is borne by customers, workers, and capital owners, in proportions that vary over time and over sectors; and these tax bearers are distributed all over the country. We assume that the ratio utilized for the excise tax (11.3%) is also meaningful for the corporate income tax. This produces a contribution of 9,400 Rs crores, or 2.1 billion US$. To

allocate the custom duties, the data on collection is also without meaning, and is ignored. The ratio of the MMR contribution can only be larger than the share of MMR in the national GDP estimated to be about 4% [Check that number]. We assumed a 5% ratio, which produces a MMR contribution to the budget of about 2,800 Rs crores, or 0.6 billion US $.

Table 4 summarizes these estimates. It shows that Mumbai, defined as the metropolitan region contributes about 33,000 Rs crores, or 7.4 billion US $ to the national budget. This represents about 11% of the total budget. There is nothing surprising nor shocking in that. Mumbai is one of the richest area of the country, and it is only natural and fair that it contributes much more than its share of population and even of GDP.

Table 4 — Contribution of MMM to the national budget, 2004-5

	Nation taxes (Rs cr)	MMR share (%)	MMR taxes (Rs cr)	MMR taxes (M $)
Personal income tax	50,924	18.0	9,166	2,083
Excise tax	100,720	11.3	11,381	2,586
Corporate income tax	83,100	11.3	9,390	2,134
Custom duties	56,250	5.0	2,812	639
Total	290,994	11.2	32,749	7,443

This makes it possible to estimate the total tax burden borne by Mumbai, which appears in Table 5. MMR contributes about 55,000 crores of Rs, or 12 billion US$ to the three levels of government. This represents more than 40% of its GDP. Such a number is very high. It is higher than the tax to GDP ratio found in many —indeed most— countries. Yet, in a country taken as a whole, households and enterprises get back in services and in money what they contribute to government. Not so in the case of Mumbai. Although we do not have estimates of what is spent in or for Mumbai by the State and Federal governments, we have every reason to believe that it is less, much less, than 55,000 Rs crores or 12 billion US$. MMR, therefore is a an important looser at the State and Federal budget game. This is true of every large city, but probably not to the extent found in Mumbai. This is of course justified by redistribution reasons. It nevertheless is an obstacle to the rapid growth of Mumbai.

Table 5 – Tax to GDP Ratios, Mumbai Metropolitan Region, 2004-5

	In Rs crores	in M US$	% of GDP
Union taxes	32,749	7,442	25.1
State taxes	17,765	4,037	13.6
Local taxes	4,550	570	3.5
Total taxes	55,064	12,049	42.2
GDP	130,350	29,625	100.0

The surprisingly high 42% ratio arrived at can be explained by three reasons. First, it could be that our estimate of taxes contributed by Mumbai is too high. We have explained how we produced it, and might have made mistakes that others will hopefully correct. Second, it could be that our estimate of MMR GDP is too low. It is based on published statistics, that could possibly ignore the informal or hidden economy. The contribution of a gangster to the GDP is probably not accounted for, but the tax paid by this gangster on his consumption of luxury goods is recorded. Third, it could be that the tax burden in Mumbai is indeed exceptionally high. The three reasons might jointly operate.

Impacts of growth scenarios on tax yields

The growth of Mumbai will automatically lead to a growth of the taxes paid by Mumbai households and enterprises to the Federal, State and local governments. Simultaneously, over the course of time, the expenditure needs of these governments will also increase. It is nevertheless interesting to find out what the magnitude of the increase in taxes contributed by Mumbai could be, and to do it in the two growth scenarios studied: the low growth scenario (with a 6% GDP growth of Mumbai) and the high growth scenario (with a 12% GDP growth of Mumbai). This is done in Table 6, which is built with the conservative hypothesis of an elasticity of tax to GDP equal to 1. This is conservative in the sense that in the absence of changes in the tax system, the tax to GDP ratio is likely to greater than 1.

Table 5 – Cumulated Mumbai Tax Contributions to Various Levels of Government, 2005-20

	Low (6%) GDP growth	High (12%) GDP growth	Difference
In thousand crores of Rs :			
Government of India	849	1,500	+691
State of Maharashstra	462	836	+374
Mumbai MMR local gov	119	216	+96
Total	1,430	2,592	+1,162
In billion US$			
Government of India	193	350	+157
State of Maharashstra	105	190	+85
Mumbai MMR local gov	27	49	+22
Total	325	589	+265

Sources and notes : Cumulated taxes are = $\Sigma_1^{15} T_i*(1+g)^i$ with T_1 = taxes in 2004-5 ang g = growth rate of both GDP and taxes.

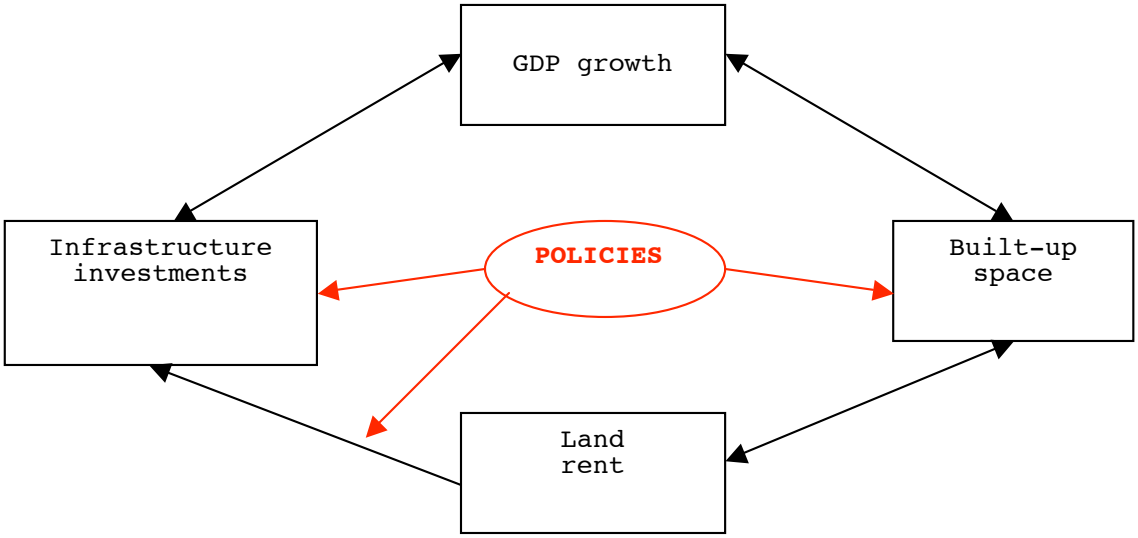
The outcomes are rather impressive. Cumulated taxes over a period of 15 years (i.e. taxes of year 1 plus taxes of year 2, etc.) represent hundreds of thousands of crores of Rs, and hundreds of billion dollars. The difference between the two scenarios indicates what the various levels of government stand to gain from a faster growing Mumbai. If Mumbai GDP increases at 12% rather than at 6%, this will mean an additional 700,000 Rs cr, or an additional 150 billion US$, for the Government of India. What is at stake for the State of Maharashstra is slightly more than half these amounts. The potential gain for local governments is smaller but remains substantial: about 100,000 Rs crores, or 22 billion US$. These tax additions have to be seen in relation to the infrastructure investments required (in conjunction with land and housing markets reforms) over the same period of time to achieve the increase in the growth rate of Mumbai –that will generate such tax additions. These infrastructure investments have been estimated to be in the 220,000-300,000 Rs crores (or 50-70 billion US$). This is more than what will accrue in taxes to the MMR local government, but much less than what will accrue in taxes to the GOI or to the State of Maharashstra.

IV – Policies for the Development of Mumbai

The two main obstacles to Mumbai's economic development are (i) the constraints upon increases in the built up area, and (ii) the lack or insufficient quality of many infrastructure. If these two obstacles (and a few

other less important ones) are jointly eliminated, then Mumbai will fully benefit from its impressive comparative advantages, and develop at a rapid pace. This note explores in quantitative terms what such a development would imply, in infrastructure investments, in built-up area, and in financing problems. Mumbai here is defined as the metropolitan region, with, in 2005, a population of about 22 million (M) people, and GDP of about 31 billion (G) US$. Calculations are made on the basis of a 10% and of a 12% growth rates. These growth rates are realistic, even modest. In the past decade, Mumbai, as defined, has been growing at more than 6% per year, in spite of the above-mentioned obstacles. This note examines the linkages that can be established between GDP growth, increases in built-up space, land rent creation, and infrastructure investments, as summarized in Figure 1.

Figure 1 – Growth, Construction, Rent and Infrastructure



It argues that the land rent associated with the growth process will be more than sufficient to finance the required infrastructure investments –which does not mean that it will be easy to capture this rent and to channel it into investment financing.

Infrastructure investments and economic growth

International experience suggests that in a relatively fast growing economy, total yearly investments represent about 25% of GDP. Of these, about 50% are business investments, in factories, commercial space or office buildings, about 30% are housing investments, and about 20% are investments in infrastructure (roads, trains, metros, ports, airports, water provision and

treatment, schools, universities, hospitals, administrative buildings, etc.). This means that infrastructure investments represent about 5% of GDP every year.

Figuring out the GDP of Mumbai year by year, taking 5% of it each year, and adding up, yields estimates of cumulative investments that should be undertaken in Mumbai in the 2005-2020 period. The numbers appear in Table 1. Infrastructure investments of 60-70 billion US$ must be done and financed. A significant share of these investments will be self-financing, by means of user charges.

On the other hand, slum improvement and elimination programs will be costly, and will have to be financed by public finance.

Table 1 – Required Infrastructure Investments in Mumbai, 2005-2020

	With a 10% GDP growth rate	With a 12% GDP growth rate
In Bilion (G) US$	60	72
In Rs crores	260	320

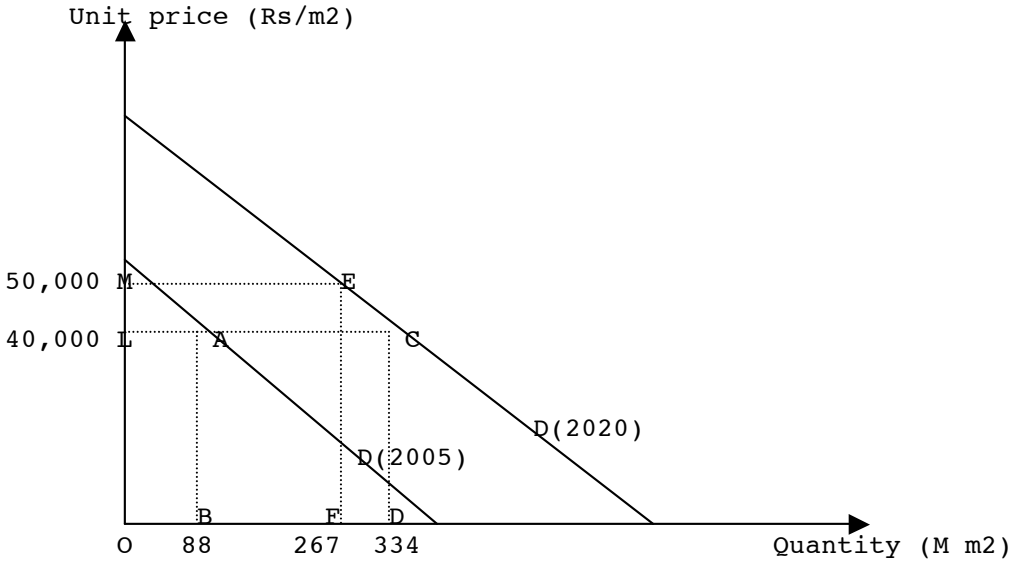
Built-up space and economic growth

Economic growth will be accompanied by an increase in built-up space that can be estimated. At a 10% growth rate, Mumbai GDP will increase fro 31 G$ in 2005 to 118 G$ in 2020, a multiplication by 3.8. At a 12% growth rate, Mumbai GDP will reach 150 G$ in 2020, a multiplication by nearly 5. GDP growth will generate household income growth. We assume that household income is equal to 60% of GDP. This increase in household income will in turn generate a demand for increased housing space.

International experience suggests that people live in houses the value of which often represents three times their annual income, and much more in certain cases. In the case of Mumbai, we estimated that in 2005, this ratio is about 4.3, a plausible number. This ratio is arrived at by multiplying the average housing space per person (4m2) by the average unit price (4,000 Rs per square foot or 40,000 Rs per m2, or 900 US$ per m2) by the number of people (22 M) to arrive at the present value of the housing stock (80 G$), which is divided by the household income (19 G$).

Assuming that this ratio remains constant over time, we can find out what the value of the housing stock will be in 2020. It will have increased at the GDP growth rate. This multiplication of the value of the housing stock by 3.8 or by 5 can take place by an increase in the quantity of housing (measured in square meters) consumed or by an increase in unit prices (measured in Rs per m2), or by a combination of both. This is represented in Figure 2. Presently, the demand for housing is figured by the curve D(2005). The demand is figured by the straight line AB, equal to 88 Mm2. There is an equilibrium in A, at a price of 40,000 Rs per m2. The area OLAB represents the present value of the housing stock in Mumbai.

Figure 2 – Housing Market, Mumbai, 2005 and 2020



By 2020, the demand for housing will have shifted rightward to D(2020). We do not know exactly where on D(2020) the equilibrium will settle. It will obviously depend upon the supply, which is in part a function of land use policies. What we know is the value of the housing stock then, which is 3.8 times what it was in 2005, in the case of a 10% GDP growth rate. It might be in C, with the same unit price as in 2005, and a total housing stock of 334 Mm2, or in E, with a higher unit price and a smaller housing stock. In both cases, the value of the housing stock is the same (LCDO = MEFO). In what follows, we will assume that unit prices remain constant, i.e. that we will be in C in 2020. As a matter of fact, this assumption does not matter much for our purpose, which is to estimate the land rent created by economic growth.

Figure 2 shows that an increase in the supply of housing would indeed deplete housing prices —in the absence of a shift in the demand curve. It shows also that in the absence of an increase in housing supply, the increase in demand would push up prices to very high levels. In practice, such cases are unrealistic. The demand for housing and the supply of housing are likely to increase jointly. Indeed, in the absence of the projected increase in housing supply, the projected growth (and the demand that goes with it) would never occur; and vice versa.

Commercial, industrial, storage and business space is assumed to be 10 m2, and the number of worker 0.3 times the population (which implies a 30% activity ratio). Average unit price of non-residential property is assumed to be double that of residential property, 40,000 Rs/m2 in our base case. We assume that the amount of non residential space per worker (10 m2) will remain constant over time, a very conservative hypothesis.

This makes it possible to produce the following Table 2.

Table 2 — Area and Value of Built up Space in Mumbai, 2005 and 2020

	2005	2020(10%)	2020 (12%)
GDP (G$)	31	118	152
Population (M)	22	30	31
GDP/cap ($)	1410	3920	4890
Households income (G$)	19	71	91
Housing stock (Mm2)	88	344	430
Housing prices (Rs/m2)	40,000	40,000	40,000
Value housing stock (G$)	80	304	391
Housing stock/income	4.3	4.3	4.3
Employment (M)	6.6	9.0	9.3
Non-residential stock (M m2)	66	90	93
NR price (Rs/m2)	80,000	80,000	80,000
NR stock value (G$)	120	164	169

Although presently the value of non residential built-up area appears to be larger than the value of residential built-up area, this will not be the case in the future. The bulk of the increase in built-up areas is in housing. This reflects the hypothesis used (particularly the assumption that floor space per worker remains constant), but these hypothesis are realistic: the massive projected increase in output and income comes from an increase in productivity, not so much from an increase in the labor force or in non-residential space per worker.

Built-up Space and Land Rent

The massive increase in built-up space and in the value of built-up space will generate a large land rent that can and must be estimated. The estimation is easy. The additional value (the difference between the 2005 value and the 2020 value) is the sales value. One has to deduct the construction costs (estimated to be 100,000 Rs/m2) and the developers' benefit (estimated to be 20% of sales). The difference is the land rent.

Table 3 shows that the land rent that will be generated by a 10% or 12% growth rate of Mumbai appears to be enormous: in the 150-200 billion US$ range. These numbers are produced by realistic, and even conservative, assumptions. Calculations were redone with a lower housing unit price of 30,000 Rs/m2. Such a housing price is low, in the sense that it puts the ratio of housing stock to households income to 3, a not vary plausible low ratio. This 30,000 Rs/m2 nevertheless produces a land rent of 99 billion US$ in the 10% growth case and of 132 billion US$ in the 12% growth case. It still remains substantial. It can be shown that the assumption made about a constant unit price does not matter much for our calculation of the land rent. Our calculation is based on the total value of the housing stock, and higher prices cum lower quantities (of lower prices cum higher quantities) would produce very similar results.

Table 3- Land Rent Generated by Mumbai's Growth, 2005-2020

	10% growth	12% growth
Housing (G$) :		
Sales	224	311
- Construction costs	56	78
- Developers' remuneration	45	62
= Land rent	123	171
Non-residential space (G$) :		
Sales	44	49
- Construction costs	5	6
- Developers'remuneration	9	10
= Land rent	29	33
Total land rent (G$)	153	204

The land rent associated with the proposed development sounds impressive. It should be kept in mind that it is the land rent accumulated over 15 years. It should be compared to the output and wealth generated over the same period, not just to the GDP of the final year 2020. Accumulated GDP will amount to 1200 billion $ (in the case of a 10% growth rate) or 1440 billion $ (in the 12% growth rate). The gross land rent, before any tax,

therefore represents slightly less than 13% of this accumulated output.

Land Rent and Infrastructure Financing

Saying that economic growth will generate a land rent of 100 to 200 billion US$ when infrastructure to be financed are in the 60 to 70 billion range is reassuring. The money required to finance the development program *can* be provided by the program itself.

To begin with, an important part of this infrastructure investment program can be financed by user fees or user charges. This is certainly the case for power. It is in part the case for water (charges), and for certain transportation investments (tolls, tickets). In such cases a combination of user charges and public financing is required. Public-private partnerships can play a useful role here, in bringing to bear private sector efficiency and in providing up-front money. These partnerships must be explored on a case by case basis.

There will nevertheless remain an important share of infrastructure investments that will have to be financed out of public revenues. This share is not known exactly but seems to be about 50%. Assuming this number, there would remain 30-35 billion $ to be borne by public finance. This amount can and should be financed out of the land rent. In view of the respective numbers, this should not be impossible. To this effect, three avenues can be explored.

The first one consists of deals with developers. In a number of cases, there are developers ready to undertake a particular infrastructure investment in exchange for development rights. The most obvious example is the 1 billion $ bridge across the bay: developers have already expressed their willingness to build it provided they can develop part of the area on the east side of the bay. Such deals are difficult to negotiate, technically and politically, but they ensure rapid and efficient completion of much needed infrastructure projects.

Development charges (also called development levies, or sale of development rights) are a tax on the first sale of newly developed built-up space, assessed on the sales value, at a rate to be determined. The rate could be higher, or be similar, on non-residential construction. It is important to understand that a development charge does not increase the sale price of housing or non residential floor space. It is entirely taken out of the land rent.

The after tax sales price of a newly constructed structure is entirely determined by the willingness to pay of the purchaser. Developers sell at the highest price possible. They deduct construction costs, their own compensation – and the development charge– and the rest is what they are ready to pay for the land, the land rent. An increase in the development charge is a decrease in the land rent.

Table 4 indicates the amount of development charge that could be raised as a function of the tax rate. It shows that a relatively modest rate of 10% would produce revenues in the 27-36 billion US$ range. It is feared that too high a rate might induce fraud, cheating and corruption.

Such revenues, created by development, could and should be ring-fenced in a special development fund, and ear-marked for infrastructure investments.

Table 4 – Development Charge as a Function of Tax Rate, 2005-2020

Rate	Base(10%) (G$)	Proceeds(10% (G$)	Base (12%) (G$)	Proceeds(12%) (G$)
5%	268	13	360	18
8%	268	21	360	29
10%	268	27	360	36
12%	268	32	360	43
15%	268	40	360	54

Note : The tax base is the sales value of residential and non residential property to be sold between 2005 and 2020 in the case of a 10% GDP growth rate of Mumbai metropolitan area.

A third avenue would be to rely upon the property tax. Presently, the effective tax rate of the property tax (the ratio of property tax paid to built-up area value) is about 0.17%. This is an average, and the effective rate varies greatly from property to property –which is one of the reasons why the tax, perceived as unfair, is very unpopular. Table 5 indicates what the property tax proceeds would become as a function of various tax rates.

Table 5 – Cumulated Property Tax Proceeds, 2005-2020

	10% GDP gr rate (G$)	12% GDP gr rate (G$)
With		
present tax rate (0.17%)	8.8	10.5
double rate (0.34%)	17.6	21.6

Even the present low property tax rate will produce an important amount of revenue (over the 15 years period): about 10 billion $. A doubling of the tax rate would double this amount. On the other hand, this revenue, which

accrues to the corporations, is badly needed. Most of it will be required for the day-to-day functioning of the corporations. It would be not be easy to siphon a significant part of it for infrastructure investment, although it is theoretically not impossible, and although even a small part (let us say 10%) of it would make a welcome contribution.

Conclusion

The infrastructure investment program required to push Mumbai on a 10-12% development path might seem impressive and unrealistic. In reality, it is not. The resources that will be generated by this growth process are so massive that they are more than sufficient to finance this infrastructure program. It is possible, and therefore necessary, to think big for Mumbai.

V - Quantifying Mumbai's Growth to Explore Financing and Land Use Issues[1]

Introduction

Many of the current discussions on Mumbai's growth strategies and what they imply are conducted in largely literary terms, without much reference to actual numbers. The Transport Study undertaken by LEA Associates for MMRDA is a welcome exception, but it is an exception, and it is, by nature, heavily focused on transportation. The need for additional quantitative analyses is therefore great. This note is a modest step in this direction.

In order to get a better understanding of what a high (or higher) growth of Mumbai would mean in terms of income, housing construction, living space, taxes paid, investments required, land required, or financing sources, a simple (even simplistic) model has been produced. It is based on a small number of interrelated key variables, that are moved over time by assumed GDP and population growth rates. The variables are linked to each other by logical or behavioral relationships, that often involve estimated or assumed parameters. The values given to these parameters can be modified, in order to show the sensitivity of the main variables to such changes.

[1] Prepared in December 2006

Structure of the model

The model, or more modestly, set of relationships, is centered on built-up floor in Mumbai. It distinguishes between residential built-up floor (housing) commercial built-up floor (office, commerce, etc.) and industrial built-up space (factories, storage). The remaining part of the developed area (roads, railways, recreation land, government buildings) is treated as a residual.

Housing — The value of the housing stock (Vh measured in Rs) is a function of households income (K also measured in Rs), which is itself a function of GDP (Y equally measured in Rs):

$$Vh = r*K$$

$$K = h*Y$$

with r and h parameters to be estimated. The value of the housing stock (Vh always measure in Rs) is also the product of the quantity of housing (Sh, measured in m2) by the unit price of the housing stock (vh measured in Rs/m2); and the quantity of the housing stock is equal to the population (P in persons) multiplied by the capita living space (s in m2/person):

$$Vh = Sh*vh = P*s*v$$

Hence:

$$r = P*s*v/K$$

The housing stock consumes land. The amount of land devoted to housing (Lh, in m2) is related to the quantity of housing (Sh, in m2) and to the housing floor-space index (fh, a ratio):

$$Sh = Lh*fh$$

Over time, GDP and population increase:

$$Y_t = Y_{t0}*(1+g)^t$$

$$P_t = P_{t0}*(1+p)^t$$

with g and p parameters indicating the growth rates of GDP and of population. The quantity and value of housing also increase. The yearly housing sales (Wh, in Rs) is the difference between the value of the stock at the beginning of the year and the value of the stock at the end of the year. Similarly, the yearly housing construction (Th, in

m2) is the difference between the quantity of housing (Sh in m2) at the end and at the beginning of the year.

$$Wh_t = V_{t-1} - V_t$$

$$Th_t = S_{t-1} - S_t$$

W, the housing sales calculated for every year, is a key variable of the analysis. It is the tax base of the proposed development charge on housing (Dh, in Rs), that is equal to the product of yearly sales (W) by the development charge rate (dh):

$$Dh = dh*Wh$$

It can also be used to calculate the land rent associated with housing construction (Rh), which is equal to these sales minus housing construction costs (Bh) minus developers compensation (Xh):

$$Rh = Wh - Bh - Xh$$

with construction costs (Bh) equal to housing construction (Th) multiplied by unit housing construction costs (bh), and developers compensation (Xh) equal to sales (Wh) multiplied by the rate of developers compensation (xh), the yearly rent on housing can also be written:

$$Rh = Wh - Th*bh - Wh*x$$

Commercial built up floor – Commercial, or more precisely tertiary, activity is in the model generated by population and employment. A rate of activity (e, a parameter) is postulated and decomposed into a rate of commercial activity (ec) and a rate of secondary activity (ei), with

$$e = ec + ei$$

The working space per worker in the commercial and tertiary sector (tc, in m2/worker) is also postulated. It can remain constant or increase over time.

The built up floor in the commercial sector (Sc, in m2) is therefore at any moment of time:

$$Sc = P*ec*tc$$

The yearly construction of commercial floor (Tc in m2) is the difference between the stock at the end and the the stock at the beginning of the year:

$$Tc_t = Sc_{t-1} - Sc_t$$

The value of the commercial built-up floor and of the yearly sales (increase in the value of the commercial built up area) are obtained by multiplying the quantities just mentioned by the value of commercial floor (vc).

Land consumption, development charges, and rent related to commercial developments are determined as in the case of housing development.

Industrial built up land — Similar concepts and procedures are used to determine the quantities and values of industrial built up areas, the yearly increments in these magnitudes, the land related consumption, the associated development charges and rents.

Table 1 — List of Variables and Parameters

	Total	Housing	Commercial	Industrial
Macro variables				
Population (M. people)	P	-	-	-
Employment (M. workers)	E	-	Ec	Ei
GDP (cr Rs)	Y	-	-	-
Households income (cr Rs)	K	-	-	-
Union taxes (cr Rs)	U	-	-	-
State taxes (cr Rs)	A	-	-	-
Local government taxes (cr Rs)	L	-	-	-
Infrastructure invest. (cr Rs)	G	-	-	-
Stock variables (at end of year)				
Value of stock (cr Rs)	V	Vh	Vc	Vi
Quantity of stock (M. m2)	T	Th	Tc	Ti
Living space (m2/cap)	-	s	-	
Working space (m2/worker)	-	-	tc	ti
Built-up land	L	Lh	Lc	Li
Flow variables (during year)				
Value increase in stock (cr Rs)	W	Wh	Wc	Wi
Quantity increase stock (M m2)	T	Th	Tc	Ti
Development charge (cr Rs)	D	Dh	Dc	Di
Construction costs (cr Rs)	C	Ch	Cc	Ci
Developers compensation (cr Rs)	X	Xh	Xc	Xi
Land rent (cr Rs)	R	Rh	Rc	Ri
Parameters				
Population growth rate	p	-	-	
GDP growth rate	g	-	-	
Households inc/GDP ratio	h	-	-	
Value housing/households inc	r	-	-	
Activity rate	e	-	ec	ei
Unit value of built-up space (Rs/m2)		vh	vc	vi
Unit construction costs (Rs/m2)	-	ch	cc	ci
FSI (floor space index)	-	fh	fc	fi
Rate of developers compensation	-	xh	xh	xi
Rate of development charge	-	dh	dc	di
Union Taxes/GDP ratio	u	-	-	
State taxes/GDP ratio	a	-	-	
Local gov taxes/GDP ratio	l	-	-	
Infrastructure inv/GDP ratio	i			

Note: All variables are time indexed

Accompanying models — Two additional models or procedures are used. One is an estimate the behavior of taxes borne by Mumbai, and the amount of infrastructure investments required. Taxes borne by Mumbai are assumed to remain equal to the share of GDP recorded in 2004, and estimated in Annex A: 25.1% for Union taxes, 13.6% for Maharashtra taxes, and 3.5% for local government taxes. Infrastructure investments required are assumed to represent 15% of total investments, equal themselves to 33% of GDP, i.e. 5% of GDP.

Present Situation

The magnitudes used in the model presented in the previous section must be estimated for the MMR region for 2005. Together they present a picture of the economy of the built-up Mumbai metropolitan region. It is surprisingly difficult to find well-grounded data for the MMR. The following numbers are reasoned guesstimates, which are compared to or based upon other existing estimates, particularly those made for the Transport Survey by LEA. They can be regrouped into two categories: macro-economic variables, and land-use related variables.

Table 2 – Macro-economic variables, MMR, 2005

Population P (in M inhab.)	20.7	
GDP Y (in 1000 cr Rs)	130,000	(G US$ 30.2)
GDP/cap y (in Rs)	62,700	(US$ 1,460)
Households income K (in 1000 cr Rs)	78,400	(G US$ 18.2)
Union taxes U (in 1000 cr Rs)	32,500	(G US$ 7.6)
State taxes A (in 1000 cr Rs)	16,900	(G US$ 3.9)
Local taxes L (in 1000 cr Rs)	4,550	(G US$ 1.1)
Workers in industry Ei (in 1000)	2,643	
Workers in tertiary sector Ec (in 1000)	995	

Source : see text

Macro-economic variables – The population is the best known of these magnitudes. The population is taken from the 2001 Census and extrapolated at a rate of 2.2% per year.

The GDP number is calculated from published State data on the GDP of Mumbai, Thane and Raigard districts (with a rebate for the non MMR part of the latter two districts). There is one reason to believe that this number is an underestimate. The total amount of taxes borne (not paid) by Mumbai enterprises and households represents 43% of this GDP estimate[1]. This ratio is extremely high, comparable to what is found in Western Europe, and suggests a possible underestimation of the GDP estimate. Households income has been estimated, quite arbitrarily, to amount to 60% of GDP[2].

Our employment numbers are poor. They are based on LEA data by transport zones (in 107 zones) that estimates the total number of "workers" at 7,756,000, and provide a six categories breakdown of "employment" that adds up to

[1] See Annex A for the derivation of the amount of taxes borne ; the head office effect has been eliminated.

[2] The outcome is completely at variance with the estimate that can be derived from the LEA study. They report monthly incomes of 7,000 Rs per month (a very low number indeed), which would produce a total households income of about 17,400 million crores Rs.

3,813,000 (about half). We assumed that the difference between these two numbers consists of people whose work does not require built-up-space, such as people in the construction industry, or in the transport sector, or of informal workers such as street vendors or people working at home. Since we are interested in the number of workers to determine the amount of non residential floor area, we decide to ignore these undetermined workers, and also ignored people working in the primary sector and in education. This gives us about one million workers in industry and 2.6 million workers in the tertiary sector. Fortunately, these dubious numbers do not play a key role in the remainder of the analysis.

Land use-related variables — Land use-related variables are land, built-up-area (in value and in square meters), FSIs (floor-space index), densities, and they are examined separately for the three main usage categories used in the model: housing, commercial (including offices), and industry. Other uses such as roads and institutions are dealt with separately.

The best data on land uses seems to be the one produced by LEA for the transport study, because it is based on the analysis of aerial photographs. It appears on Table 3. The source does not discriminate between housing and commercial, for which it gives 393 km2; we allocated 5% of it to commercial activities and 95% of it to residential or housing activities, on the basis of other data for MMC only.

Table 3 — Land Uses, MMR, 2005

	In km2	In %
Developed land		
Housing Lh	373	49.0
Commercial Lc	20	2.6
Industry Li	105	13.8
Other developed	263	34.6
Total developed L	761	100.0
Non developed (green space)	3,300	
Total	4,061	

Source : LEA for MMRDA. 2006. *Land Use Report*

Table 4 presents estimates of the built-up floor in quantity and in value in 2005. It was estimated as follows. For housing quantities, we know that the amount of floor space per person is about 4 m2. Multiplied by the population, this gives 83 Mm2. The unit value of built-up-floor is known to be about 40,000 Rs/m2. To obtain the value of the total stock of housing built-up floor, we multiply the quantity obtained by this unit price, and obtain a value of 331,400 thousands cr Rs. It is important

to relate this number to the number for households income, 78,400 thousand cr Rs: it yields 4.25, which means that people live in houses that are worth 4.25 times their annual income. This is a reassuring number, because this ratio is known to vary internationally from about 3 to 7. It gives credibility to the preceding numbers.

Table 4 – Built-Up-Floor, MMR, 2005

	Housing	Commercial
Quantities S (M m2)	83	26
Unit prices v (Rs/m2)	40,000	80,000
Values V (1000 cr Rs)	331,400	64,000
Consumption per user s (m2/person or worker)	4	10
Value of housing/household income r	4.25	-

For commercial built-up floor (BUF) in the formal sector, we assume that the amount of floor space per worker is about 10 m2 (sc=10). Multiplied by the number of workers in this sector gives us the quantity of commercial BUF in 2005: Sc=26.4 M m2. Assuming a unit price (vc) of 80,000 Rs/m2, we obtain the value of commercial BUF: Vc=64,000 thousand cr Rs.

For industry, the concept of BUF does not apply very well. Industry consumes vast tracts of land, most of which is unbuilt.

We can now produce Table 5 by relating some of the preceding numbers in order to offer estimates of densities and floor-space ratios. Some of the concepts used deserves explanation.

Table 5 – Densities and FSIs, MMR, 2005

	Housing	Commercial	Industry	Total
Population P (M)	20.7	-	-	20.7
Workers E (M)	-	2.6	1.0	3.6
Land use L (km2)	373	20	105	761[a]
Specific density[b] (user/km2)	55,000	132,000	9,500	-
Overall density (user/km2)	27,200	3,500	131	-
Built-up-floor S (km2)	83	26	105	
FSI f (BUF/Land use)	0.22	1.3	1	-

Notes: [a]Total developed land, includes also other land use categories such as institutions and roads. [b]Specific densities are defined as the number of users (people or workers) divided by the land dedicated to them (housing, commercial, industrial), whereas overall densities are defined as the number of users (people or workers) divided by the total developed land.

Mumbai's densities appear relatively high, although not exceptionally high. It must be emphasized that these numbers relate to the entire metropolitan region, and not to the Mumbai Municipal Corporation, where they would be significantly higher. In the rest of the region, they are

certainly much lower. It could be also that the estimates of land area by category calculated by LEA are somewhat overgenerous.

FSIs appear very low for housing: 0.22 and low for commercial: 1.3. These FSIs are defined as the ratio of the housing (or commercial) built-up area divided by the land area devoted to housing (or commercial) activities. This sounds like the definition of legal FSIs. But in reality, legal FSIs are slightly different. First, their numerator is larger than the one used here, which refers to housing space, not including staircases and other "lost" built-up space; to be in line with legal FSIs, our numerator should therefore be increased by about 15%. Second, their denominator is also different, because it is calculated at the plot level. The land area estimated as "housing" land by LEA probably includes areas like smaller roads or streets, perhaps land used for schools or other utilities. To bring it in line with legal FSIs, our denominator should probably be decreased by 20% or more. This would produce, for housing, a FSI of 0.32, still very low. The two points made above apply: these FSIs relate to the MMR at large, not to downtown Mumbai; and LEA estimates of land uses may exaggerate land consumption. Nevertheless, it is clear that FSIs are very low in the MMR.

Base-line Scenario for 2020

The model can now be used to construct, year after year, a picture of the changing situation. The outcomes are obviously a function of the values given to the various parameters used in the model. These values define a scenario.

Parameters of the scenario – For the baseline run of the model, most of the values of the various structural parameters are those observed in, or rather estimated for, 2005. A few are added, however. We need unit construction costs bh for housing and bc for commercial floor. We assume that bh=bc=10,000 Rs/m2. We also need a rate of developer's compensation, the amount of income developers keep as a function of sales prices, dh in the case of housing and dc in the case of commercial floor. We assume xh=xc=20%. We also assume that there will be a development charge dh and dc, a levy proportional to the value of floor sales, and take it to b e 10% (dh=dc=10%).

Population and GDP growth rates are the key dynamic parameters, that make the model move. Their values are postulated. Population is postulated to grow at a rate of

2.2% per year. GDP is postulated to increase at a 12% growth rate per year. Table 6 summarizes the values of these parameters. Obviously, these values could be changed (and will be changed in the subsequent sections).

Table 6 – Values of Parameters, Baseline Scenario

	General	Housing	Commerc	Industry
Population growth rate	p=2.2%	-	-	-
GDP growth rate	g=12%	-	-	-
Households income/GDP ratio	h=60%	-	-	-
Value housing/households inc	r=4.3	-	-	-
Activity rate		-	ec=12.7%	ei=4.8%
Unit value of built-up floor (Rs/m2)		vh=40,000	vc=80,000	-
Unit construction costs (Rs/m2)	-	bh=10,000	bc=10,000	-
Rate of developers compensation	-	xh=20%	xc=20%	-
Rate of development charge	-	dh=10%	dc=10%	-
Union Taxes/GDP ratio	u=25.1%	-	-	-
State taxes/GDP ratio	a=13.6%	-	-	-
Local gov taxes/GDP ratio	l=3.5%	-	-	-
Infrastructure inv/GDP ratio	i=5%			

Outputs of the model

The spreadsheet annexed gives for every year of the 2005-2020 period the value of model variables. We have extracted the values of key variables for the terminal years, and also for the flow variables the sum for all the 2006-21 period. These numbers appear in Table 7.

Table 7 – MMR Key Variables, 2006 and 2021

	2006	2021	2006-2020 (cumulated)
Population (in M people)	21.2	29.4	
GDP (cr Rs)	130,000	797,000	-
GDP/cap (Rs)	6,200	26,800	-
Taxes paid to Union (cr Rs)	33,000	199,000	1,520,000
Taxes paid to State (cr Rs)	17,000	104,000	790,000
Taxes paid to local gov (cr Rs)	4,5000	28,000	213,000
Housing stock (M m2)	94	514	-
Housing stock/cap (m2/cap)	4	17	-
Housing construction M m2)	10	55	420
Land for housing (Mm2)	417	2,285	
Housing density (people/km2)	50,800	12,860	
Total Land developed (Mm2)	835	3767	
Yearly land consumption (Mm2)	73	380	
Development charge base (cr Rs)	40,300	220,000	1,721,000
Development charge proceeds (cr Rs)	4,000	22,000	172,000

Four important conclusions emerge from the model run and from Table 7.

The first is that many of our variables will be multiplied by a factor of 4 or 5 in only fifteen years. This is the case of GDP per capita, or of the housing

stock per capita —which increases from a present low 4 m2 per person to a more acceptable 17 m2 per person— for instance. This is also true for housing consumption or for land consumption (with the present built-up-floor to land ratios) This is not very surprising, because these variables are more or less correlated with GDP. The 12% GDP growth rate postulated works wonders.

A second conclusion is that the key driver of the spatial dynamics studied is the demand for housing, not for commercial or industrial built up floor, for two reasons. First, housing land is much more important than commercial or industrial land. Second, the demand for housing increases like GDP whereas the demand for commercial and industrial floor and land increases like employment and population. Housing construction and land use consumption dwarfs commercial and industrial construction and land use consumption, so much so that we do not even report the numbers in Table 7. This is in part a consequence of the model's assumptions, but these assumptions reflect a major dimension of reality.

A third conclusion is that financing infrastructure investments is possible. Nobody knows exactly what investments have to be done to make the proposed economic and spatial development possible, but orders of magnitude can be offered. A rule of the thumb is that infrastructure investments in a fast developing country or area should represent about 5% of GDP. Over the 15 years period, the cumulated investments would represent 311,000 cr Rs (or US$ 70 billion). But a significant share of these investments, particularly in power, and in water (although not in sanitation) can be recuperated in the form of user charges.

But this numbers is to be compared with the cumulated proceeds of the development charge, 172,000 (also about US$ 40 billion). A relatively modest 10% development charge, entirely borne by landowners, would fund about 60% of the required infrastructure investments, which might be the amount that has to be tax-financed. A 20% development charge, which would produce, in cumulated terms, twice as much, ie. 344,000 cr Rs would be more than sufficient.

A fourth conclusion is that the present built-up-floor to land ratios are entirely unsustainable, or, more precisely incompatible with a high GDP and personal income growth rate implying major increases in housing consumption. The present land use ratios would lead to a quadrupling of land consumption in the area, which is

impossible for environmental, transport, and financial reasons.

The 3,770 km2 of developed land associated with this scenario must be compared with the 4,060 km2 of total available land in the MMR. This type of development would eliminate practically all green space in the agglomeration.

Transport-wise, it would equally be a disaster. The average distance of workers to jobs would increase, thereby decreasing the effective size of the labor market. And relatively low densities would make it impossible to provide efficient and cheap public transport, forcing many people to switch to the automobile.

Finally, developing about 3,000 km2 of land would be extremely costly. We have an estimate of land development costs per square meter, based on the experience of CIDCO: 1,500 Rs/m2. For 2,932 km2, this means a cost of 439,000 cr Rs (about US$ 100 billion), not counting the major infrastructure investments planned (bridges, metro, railway lines, dams, main pipes, sewerage, etc.) which are estimated to be around 130,000 cr Rs (US$ 30 billion). The resulting investment cost of 570,000 cr Rs (US$ 130) would be very difficult to finance. It would for instance require a development charge at the rate of 33%, that would made the charge inacceptable.

A 30 million people metropolis cannot afford an average floor-space ratio of 0.23. As discussed above, this average ratio —calculated on the basis of questionable LEA land use data— is not the same thing as the formal, legal, FSIs, although increasing these formal FSIs is certainly part of the solution. More generally, urban planning in Mumbai must understand the need for design that economize on land: in this respect, Navi Mumbai is an example of what not to do.

Because the development charge plays a key role in the proposed financing plan, it is important to understand how it functions. Many people fear that a development charge can increase housing or non-residential prices, and be borne by households and businesses. Such a fear is entirely unfounded. Why? Because developers are no philantropists. They already sell what they build at the highest possible price. The price vary with location and quality of building, but it is as high as the market can bear.

Let us assume that for a particular building, this selling price will be v (Rs per m2), or so the developer believes. He know that construction costs will be c (Rs per m2). He wants a reasonable compensation of, let us assume, 20% of the sales, for the risks he takes, the work he does, and the interest on the money he borrows. Let us assume that the floor space index for the land on which this building will be erected is 1. In the absence of a development charge, the price m (Rs per m2) our developer is ready to pay for the land is:

$$m = v - c - 0.2*v$$

m is the land rent. This is the maximum amount our developer is ready to pay for the land.

If a development charge of let us say 10% of the sales value is introduced, this will not affect v, the sales value, not c, construction costs, nor 0.2*v, the developers compensation, but it will increase —by 0.1*v— the costs taken into account by the developer, and deducted by the developer in his estimate of what he is ready to pay for the land. The maximum price he is ready to pay for the land will be m':

$$m' = v - c - 0.2*v - 0.1*v$$

It is easy to see that the land price has been decreased by the amount of the development charge. In other word, the burden of the tax is entirely borne by landowners. This is not unfair, nor uneconomic. The value of the land owes very little, if anything, to the activity of landowners. It is created by Mumbai's economic growth, and by infrastructure investments. Reducing the land rent will not modify landowners behavior in an undesirable way —contrary to what happens with most taxes. In addition, in the case of Mumbai, the land rent is so high that even after the development charge, it will remain substantial.

This analysis, which is accepted by all economists, is also endorsed by developers. The Mumbai developers we met all agreed that this simple model reflects their behavior. This is why they do not object to a development charge. As a matter of fact, developers realize that if the charge proceeds are used to finance infrastructure investments, it will make it possible for them to build more, which is their business, and they welcome such a development charge.

To sum up, this accounting exercise shows that a high GDP growth rate for Mumbai is quite feasible, and that the

real estate activity it would generate would easily provide (by means of a development charge) the financing of the required infrastructure investments.

We can now build other scenarios, by changing some parameters of the mode, in order to compare the outcomes with those of the baseline scenario.

Impacts of a Lower Growth Scenario

What would happen if GDP were to grow at a rate of 8% per year? This lower rate of growth would imply a lower lower households income, a lower demand for housing floor, and lower demand on physical development. It would also imply smaller housing units, higher densities, smaller development fees, and smaller tax contributions to the Union, the State, and local governments. The impacts upon commercial and industrial floor space, land, and construction, would be minimal because these magnitudes are driven by population and employment, which are supposed not to be affected by a lower GDP growth. Table 8 compares some of the main outcomes associated with this scenario with those of the baseline scenario.

Table 8 — Impacts of a 8% v. a 12% GDP Growth Rate, Selected Variables, 2006-202

	g=8%	g=12%	Ratio
GDP/capita in 2021(Rs/year)	152,000	271,000	56%
Housing/cap in 2021 (m2/cap)	10	17	59%
Housing construction in 2021 (Mm2)	25	55	45%
Housing land in 2021 (Mm2)	1277	2285	56%
Housing densities (People/km2)	23,000	12,900	178%
Housing land consumption in 2021 (Mm2)	95	245	39%
Total developed land in 2021 (Mm2)	2225	3770	59%
Development charge base in 2021 (cr Rs)	85,000	220,000	39%
Devt charge proceeds in 2021(cr Rs)	8,500	22,000	39%
Cumulated DC proceeds 2006-21 (cr Rs)	81,500	441,000	18%
Cumulated taxes paid to Union (cr Rs)	1,097,000	1,590,000	69%
Cumulated taxes paid to State (cr Rs)	570,000	826,000	69%
Cumulated taxes to local gov (cr Rs)	153,000	222,000	69%

The differences between the two scenarios are large indeed. The much needed increase in housing space is substantially reduced, to 10 m2 per head, instead of 17 m2 per head. Housing construction activity is seriously reduced, and with it housing land consumption, and development charges (the reduction is not so marked for development charges, because part of them are assessed on commercial developments and not affected). Densities are much less reduced.

The reductions in taxes contributed by MMR to the Union and to the State are also very impressive. This lower growth rate means that over the 2006-21 period, the Union will raise from Mumbai one million cr Rs instead of one million and a half, a 500,000 cr Rs shortfall (about US$ 120 billion). For the Sate, the shortfall will be about 370,000 cr Rs (US$ 86 billion). These high numbers — much larger than the entire present GDP of the MMR— underscores what is at stake, and what the Union and the State have to gain (in merely financial terms) at a rapid development of Mumbai metropolitan region. This should induce them to do all that is required to push the GDP growth to this high 12% rate.

It also appears that the financing of infrastructure investments would much more difficult in this slower growth scenario. A 10% development charge will only produce, on a cumulated basis, 81,000 cr Rs, as opposed to 172,000 in the baseline scenario. The required infrastructure investments would be smaller, but not much smaller, and 81,000 cr Rs would be insufficient to finance them.

Conclusions

This attempt to quantify the economic and spatial growth of the MMR with the help of a model is rather crude.

First, it has revealed the paucity and the fragility of the data required to implement such a model —and more generally to understand the dynamics of urban growth in the region. A model forces you to search for the appropriate magnitudes identified, and to realize that there are often no estimates of these magnitudes. Even allowing for our own shortcomings in finding the appropriate data, it can be said safely that the knowledge base on which the architects of Mumbai's growth are presently working is shockingly insufficient. A systematic and massive effort should be undertaken to improve, consolidate and expand it.

A second limitation of this analysis is that it deals with averages. This is particularly bad for the geography of the region. The analysis does not distinguish between the various parts of the MMR, and treats the center and the outer ring in the same fashion, ignoring obvious and important differences. This is true for construction costs, for housing unit prices (per m2), for densities, for land uses. However, even if averages do not tell the

entire story in detail, but they provide some useful insights.

In spite of its limitations, the analysis allows some preliminary conclusions.

One is that the amount of taxes borne by Mumbai metropolitan region is enormous (more than 40% of its GDP), and cannot but make its development more difficult. This is particularly so because (although we do not have hard data on this) it seems that not much of the money taken out of the MMR by the Union and the Sate is spent back into the MMR. To a certain extent, this is inevitable and normal. But we are probably here beyond that point. Investing more in the MMR might even be paying financially for the Union and the State.

Another is that what counts in terms of land use, of construction, of growth potential, of rent creation —and of development charges— is the housing sector much more than the commercial and industrial sector. This is because the presently extremely low housing floor consumption (4m2 per person) will increase fast if growth occurs, much faster than commercial or industrial built-up-space and land consumption.

A fourth is that most or all of the infrastructure investments required can be financed by a development charge assessed on sales of built-up-floor at a modest 10% rate, at least in the case of a high GDP growth scenario.

A fifth is that the ratio of built-up-floor to land utilized is much too low. Urbanized land cannot increase as fast as built-up floor, particularly housing built-up floor, for obvious environmental, financial and transportation reasons. There is simply not enough land available to that effect in the MMR. This ratio will therefore have to increase. This is not to be confused with densities. Densities will decrease if urbanized land grows faster than population, but a 2.2% increase over 15 years is only a 38% increase. And the quality of life depends more on land allocation than on land quantity. Planners and designers must learn to economize the scarce and costly MMR land

Annex V-A: Worksheet Used for the Analysis (Truncated)

	2005	2006	2007	2013	2021	2006-2021
Baseline scenario: with a 12% GDP growth rate						
Macro-economic variables:						
Pop, with r=2.2% (P, in M)	20,7	21,2	21,7	24,7	29	422
GDP (Y, in cr Rs)	130000	145600	163072	321875	796951	892585
GDP/cap (y=Y/P, in Rs)	62687	68698	75285	130411	271300	2446842
Households income (K=h*Y, with h=0.6, ir	78000	87360	97843	193125	478171	3812927
Federal taxes paid by MMR (U=Y*u, with	32500	36400	40768	80469	199238	1588719
State Taxes paid by Mumbai (A=Y*a, with	16900	18928	21199	41844	103604	826134
Local taxes (L=Y*l, with l=3,5%, in crRs)	4550	5096	5708	11266	27893	222421
Total taxes paid U+A+L, in cr Rs)	53950	60424	67675	133578	330735	2637274
Housing variables						0
Value of stock Vh=4.3*K in cr Rs	335400	375648	420726	830438	2056134	16395584
Quantity of stock Sh=Vh/40,000 in Mm2	84	94	105	208	514	4099
Floor/cap s=Sh/P in m2/cap	4	4	5	8	17	158
Construction =Δ quantity Th=Sht-Sht-1 in Mm2		10	11	22	55	430
Sales= Δ value Wh=Vht-Vht-1 in cr Rs		40248	45078	88976	220300	1720734
Land for housing Lh=Sh/fh with fh=0,225 i	373	417	467	923	2285	18217
Specific density =P/Lh	55648	50778	46335	26749	12858	501882
Land consumption= DLh=Lht-Lht-&		45	50	99	245	1912
Commercel & industry variables						0
Workers in commerce Ec=P*ec with ec=0	3	3	3	3	4	54
Quantity of floor stock Sc=Ec*10 in Mm2	26	27	28	31	37	536
Value of floor stock Vc=Sc*80,000	2107	2153	2201	2508	2985	42873
Construction=D quantity Tc=Sct-Sct-1, in Mm2		1	1	1	1	11
Sales=D valueVct-Vct-1 in 1000cr Rs		46	47	54	64	878
Land for cce Lc=Sc/fc, with fc=1.32 in Mm	20	20	21	24	28	406
Specific density =Ec/Lc in workers/km2	132000	132000	132000	132000	132000	2244000
Workers in industry Ei=P*ei with ei=0.048	1	1	1	1	1	20
Land for industry Li=Ei* in Mm2106	106	108	110	126	149	2147
Land consumption=Dland utilized in Mm2		2	2	3	3	44
Summary variables						0
Developed land	762	835	916	1640	3767	31779
Land consumption		73	81	156	380	3005
Built-up-floor construction in Mm2		11	12	23	56	441
Built-up-floor sales		40294	45125	89029	220364	1721612
Construction costs		10641	11862	22919	55878	441153
Developers compensation		8059	9025	17806	44073	344322
Developement charge		4029	4513	8903	22036	172161
Investment		7280	8153,6	16093,8	39848	311244

Note : some of the cumulated numbers have no meaning

VI - Land Use Development in Mumbai: Demand, Costs, & Financing[1]

Over the course of time, developed land in the Mumbai Metropolitan Region (L) is a function of the land used for housing buildings (H). But it consists also of a largely fixed part (A), used for industry, major roads, railway tracks, airports, port, and of a third part (B) for schools, recreation, institutions. To keep things simple, we will ignore land used for commercial buildings (C); it is only a relatively small part of H (perhaps 5% presently), and a share that will decrease over the years, because H will increase (all other things constant) at the rate of GDP growth whereas C increases at the rate of population growth. Table 1 indicates the relative importance of these categories in 2005.

Table 1 – Major Developed Land Uses, MMR, 2005

	(in km2)
Housing buildings (H)	76
Major infrastructure (A)	169
Other public spaces (B)	198
Total land developed (L)	440

Source : LEA. Land Use Report for L and for A. Estimates for H.

Nearly by definition, H is a function of housing floor space (F) and of the FSI (f) defined as F/H. With f, the average FSI, estimated to be 1.1, we have:

$$H = (1/f)*F = (1/1.1)*F = 0.9*F$$

The developed land occupied by major public infrastructure (A) is estimated by LEA to be 169 km2. This large number includes about 100 km2 or industrial land, much of which is not very intensively used. A = 169.

Other public spaces (B) like land for streets, parks, or schools, will be assumed to be b*H, a function of housing land. Data for 2005 shows that b=2.6

$$B = b*H = b*(1/f)*F = 2.6*(1/f)*F = 2.4*F$$

We therefore have developed land L as a function of housing floor space F (and of FIS f):

$$L = 169 + (1/f)*F + 2.6*(1/f)*F$$

[1] Prepared in December 2006

Demand for Developed Land in 2021

The demand for housing floor space F is a function of unit housing floor prices, and of households income, which is itself a function of GDP. Assuming constant unit housing prices (per m2) constant, housing floor space will increase like GDP. With g the GDP growth rate, we will therefore have, after n years:

$$L = 169 + (3.6/f)*84(1+g)^n$$

For n=15, that is in 2021, and for various values of FSI f and of growth rate r, the quantity of developed land L will be as indicated in Table 2.

Table 2 – Developed Land As A Function of GDP Growth Rate and of Average FSIs, MMR, 2021 (in km2)

Growth rate : FSI :	8%	10%	12%	14%
1.1 (present FSI)	1041	1317	1674	2131
2.2 (double present FSI)	605	743	921	1150
3.4 (triple present FSI)	460	552	671	823
4.4 (quadruple present FSI)	367	456	545	660

Source : Calculated according to the formula indicated above.
Note : For reference, presently developed land is 440 km2.

Table 2 shows how sensitive land consumption is to rates of GDP growth and even more so to FSIs. Developable land is scarce in the MMR, and an increase of 50% over present levels by 2021 would probably be an ambitious target. This would mean 660 km2. Table 2 shows that such a land development constraint could not be achieved with the present average FSIs, even in the relatively low growth scenarios. Table 2 also shows that the higher growth rates scenarios, and in particular the 12% growth rate scenario, the preferred one, imply at least a tripling of present averages FSIs.

Estimating Land Development Costs

Infrastructure and land development costs (LDC) consists of two parts. First, there are “fixed costs”, investments which have to be made in any case, in the metro, in the railway, in the airport, in the port, in dams, in main water pipes, in sewers and in used water treatment plants. They are estimated to cost about Rs crores 129,000 (about US$ 30 billion). Second, there are land development costs; The experience of CIDCO suggests a

figure of Rs 1,200 per m2. This is Rs crores 120/km2. We therefore have (in Rs crores) for LDC as a function of L:

$$LDC = 129,000 + 120*(L-440)$$

Table 3 indicates infrastructure and development costs as a function of total developed land in 2021.

Table 3 – Infrastructure and Land Development Costs as Function of Land Developed, MMR, 2021

Land developed in 2021 (in km2)	Costs over the 2006-2021 period (in Rs crores)	(in US$ billion)
500	136,000	31
600	148,000	34
700	168,000	36
800	172,000	39
900	184,000	42
1000	196,000	44
1,100	208,000	47

Development Charge

It is envisaged to finance infrastructure and land development costs by means of a development charge based on the sales value of housing floor (and also of commercial floor) multiplied by a rate r. Sales values are independent of FSIs, but not of GDP growth rates, not of unit (per m2) prices. Assuming unchanged unit prices, estimated to be Rs 40,000/m2, we can produce Table 4.

Table 4 – Development Charge Proceeds, as a Function of GDP Growth Rate and Charge rate, MMR, 2006-2021 (in Rs crore)

GDP growth rate Charge rate	8%	10%	12%	14%
5%	36,000	54,000	76,000	102,000
10%	72,000	108,000	152,000	206,000
15%	108,000	162,000	228,000	308,000

Conclusions

The comparison of Tables 3 and 4 shows that a 10% charge in a 12% growth scenario coupled with a FSI three or four times the present levels would produce and amount of developed land consistent with availability constraints, as well as enough money to pay for the infrastructure backlog and the land development costs.

These numbers are only rough estimates. They are no better than the parameter values on which they are based, which could and should certainly be revised and improved. It would also be very useful to disaggregate spatially the

model and to introduce a greater dose of geography into the analysis.

But the methodology used, although it simplifies reality, probably captures the essence of the problem, and the main conclusions arrived at are probably fairly robust.

1) One is that a high GDP growth rate will quadruple the amount of housing space per inhabitant and play a key role in relieving Mumbai's housing problems.

2) A second is that this would not be possible without a substantial increase (a tripling) of average FSIs.

3) A third is that this would not be achieved at an increase in densities, but, on the contrary, by a slight decrease.

4) A fourth is that the amount of additional developed land required —about 50% of the present developed land in the MMR— seems compatible with existing constraints on developable land.

5) A fifth is that a 10% development charge based on the value of additional floor sales would produce the amount of public money necessary to pay for the major infrastructure investments required as well as the cost of land development.

VII - Recuperating Land Value Increments in the MMR[1]

Urban growth, defined as the growth of population, urbanized area and GDP of an agglomeration, creates increases in land values all over the urban area, including in the already built-up areas. The reasons for this have been known for at least two centuries and were clearly established by Ricardo, on the case of the agricultural land rent. It has also been recognized for long that capturing this urban land rent was both fair (because it was unearned income) and economically neutral (because it did not induce uneconomic behaviors). It is therefore socially desirable. This note, however, focuses on one particular type of land rent: the one that is created at the margin by development. Increases in the built-up area of an agglomeration (which includes redevelopment of already built-up areas as well as urbanization of rural land or urbanization of underutilized urban land) creates large increases in the value of the land that is developed or redeveloped. This is what is expected to happen in Mumbai metropolitan region on a grand scale. What are the instruments available to capture part or whole of these land value increments? How do they compare? What are the merits and drawbacks and problems and potentials of each of them ? Section I of this note compares four possible instruments. Section II considers a particular, although important, example of land value increasing infrastructure investment: the Mumbai Trans Harbor Link (MTHL), and examines how he land value increments it will generate could be estimated.

Comparing Four Instruments

Four instruments

Four types of policy instruments can be utilized to capture land value increments or capital gains:

- a property tax, that consists of an annual levy based on the value of the land;

[1] Prepared in December 2006

- a betterment levy, that identifies the gains and the beneficiaries of a particular public investment, and make these beneficiaries pay part or whole of these gains;

- a contribution to public investments, that make the beneficiaries pay or finance part or the whole of the investment that generates the land value increment, and which is often negotiated;

- a development charge, that makes the developer pay a charge based on sales of built-up floor, either on a quantity basis (so much per m2) or, much better, on a value basis (so much per cent of the sale value). The developer will shift the burden of the charge upon the land owner, so that the development charge will actually capture (part of) the development-created rent.

These four instruments will be compared from three viewpoints. One is their efficiency at capturing the land value increments. A second is their positive or negative economic impacts. Last, but not least, is the administrative feasibility of the various instruments.

Efficiency in capturing land value increments

The land value increments generated by development or by a particular investment are notoriously difficult to estimate. They are often virtual and do not materialize until a land sales takes place, which is not always the case. Even when this is the case, there is often a certain opacity in urban land markets, particularly when it comes to prices. In addition, even if and when land sales prices are correctly known, it is often not clear what initial land purchase prices have been, because the land may have been in the owner-seller land for many years or decades. Further, land value increments vary from one place, even one lot, to another. Finally, it is often difficult to distinguish in a known land value increment what is caused by a specific infrastructure investment from what is caused by the general growth of the city (itself caused by infrastructure investments at large, but also population growth and productivity growth). Capturing this unknown quantity is therefore not easy. The various instruments fare differently in this respect.

The property tax (assuming the tax base is well assessed, and reflects land values —a generous assumption) is not bad at capturing increases in land value, whatever their cause. It does so every year, rather than once for

all, which means it can capture (always assuming perfect assessment) all the various increases that might occur over the course of time. The share that is capture depends upon the rate of the tax.

The main problem with the property tax is that it does not differentiate between the value of the land and the value of the built-up area constructed on that land. Many of the above-mentioned arguments in favor of the property tax apply to “pure” land tax, a tax assessed on on the value of the land on which the property is erected. There are very few, if any, such taxes. The pure land value is usually only a fraction of the property value. This makes in practice the property tax a rather inefficient instrument to capture increments in land values.

The betterment levy is in principle a good instrument to recuperate part or whole of these increments. It is used in many Latin American countries, such as Brazil and Colombia, in the case of neighborhood investments, such as the pavement of a road, or sanitation improvement. The beneficiaries are usually not numerous, they can create a neighborhood association, and decide jointly how to apportion the benefits between the various beneficiaries (the closer you are from the paved road, the greater the benefit). What is recuperated is usually not so much the land value increment as the cost of the investment. It is an application of a benefit principle rather than a land value increment capture principle. And it is very difficult to use this instrument for large scale projects benefiting many people in often indirect ways.

The negotiated contribution resembles a betterment levy. The purpose is also often to finance a project, rather than to recuperate the land value increases caused by the project, except that in that case the project is usually large, and the financing is done by the beneficiary. The share of the land value increases captured is not known. We only know that it is below 100% (otherwise the land owner would not engage in the deal), and it can be much below.

The development charge is a rather effective instrument. It is important to understand how it functions. The charge is paid by the developer. It does not increase sales prices, contrary to what many non-economists believe, for the reason that developers are no philanthropists and that they already (in the absence of a development charge) charge prices as high as the market can bear. Developers operate as follows. From the sales price of the built-up

area they intend to built and sell, they deduct construction costs, and their own compensation (that includes a remuneration of the important risks they take). What remains is what they are ready to pay to the land owner to purchase the land. A development charge will increase the developer's costs, and reduce, by the same amount, the price offered to the land owner. The burden of the tax is therefore entirely borne by the land owner. This is why a development charge is an effective fashion of capturing part of the land value increments.

As a matter of fact, the development charge is not proportional to the land value increment, but to the new (and increased) land value. Consider a piece of land purchased for 100 and a piece of land purchased for 200. As a result of infrastructure investments, they are now both worth 300, or would be worth 300 in the absence of a development charge. Let us assume that the development charge, which is based on the value of built-up floor and therefore of land, is 50. It will capture 25% of the land value increment on the first piece and 50% of the land value increment on the second piece.

An interesting feature of the development charge is that it integrates variations in land values increments caused by varying FSIs. A piece of land allocated a high FSI will see its value increase much more than a similar piece of land allowed a small FSI. But more will be built on the first piece, more will be sold, more development charge will be levied, and more of the greater increment will be captured.

The share of the increment captured is a function of the rate of the charge. Since we often do not know the magnitude of increments, and their relation to sales prices of built up areas, it is not easy to find out whether a given rate of the charge is too high or too low.

Economic impacts

From the viewpoint of the economic impacts, these four instruments fare rather well. They belong to the rare specie of non-distorting taxes. Most taxes (however useful they are because of what can be done with public expenditures) modify economic behaviors in undesirable way, reducing output and growth. Not so with taxes based on land value increases. A tax on income might reduce the propensity to work, a tax on capital the propensity to save or invest, but a tax on land value increases cannot reduce land supply, which is fixed and God given.

A distinction, however, must be made between the first instrument (property tax) and the three other ones. Because the property tax is based on the value of the built up property as well as the value of the land, its taxation is not entirely neutral. The part that is based on the value of land is neutral, but the part that is based on the built-up property. In principle at least, it can discourage construction, and probably results in a lower level of built-up space, and undesirable outcome. Betterment levies, negotiated compensations, and development charges, because they are based only on land value increments (or proxies) do not have this drawback.

Administrative feasibility

Economists and politicians alike tend to underestimate the administrative difficulties associated with taxation, which vary greatly with each type of tax or fiscal instruments. All other things equal, a tax easy to administer is much better than a tax difficult to administer. Indeed, in the choice of an instrument, this criteria should receive high priority.

The property tax fares badly in this respect. It is a tax difficult to administer. It is paid by a large number of property owners, in amounts which are often very small. But collection costs are largely independent of property value: it is not much easier to assess and to collect the tax of a slum than that of a palace. It follows that collection costs on slums may be higher than the tax generated. Assessment of the value of properties that do not change hands often is notoriously difficult. It has to be done every year, to take into consideration changes in values or in properties. In addition, the property tax is usually not a popular tax, and public understanding and cooperation in tax assessment and collection is not easily forthcoming. In short, property tax administration is costly and susceptible of corruption.

For different reasons, betterment levies and negotiated contributions are also difficult to administer. They require very competent and honest taxmen (or taxwomen). In the case of betterment levies, one has to estimate often intangible benefits and to allocate them fairly between property owners. This is so difficult that it is often delegated to neighborhood associations, but this, by definition, can only be done for small and well localized infrastructure investments. In the case of negotiated contributions, the difficulties inherent in this sort of negociations are formidable. There is an asymmetry in information, with the land owner/developer usually knowing

the costs and the potential benefits of the projects much better than the administrative agency. The possibility of collusion is great, so that even the most honest deals are likely to be suspect.

By contrast, development charges are easy to administer. They are a one-shot affair. All that is required is to know the quantities and values of floor space sales, which are by nature public. Some purchasers and sellers might be tempted to cheat and to under-report unit values, but there are usually too many purchasers to render this undetectable.

Summary and conclusions

Table 1 summarizes these analyses. Relative to each of the criteria each instrument is graded on a scale of 1 to 5, from bad to good. This grading is obviously judgmental and must be taken with some prudence.

Table 1 — Comparison of Instruments

	Property tax	Betterment levy	Negociated contribution	Development charge
Rent capture	1-2	2-4	2-3	4
Economic impact	2	4	4	4
Administrative feasibility	1-2	1-3	2	4

Source : see text

In conclusion, two points can be made.

The development charge dominates the other instruments from the tree viewpoints identified. As mentioned, development charges are not a perfect instrument (the 4 given to it for the efficiency with which it captures land value increments may be generous, and a 3-4 would have been possible), but it does as well and in several cases much better than the other instruments. There are therefore good reasons to prefer it to collect the revenues necessary to fund public infrastructure in Mumbai metropolitan region in a way which is fair (it captures unearned income) and economically sound (it does not distort behaviors).

It does not follow that the three other instruments could or should be ignored. They are not entirely exclusive from each other, but can, to a certain extent, be used simultaneously. This is so because they serve different purposes and are geared to different targets.

The property tax remains attractive as a local tax, and there is no doubt that it should be improved and developed in the MMR. The betterment levy can be very useful to make the owners of *existing* buildings (as opposed to owners of buildings to be developed) pay for the benefits they will derive from improved transport or water services, particularly at a *neighborhood* level. For the development of large tracts of land that require heavy infrastructure investments —and will produce significant and most desirable increases in the supply of residential or commercial floor space, as well as substantial profits for the owner— negotiated contributions in kind can be a valuable solution. These instruments should not be seen as substitutes to development charges, but rather as useful complements to development charges.

Estimating Land Value Increments Generated by the MTHL

The trans-harbor bridge will considerably shorten the time required to go from Mumbai City to the area situated on the other side of bay, from Novi Mumbai on the North to the area situated to the South (where Reliance holds some 1,400 ha) and in the future to the airport. As a result of the bridge, all the properties located in that area (whether built or to be built), and consequently the land on which they are built, will become much more attractive and therefore valuable. The bride will generate massive land value increases.

Land Value Increases

How can land value increments generated by the bridge be estimated? What share of this increase will accrue to the Reliance properties?

The starting point could be the cost-benefit study of the bridge that must have been conducted by MSRDC. This study has estimated the social benefits generated by the bridge. The bulk of these benefits consists of time gains, on existing and future trips, as well as on additional trips generated by the bridge. To estimate these time gains, the cost-benefit analysis must have made hypotheses on the number of people and jobs in the area under study, perhaps decomposed by area (including Reliance area); and these hypothesis include assumptions on land use allocations and constraints (including FSIs).

The value of these time gains is a reliable estimate of the land value increment. A person living in the area

and earning 100 in time savings because of the existence of the bridge, is ready to pay 100 more to have a house there. This additional 100 will be shifted to the land owner.

The second task, to allocate spatially this gain, is more delicate. To begin with, a certain part of the gain will accrue to Mumbai City landowners. Because the properties built on their land is now more easily linked to the Navi Mumbai area, and will be more easily linked to the airport (mostly patroned by Mumbai city residents), these properties are more attractive and so is the land. The total bridge-induced gains should therefore be allocated to the East side of the bay prorata the number of trips originating from this side. A proxy for that should be the ratio of East to West to total trips in the first part of the day.

Similarly, the share of the East side gain that accrues to Reliance is proportional to the gain made by people living or staying on Reliance properties. If a transport model has been utilized, it has probably analyzed the flows of people origination from this area, and the numbers it has produced can be utilized. If not, the number of people who will live and work in this area, relative to the total number of people who will benefit, can be used as a proxy.

This relatively simple calculation will provide an indication of the land value increment brought to Reliance property by the MTHL. This indication however will be no better than the time gain estimate provided by the cost-benefit analysis. This CBA will therefore have to be studied carefully: what value (or values) of time have been utilized? How have the crossing flows be estimated? How has the demand (or the price elasticity of demand) for the bay crossing been estimated ? A sensibility analysis would be useful (if it has not already been done within the CBA).

The estimate of land value increment thus obtained, or perhaps its lowest value, would represent the maximum amount that can in principle be recuperated from the landowner, either in the form of a betterment levy or of negotiated compensations —such as paying for the bridge. The share that could or should be recuperated is much below 100% —30% might already be rather good by international standards— and is a political matter.

Estimating the proceeds of a development charge

To find out what a development charge could be and how much it would produce requires a completely different approach. One would have to estimate (i) the amount of built-up-floor that will be built and sold on Reliance land, (ii) at what price. The amount of built-up-floor is a function of the land area, and of the FSI attached to this land, which are probably known. Note that this FSI is the effective land FSI, not the legal plot FSI. To go from the latter to the former one must take into account the amount of land that has to be devoted to roads and streets, schools, recreation, and other social activities. The effective land FSI is perhaps something like one-third of the formal FSI.

Assuming a formal FSI of 2, a ratio of formal to effective FSI of 3, and a unit price of 50,000 Rs/m2 (these numbers are just hypotheses), would produce a sales price of 230,000 cr Rs. A 10% development charge would yield 23,000 cr Rs (about US$ 5 billion), nearly ten times the cost of the bridge. The sales price is not to be confused with the land value increment. One must deduct the construction cost, the developers's compensation, and the purchase price of the land. They can all be estimated, but this is not even necessary. We know that the estimated 23,000 cr Rs (to repeate, a number that is not worth more than our hypotheses) will be contributed by the land value increment.