Third World housing: space as a resource

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Some time ago, at the environmental conference in Stockholm, Indira Gandhi said that in countries like India the most serious pollution of all is poverty.

And one can go further. For it is not just poverty, but the particular forms which poverty takes in our urban areas. Rural poverty in India is a different thing. The people are as poor — often in fact poorer — but they are not as dehumanized. Obviously, there is very little relation between the way our cities are built and the way people use them (fig. 1). Not having the proper range of spaces they need in order to live, people merely misuse what they do have access to — hence the thousands of families cooking on pavements, defecating along railway tracks, and so forth.

The scale of the problem is staggering. By government count, a few years ago, there was a backlog of almost 12 million housing units required in our urban areas alone. To this must be added the four-fold increase in urban population expected over the next three decades. In contrast, our resources — both financial and material — are minimal. About 25 percent of our urban households earn less than Rs 200 per month. The next 50 percent earn between Rs 200 and Rs 500. Even if we assume a rent-paying capacity of a quarter of this income (high by Indian standards for this economic level), then, using brick and concrete, very little can be constructed for this money — somewhere between two and five square meters per family — and this for 75 percent of the population. Furthermore, it is not merely a question of financial budgeting; there is not enough cement and not enough steel in the country to deal with our millions of urban homeless in this way.

Yet will self-help schemes provide the answer? Granted that simple mud and bamboo houses are very much cheaper, but since densities anywhere near the city center are extremely high, these "sites-and-services" schemes are usually located on the periphery of cities, far away from the mass transport lines. They often tend to become ghettos of cheap labor, at the mercy of one or two local employers. But putting in a mass transport system and a full range of municipal services is expensive.

This is the dilemma: multistory tenements cost more to construct yet save on transport and other infrastructure costs; and low-rise housing costs less to construct but occupies more space.

What is the point of trade-off between these two? To answer this, we must of necessity examine the entire system we call "city" and try to arrive at a

Fig. 1: High-rise, high-density living — within a single-story shed!

solution which is the most economical in its total cost per family — including roads, services, schools, green areas, and mass transportation systems.

Providing housing involves much more than just building houses. The room, the cell, is only one element in a whole hierarchy of spaces a human being needs in order to live in a city.

This hierarchy is determined by many factors, such as climate, culturally-defined life styles, and so forth. For instance, under Indian urban conditions, it appears to have four major elements:

- The space needed by the family for exclusively private use, such as cooking, sleeping, or storage;
- The areas of intimate fine-scale contact such as the doorstep where children play, or you chat with your neighbor;
- The neighborhood meeting places (for example, in our villages, the village well) where you become part of your community;
- Finally, the principal urban area — such as the *maidan* — used by the whole city.

Each element in this hierarchy can consist of covered spaces or open-to-sky spaces. For example, many of the private activities at the microend of the scale, such as cooking and sleeping, need not be exclusively indoor but can — and do — take place in an open courtyard (provided of course that privacy is reasonably assured). In fact, depending on the cost of building construction this trade-off is automatically adjusted, each society (and each family within it) finding its own balance. This adjustment is of the utmost importance, particularly in developing countries, because they are usually in warm tropical climates where a number of activities can indeed take place in the open.

The second important fact about the elements in this hierarchy is that they are mutually interdependent. That is to say, less space in one area can be adjusted by the provision of more in one of the other three. For example, smaller dwelling units might be compensated by larger neighborhood community spaces, or vice versa. (New Delhi provides about 1.5 hectares of open space per thousand people; that is, about 72 square meters per family. The question is: Would we be better off trading some of this public area for more private space — say a courtyard of 10 square meters per family? Exchanging monumental public vistas for greater individual privacy — especially for the poor — may not be such a bad bargain. And we might even save some land area in the process.)

To recap briefly, housing is not only cells in isolation but a hierarchy of activities and spaces; secondly, within each activity there is a trade-off between spaces which are covered and those open to the sky; thirdly, the activities themselves are mutually interdependent and there can be spatial trade-offs between them.

To identify the hierarchy and to understand the nature of these trade-offs is of course the essence of the task of providing housing. Without this, one is in grave danger of formulating the wrong questions. For instance, most attempts at low-cost housing define the question simplistically as the necessity of piling up as many dwelling units as possible on a given site, without any concern for the other spaces involved in the hierarchy. As a result, in much of urban India, the people — especially the poor — are trying somehow to work out a pattern of living within the totally inadequate context provided for them.

Tragically enough, piling people on top of each other does not in fact "save" much land for the city. In most urban areas around the world, only about 15 percent of land use is devoted to residential building sites. The rest is in other space-extensive uses, such as industry, warehousing, and so forth. For instance, transport is usually between 25 percent to 35 percent of land use. Even with the inclusion of the land devoted to local distributory roads, tot-lots, and so forth, housing only occupies about a third of most cities. Doubling the number of people on each site does not significantly alter the land use of the whole city. It can mean much higher profits for individual developers which is one reason it is done. Conversely, lowering the density on residential plots only marginally enlarges the city.

Nevertheless, the question arises: Will lowering the densities disproportionately increase the cost of the service infrastructure in particular, of the travel time and travel costs involved in the public transport systems? This is indeed an important question. Without transport there can be no mobility, therefore no job choice — in fact often no job at all — and for the poor, mass transport becomes as crucial an urban prerogative as housing.

A mass transport system — whether a tram, or a train, a bus in mixed traffic or on a reserved track — is essentially a linear function (fig. 2). It only becomes viable in the context of a land-use plan which develops corridors of high-density demand. Thus the cost and convenience of the mass transport system are not merely a function of overall densities, but depend also on the structure of the city — namely that it be a linear system, or a combination of linear subsystems — with each station having a sufficient hinterland of commuters.

Let us take an example. Assuming a dwelling unit of 32 square meters and a communal space of 30 square meters per family which includes activities related to the small community, such as tot-lots, health centers, and so on, but not school playfields and other space-extensive uses outside this area at the next level, we find that ground-floor houses on individual sites (each 4 by 11 meters) will accommodate about 25,000 people in a three-quarter square kilometer area (eight to ten minutes walk from a station); five-story walk-up apartments, 40,000 people; and ten-story apartments using elevators, 55,000 (fig. 3). In all three cases, there are a sufficient number of commuters in the hinterland of the station for a viable mass transport system (figs. 4-7, pp. 36, 37).

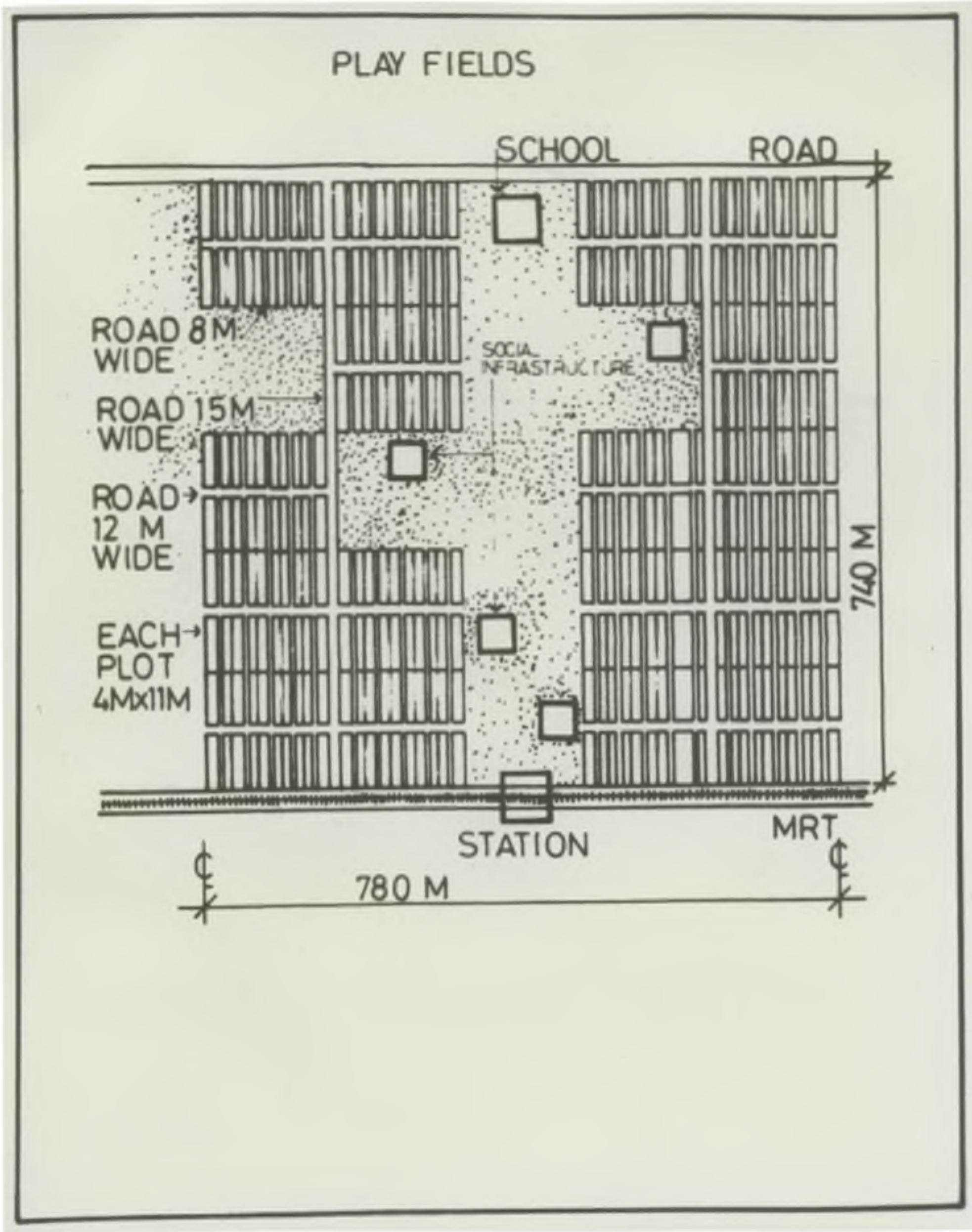

Fig. 2: The diagrammatic representation of a sector. Each family has been given a site of 4 m by 11 m on which they can build an incremental house (starting with a small shed and building up gradually to a complete house of 30 sq m to 40 sq m having two or three rooms, kitchen, bath and WC). The social infrastructure (schools, tot lots, local shopping, health centers) totals 30 sq m per family and is located along the middle of the square. The land-intensive uses (such as playfields) are just outside the sector, farthest away from the MRT (mass rapid transit), so as to minimize service infrastructure costs. In this pattern, the total number of families in the sector comes to 5,000. Assuming an average of five persons per family, this comes to 25,000 persons on each side of the station or 50,000 per transit stop.

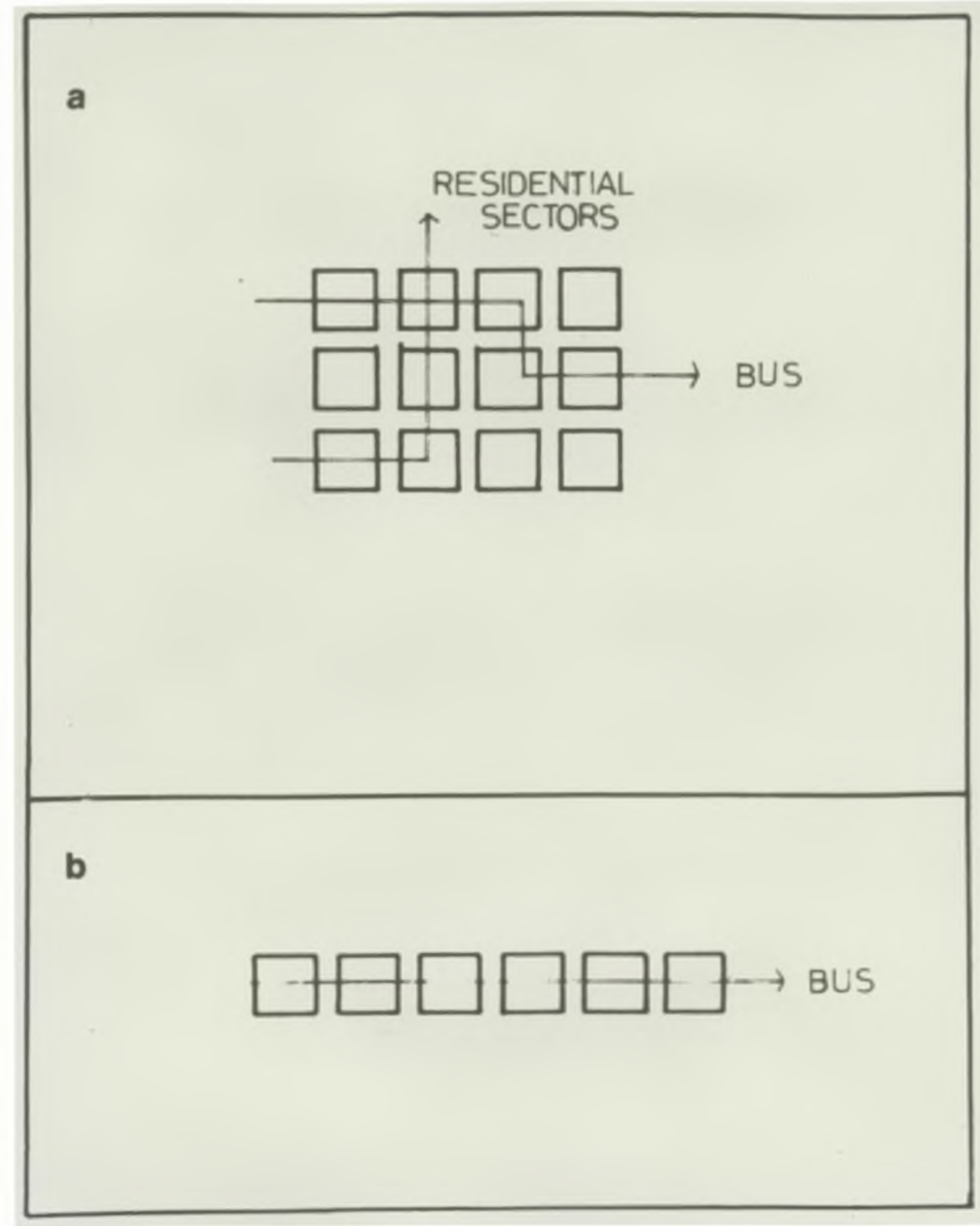

Fig. 3

a: A mass transport system is essentially a linear function. It only becomes viable in the context of a land-use plan which develops corridors of high-density demand. These diagrams illustrate a pattern of growth, involving a hierarchy of compatible transport systems. Starting with a simple bus in mixed traffic, we gradually build up to a complex network involving trains on four or more tracks without at any stage transgressing the cost/capacity constraints we face. Furthermore, the interchanges between systems constitute natural nodal growth-points in the city structure.

b: A series of sectors (some exclusively residential, others mixed residential-employment areas, depending on need) growing along a bus line. The fact that the system is linear — as opposed to a grid — makes for a corridor of medium-density demand and thus for an efficient bus system.

The density variations cause crucial mutations in the living patterns — really the life styles — of the people. Furthermore, they can also make a decisive difference to the cost of constructing the dwelling. There is a great variety of simple materials (mud, brick, and thatch) and existing vernacular technology which can be used for ground-floor housing. Furthermore, any open-to-sky space left on the site is really an extra room, obtained at no cost and usable at least part of the year for essential family purposes.

Understanding these trade-offs, and identifying the various options available to us, necessitates an overview of alternate land-use patterns, taking into account a number of crucial variables, for example:

- The cost of providing mass transport;
- The cost of service infrastructure (roads, water supply, sewer lines, etc);
- The cost of social infrastructure (schools, hospitals, etc);
- The construction cost of the units;
- Some usability coefficients for open-to-sky space, both private and communal;
- Some weightage against using nationally scarce materials (steel, cement, etc);
- Some weightage in favor of configurations and densities wherein it is possible to recycle human and other wastes.

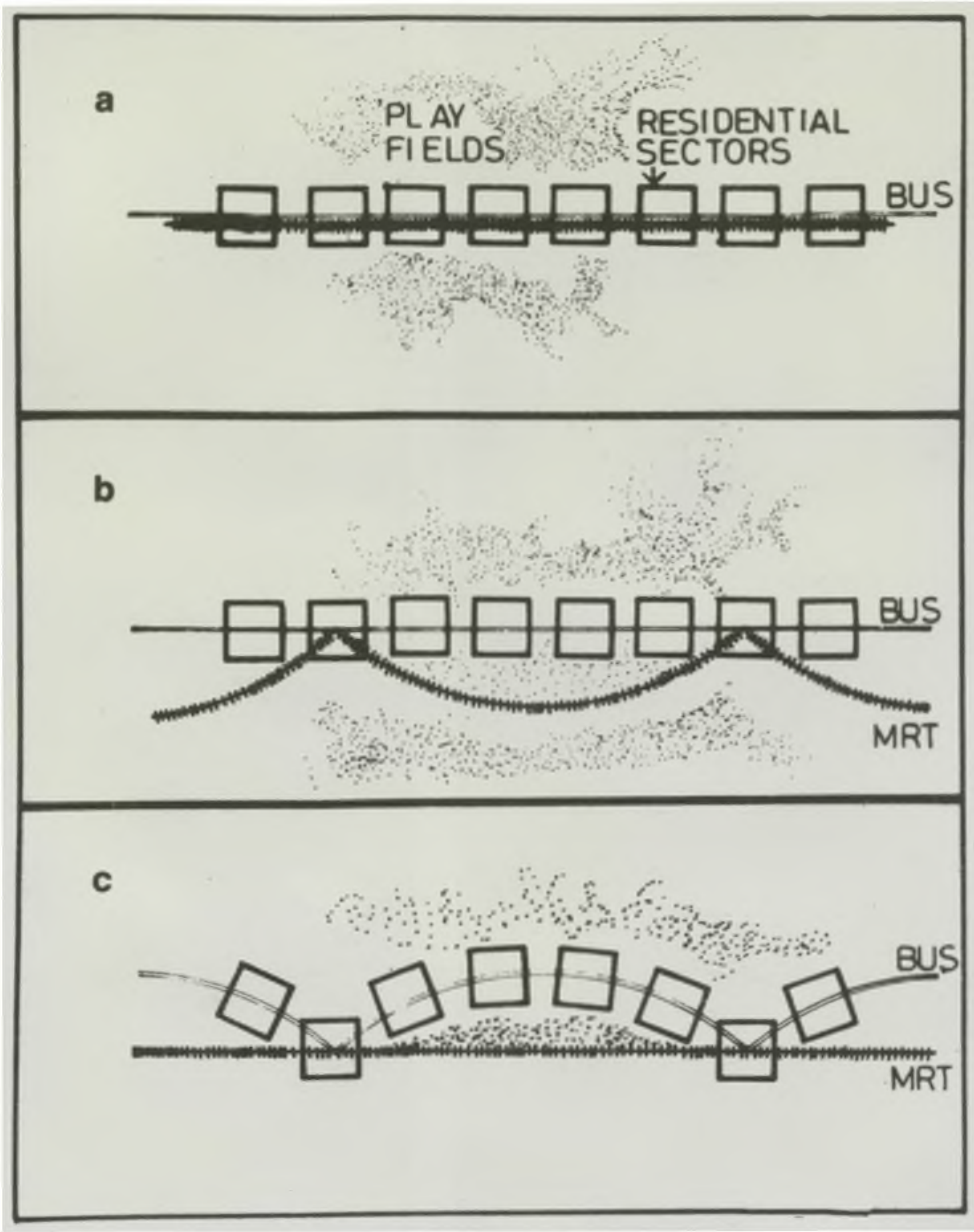

Fig. 4

a: With the intensification of densities, the traffic grows and a primary MRT becomes necessary. To install a track down the center of the development involves either acquiring developed land and knocking down buildings, or reserving this land from the beginning. This is difficult first because of squatters, and second because it would leave a scar of no-man's-land running down the middle of the sectors for the first few years.

b: Keeping the train alignment outside the system is better. The train stations (which would be less frequent than the bus stops) occur only every fourth or fifth sector, the train track being kept outside the intermediate sectors. This results in a somewhat devious and illogical train alignment.

c: The pattern is reversed with a bus line which meanders; later on, when the train is installed, its alignment is direct. This pattern more clearly reflects the alignment constraints of the two systems.

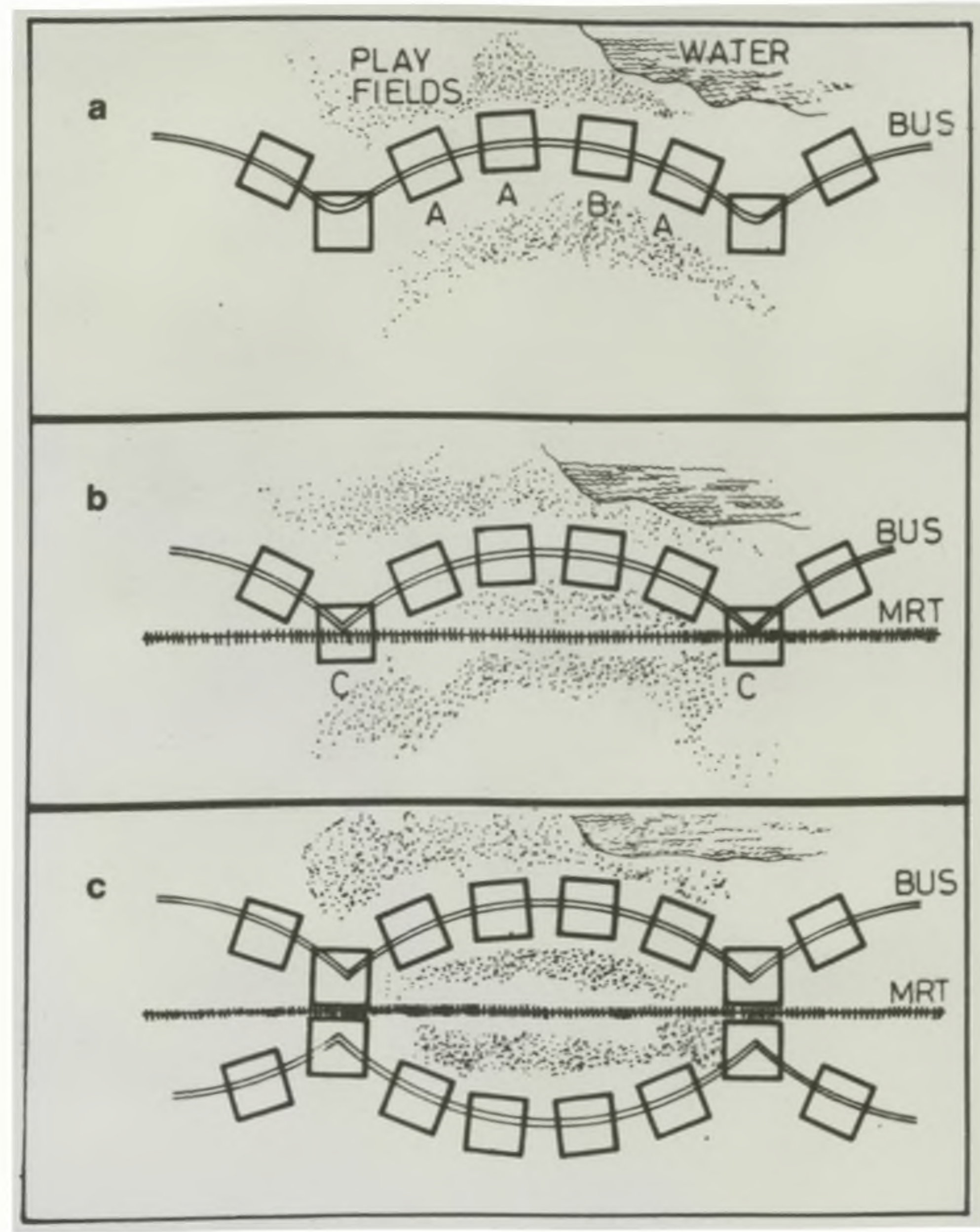

Fig. 5: How the system grows

a: We start with a bus line (secondary MRT) generating a series of sectors of approximately equal importance. Let's call them Type A. Perhaps one, because of its particular location (near the water?), grows in importance; let's call it Type B.

b: As the traffic grows and the primary MRT is installed, the interchanges generate additional activity, upgrading these particular sectors (Type C).

c: With time, a secondary bus line can be installed, opening up a whole new section of the hinterland.

Considerable research has been undertaken and from the work we have done so far, it appears that in most Third World urban areas, these trade-offs would decisively favor a pattern of medium-density ground-floor housing on plots of between 45 to 100 square meters. It must again be emphasized that the gross residential area required is not much greater than that required for multistoried housing. Unfortunately, the notion of low-rise housing is associated with the kind of urban sprawl in the suburbs of our cities; but this, of course, is not what we are talking about. In its concentrated form, low-rise housing is the optimal and classic pattern of residential land-use, for it has a number of advantages to wit:

- An individual building his own house is a highly motivated person, this motivation engendering an increase in per capita savings so that housing is built without sacrificing other national investment targets.
- A low-rise building has a much shorter construction period. Thus, the interest cost of capital tied up during construction is considerably less.
- It is incremental, that is, it can grow with the owner's requirements and his earning capacity. Eventually, the owner may want to add an additional floor or two, either for rental or for his grown-up children's families. (This would have the additional advantage of increasing the density, though it would entail a certain

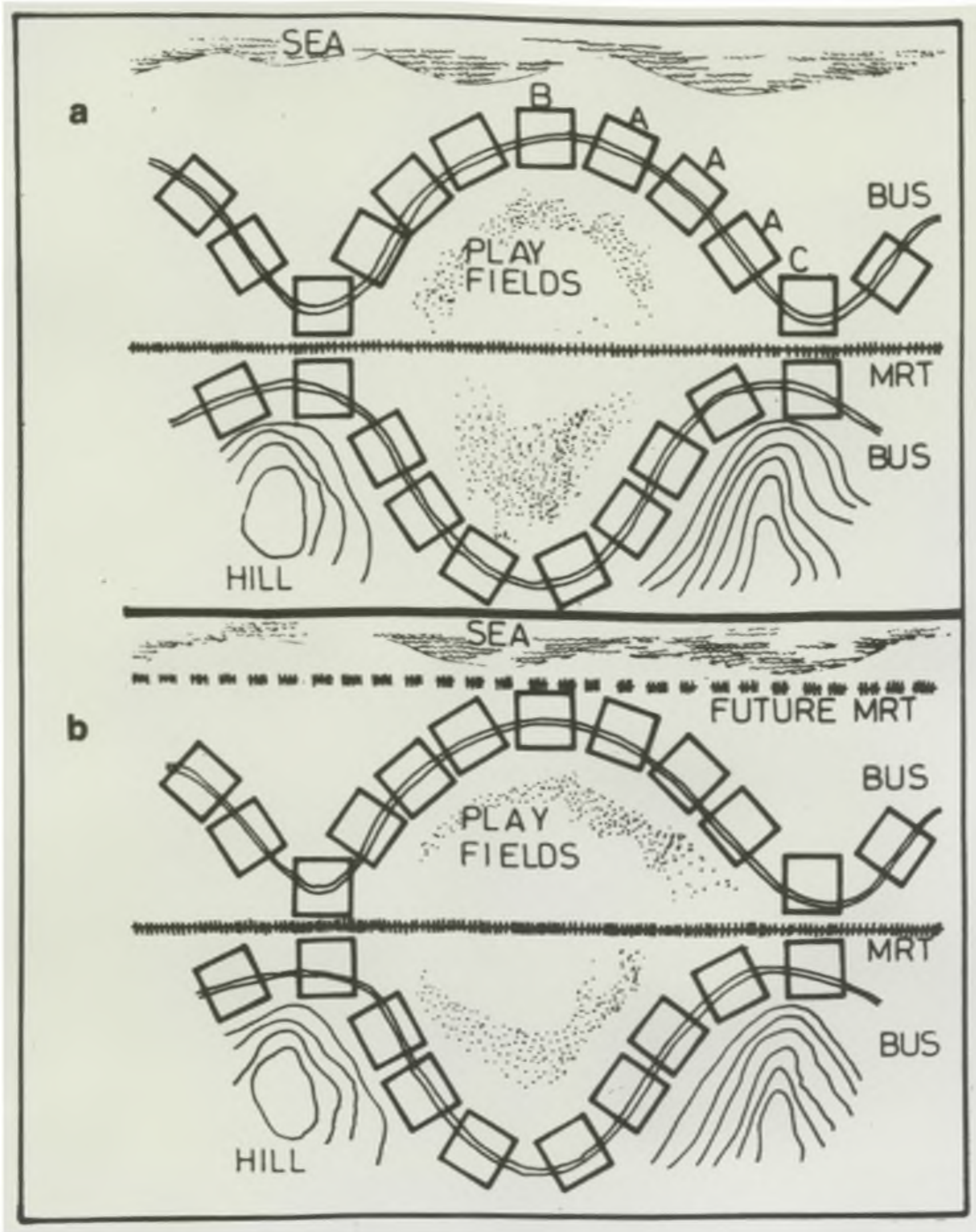

Fig. 6

a: The system is shown diagrammatically on a typical portion of the new Bombay site (which runs between hills and water).

b: In future, should densities and traffic grow beyond expectation, an additional primary MRT can be installed. This upgrades the importance of some Type A sectors (which now provide an opportunity for locating new social infrastructure and other facilities for the additional population).

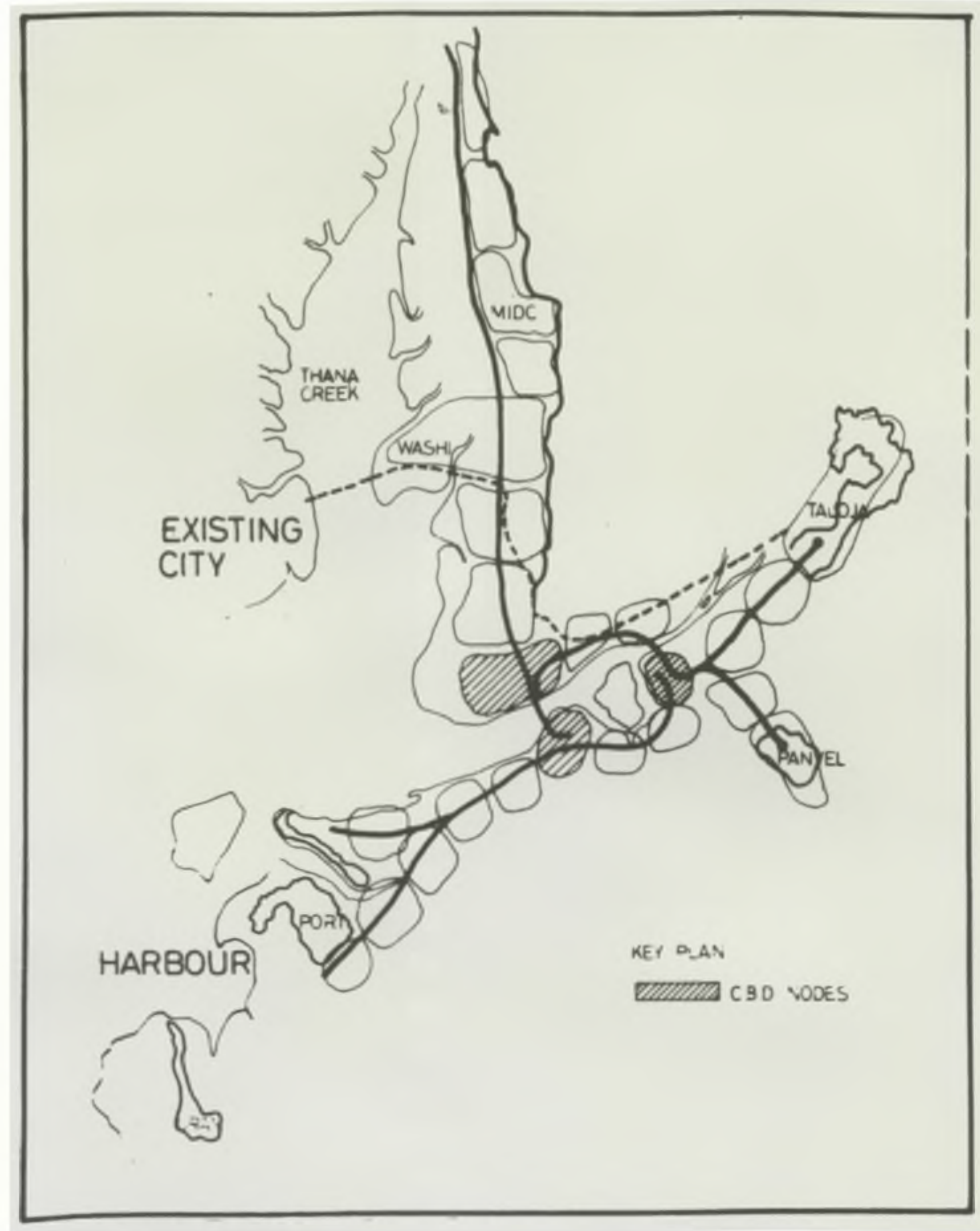

Fig. 7: One of several possible basic structural plans for new Bombay, showing three such linear spines arranged in a pinwheel around the CBD (Central Business District). Each spine is hooked into the CBD at one end and into the regional transport network at the other, thus relating the new CBD to the surrounding region.

flexibility in the pattern of infrastructure provided.)

- It has great variety, since the individual owner can design and build it according to his own needs.
- It need not use high-priority construction materials. Multistoried buildings must of necessity use steel and cement — commodities which are in excruciatingly short supply in developing countries. On the other hand, the individual row house can be constructed out of anything and improved over time.
- Of course, if the house in its early stages is constructed of brick, mud, and country tile, then it will not have a life span of more than 10 or 15 years — as compared to an RCC structure which will have a life span of, say, 70 years. But this impermanence is really an advantage. For after 15 years, when our economy improves, we might presumably have more resources to deal with this problem of housing. As Prof. Charles Abrams has pointed out, "renewability" should be one of the prime objectives of mass housing in developing countries; for as the nation's economy develops, the housing patterns can change. The five-story concrete tenement slums built by housing boards all over this country are really the work of pessimists. What they are saying is: we aren't going to have any future.

Of course it is one thing to be able to identify optimal residential patterns and densities; it is quite another matter for the authorities to be able to stabilize densities at these levels. This is of course a crucial question. And it is here that strategies must be developed, strategies which would, in all probability, involve the mass transport system. For instance, if we could install a transport system to open up new areas for residential use, we would, in effect, be subsidizing low-cost housing indirectly through a subsidy on the transport system. This might well be preferable to a direct subsidy on housing, which often leads — at least under Indian conditions — to illegal transfers of the tenements, and interferes with the market.

In any case, the critical issue in Third World cities is not so much a question of increasing densities, but rather one of lowering them. For instance if we can bring down the density in the residential areas to 80 or 100 persons per acre, it may become feasible to dispense with central sewage systems and instead recycle waste matter (both human and animal) to considerable advantage (cooking gas, fertilizer, and so forth). Under Indian conditions this would have the additional advantage of continuing the pattern of life which people are accustomed to: as though Mahatma Gandhi's vision of a rural India had an almost exact urban analogue.

The optimal-sized plot — or let us call it a standard-sized plot — will cover up to 97 percent of the urban population. This is indeed a concept with profound sociopolitical implications: one which would constitute a crucial step towards defining a truly egalitarian urban society, totally different from that prevailing in the vast majority of Third World cities — where the surrealistic contrast of rich and poor is formalized and made permanent in the totally unequal amount of urban space they each command.

In too many Third World cities (such as Bombay or Dacca), the residential densities in the poorest sectors are extraordinarily high. And these densities are not achieved through high-rise buildings; they result primarily from the criminal omission of play spaces, hospitals, schools, and other social infrastructure in these areas. (For instance in Bombay City, open space is about 0.10 hectares per thousand persons — and this includes the "green" of traffic islands!)

In conclusion, it must be emphasized that any investigation of optimal densities is largely determined by the scale of the context we establish. For instance, to a developer looking at an individual urban site, the trade-off between cost of construction and marketability will lead to a somewhat higher level of density, since he is not responsible for the schools, roads, and other infrastructure involved in his decision. To an authority responsible for a larger context — say the whole neighborhood district — this trade-off will certainly give another answer. To anyone looking at the whole city, in fact at the nation and its resources, the answer will change again. Given the awesome scale of future urban growth, there can be little doubt that it is within the larger dimensions that we should view this problem.

For too long we have allowed the land-use patterns and densities of our cities to be determined in the narrowest context by the random (and self-interested) decisions of individual commercial developers — higher densities triggering off higher land values, and vice versa, in an increasingly vicious spiral. Today, almost the entire building industry in all our major cities is turning out a product that only the middle and upper classes can afford and with three-quarters of our society falling below the price-line! In their confusion and desperation, architects and engineers start searching for new "miracle" technologies (rather like the elusive medieval touchstone which would convert dross into gold). But the problem of housing the vast majority of our urban people is not one of finding miracle building materials or construction technologies; it is primarily a matter of reestablishing land-use allocations.