

Summary

The Regional Plan for MMR, 1973 viewed burgeoning population as the root cause of Greater Mumbai's problems. As investment required to maintain adequate level of infrastructure for the growing population was unlikely to be available, the Plan recommended restricting Greater Mumbai's population to 7 million, putting ban on setting up new industries, offices and commercial establishments, and relocating certain economic activities to new growth centres. In view of constraints on Greater Mumbai's physical growth imposed by its peculiar geography, the strategy was considered to be a least cost solution, and the one that was in the interest of maintaining the city's vitality as the 'engine of economic growth'. The strategy was in consonance with the prevailing view that unless drastic measures are taken to restrict growth of population and economic activities of the large cities, civic services in them will break down and quality of life will suffer.

Twenty years after the plan, Greater Mumbai continues to reel under increased demographics pressure, poor infrastructure, and high level of environmental pollution. And its economy seems to be loosing its edge. Fortunately, over the years, there has been a distinct change in the perception of the role of large cities, and the problems faced by them. No longer are they regarded as over-grown, unmanageable, sick urban entities, but the ones that play an important role as generators of national wealth. Far from restricting their growth, the current approach is to facilitate their development through provision of infrastructure, and by removing any obstacles in the path their economic progress.

In the context of the liberalisation of economic policies, Greater Mumbai has a very significant role to play not only in contributing to the national economy, but also in facilitating integration of the country's economy with the rest of the world. With its premier position as the country's financial capital, its leadership in the country's international trade, its strategic location with respect to the global market centers, and its ability to provide wide range of technical, professional and business services. Greater Mumbai has the potential to emerge as an international city, fostering growth of financial and business services, and hi-tech, export-oriented industries. Basic to such development is the provision of high quality infrastructure – especially, telecommunication and transport – office complexes, housing, and good living environment. This cannot be achieved through sole reliance on public investment, regulations, and controls. It calls for an approach that would facilitate increased investment by private sector in infrastructure and other developments; enable appropriate structural changes in the Regions' economy; and permit adoption of land use policies that respond to market potential. The growth management strategies of the revised Regional Plan for MMR, 1996-2011 reflect this approach.

Despite major departures from the Regional Plan, 1973, its spatial development strategy, namely, creating a poly-nucleated structure through development of Growth Centres, continues to guide the strategy of the revised Regional Plan. This is, firstly, because much efforts and investment have gone into development of the Growth Centres; and, secondly, because the strategy continues to remain valid even in today's context. The international experience indicates that a multi-nodal or poly centric urban structure seems to accommodate increased freedom of location, and larger size of the large urban area better than a mono-centric city; and that the development of the polycentric structure is associated with and helpful to large cities' globalisation process (Dieleman and Hamnett, 1994).

Regional Setting

The Mumbai Metropolitan Region extends over an area of 4355 sq.km. and comprises Municipal Corporations of Greater Mumbai, Thane, Kalyan, Navi Mumbai and Ulhasnagar; 15 municipal towns; 7 non-municipal urban centres; and 995 villages. Its administrative limits cover Mumbai City and Mumbai Suburban Districts, and parts of Thane and Raigad District. There are 40 Planning Authorities in the Region that are responsible for the micro-level planning of the different areas.

The Region as whole is a lowland lying on the west of Sayhadri hill ranges. It has a varied landscape that is marked by a series of north-south hill ridges in the central and eastern part. Their step-like terraces and layered appearance is characteristic of the Deccan lava country, which is formed by successive layers of basalt flows. Its river system consists of 5 major rivers that, along with their numerous tributaries, drain the region into the Arabian sea. They are also important sources of water for the Region. The Region has a 167 km long coastline that is highly indented by estuaries, bays and creeks, The coastal belt in the North and south are famous for their coastal plantations, beaches and hamlets that have great-scenic value. Wetlands occupy vast area of land along the coast. They consist of mud flats, marshes and mangroves.

The climatic condition in the Region especially in the summer are oppressive because of the high temperature associated with high humidity. Winters are relatively pleasant. Monsoon brings in heavy rain that averages about 2000 mm. per annum. Very heavy rains with intensity of 250 mm. In 24 hours are not uncommon.

Mumbai's peculiar geography – a narrow wedge-shaped land surrounded by waters on three sides – has for decades dictated its spatial growth. While the early growth of Mumbai took place in the south near the port, it spread northwards along the suburban rail corridors. Till 1968, most of the Region's urban growth was confined to greater Mumbai's municipal limits through it had begun to occur in thane, Kalyan and surrounding areas beyond Greater Mumbai.

The urban sprawl study indicates that in the post 1968 period along with Mumbai's suburbs, the growth occurred in Thane, Kalyan, Mira-Bhayander, Navi Mumbai and Vasai-Virar areas . This led to increase in the built-up area from 234 sq.km. in 1968 to 575 sq.km. in 1987.

The urban built-up area of the Region accounts for about 12 percent of the Region's total area. Most of this growth has taken place by conversion of agricultural land or by reclamation of wetlands. Despite rapid urban sprawl of the past few decades, agriculture still accounts for the largest land use in the Region accounting for 42 percent of its area. About 26 percent of the Region's area is covered by forest which are relatively well protected.

The Growth of Population

The thrust of the revised Regional Plan is on providing adequate infrastructure facilities in different parts of MMR so that problems such as housing shortage, traffic congestion, water supply deficiency and environmental degradation currently faced by the people in the region are alleviated and opportunities are created for advancement.

Some idea of what would be the total population in the region and what will be its distribution by the year 2011 is therefore necessary for planning the commensurate infrastructure and other facilities. For projecting the target year population the ratio method is used. This method employs a top-down approach using the projected macro-level population of India and from that derives that of Maharastra followed by that for MMR by analysing that past ratios of the population of the smaller area to that of larger area containing it. The trends of natural growth and migration and the impact

of surrounding developments are thus implicitly incorporated in projections of likely future population of the region.

The estimated population of MMR in the year 2011 is 22.4 million. Out of this, the population of Greater Mumbai which is already showing a declining growth rate is expected to be 12.9 million. The population of western region comprising Mira-Bhayander and Vasai-Virar areas is projected to be 1.6 million, that of north-east region consisting Thane Municipal Corporation, Kalyan Municipal Corporation, Ulhasnagar and Bhiwandi areas to be 5.2 million and that of Navi Mumbai region to be 1.8 million.

The Island portion of the Greater Mumbai is expected to continue to lose the population whereas the western and eastern suburbs would continue to gain in population. Mira-Bhayander sub-region and Navi Mumbai are projected to grow at a rate more than 5% per annum while the remaining parts of MMR are likely to grow at comparatively slower rates. The share of Greater Mumbai in the population of MMR is thus expected to reduce from 68% as in 1991 to 58% in 2011. It is however necessary to review the population growth and distribution trends again in year 2001 when the next census data are available and revise the estimates accordingly.

Regional Economy

There has been a significant growth in the economy of MMR both in terms of income and employment over the last two decades. A shift is however observed in the nature of activities namely, from the traditional manufacturing to trading and services.

The estimated total Regional Domestic Product (RDP) for MMR in 1989-90 was Rs. 7967 crores and the corresponding per capita income was Rs. 4822 at 1980-81 prices. The RDP has registered an overall growth rate of 5.9% during 1980-89 period while per capita income has grown at 3.2% during the same period. The RDP for the secondary sector shows the rate of growth to be 5.7% while the tertiary sector RDP increased at 7.1% during 1980-89. In case of Greater Mumbai the secondary sector RDP has grown at 3.9% while the tertiary sector shows the growth at 6% per annum in the corresponding time period. This indicates the emerging change in the nature of economy of the region. Examining the sector wise growth in RDP over the last three decades and taking into account the changing sectoral trends, The RDP for the year 2011 for MMR is projected to be Rs. 28612 crore and the corresponding per capita income to be Rs. 12750.

The average household income in urban MMR in 1989 was Rs. 2,600 per month. In 1989 about 27% of MMR population was under the poverty line (household income Rs. 1,290/month at 1991 prices).

Information on employment is available from different sources like primary census, economic census, annual survey of industries, and employment market information report. It is observed that in Greater Mumbai in particular, the share of manufacturing sector employment has reduced from 36% in 1980 to 28% in 1990 whereas in trade, finance and services sector it has increased from 52.1% to 64.3%. This confirms the decline of secondary sector in MMR economy.

There is also a shift in the spatial distribution of employment in Greater Mumbai. The employment in the Island City (A to G Ward) which constituted 71.8% of the total employment in 1971 is reduced to 55.7% in 1990. This is mainly on account of marked decline in the manufacturing sector employment. Similarly, the office sector employment which has increased in Greater Mumbai from 3.52 lakhs in 1980 to 6.29 lakhs in 1990, the share of CBD of Greater Mumbai (A to D Ward) has reduced from 54.7% to 47.5% over this period. Further, a trend of growth of smaller establishments i.e. those employing less than five persons is now firmly set in Greater Mumbai.

For projecting the future employment in MMR, trends in productivity i.e. RDP per employee are extrapolated and applied to the projected RDP. The employment in MMR which was 3.23 million in 1990 is projected to 5.43 million in the year 2011. The share of manufacturing sector employment is expected to decline from 35% to 27% and share of tertiary sector employment is expected to increase from 64% to 72% over the 1990-2011 period. This change of dominance from manufacturing to services activities in the MMR economy calls for significant modification in the land-use and renewal and recycling of urban land.

Regional Development Strategy

The Regional Plan 1973, covered a wide range of issues across many sectors of the MMR's development. Yet, being guided primarily by the requirements of MR&TP Act, 1966, it remained essentially a land use plan.

Based on its diagnosis of the Region's problems, the Regional Plan, 1973 supported inter-regional dispersal of industries to reduce migration to MMR. It advocated decentralised pattern of growth by promoting new growth centres, such as, New Mumbai, and by restricting growth of industries and offices in Mumbai. It recommended bulk land acquisition as a measure to control speculation and raise resources for the provision of infrastructure. It believed in confining the urban growth to well-defined areas based on desirable densities and population distribution, leaving the rest of the Region as conservation area.

The experience of the past two decades questions the validity of the foregoing strategy and calls for its reconsideration on several counts. For instance, the industrial growth in MMR has been sluggish and industrial employment has been declining. The resources for infrastructure investment required for promoting poly-centric pattern of development have not been forthcoming. The strategy of bulk acquisition succeeded in Navi Mumbai but not so elsewhere. The urban growth could not be confined to its predetermined limits but occurred along the transport corridors in Mira-Bhayander, Vasai-Virar, and Thane-Kalyan area.

The existence of MMRDA with its wide ranging mandate to bring about integrated and balanced development of the Region, provides an opportunity to use the Regional Plan not only as an instrument of land use planning and development on a continuing basis. The revised Regional Plan therefore addresses both land use, and other issues covering industrial and office development, land policy, shelter, transport, environment, institutions, infrastructure, and information system.

The overall goal of the revised Regional Plan is to promote and sustain growth with social justice in a resource efficient manner. This is translated into following specific objectives:

- To facilitate and promote economic growth of the Region.
- To improve quality of life, particularly of the poor and deprived.
- To minimise adverse environmental impact that may occur in the process of economic growth.
- To improve the efficiency of existing methods of resource mobilisation.
- Adopt innovative methods of resource mobilisation, and facilitate, attract and guide private investment in desired direction.
- Promote effective citizen participation in the process of development through decentralisation of institutions.

Industrial Growth Policy

Concentration and growth of industries was diagnosed by the Regional Plan, 1973 as one of the basic causes of unabated growth, congestion, and over-crowding in Mumbai. It therefore adopted decentralisation of industries as one of its major policy objectives, and suggested measures to discourage further industrial growth in Mumbai. Despite such measures, the Plan assumed that the growth in industrial employment would continue in tune with the industrial growth in Maharashtra and India. Hence, it projected MMR's manufacturing employment to be 14 lakhs by 1991.

The Industrial Location Policy (ILP) introduced in 1974 carried the Regional Plan's intent and became a prime instrument of regulating industrial development in the Region. It prohibited new small, medium, or large-scale units in Zone I & II (i.e. Greater Mumbai, Thane, and Mira-Bhayander), and allowed expansion of only small-scale units. In Zone III & IV (i.e. rest of MMR), the Policy permitted new units or expansion of existing units.

The review of the performance of manufacturing industries in MMR indicates that, contrary to the expectations, the industrial employment in MMR has been declining over the past two decades. In 1991, the employment in manufacturing industries was only 5.99 lakhs as against projected 14 lakhs. This is despite the overall growth in India's manufacturing employment. The performance of the manufacturing industries in terms of economic indicators like capital investment, value-added, and output indicates that the MMR industries have not fared too well and, in fact, lagged behind the national performance. This indicates stagnancy and decline in Mumbai's industrial sector which can be attributed to a combined effect of a number of factors: obsolescence, sickness, or closure of Mumbai's traditional industries; industrial policies at the National, State, and Regional levels; and the natural process of decentralisation in the Region.

In the context of the foregoing review and the Industrial Growth Policy for the future, the revised Regional Plan addresses a number of critical issues, namely, what is the future of manufacturing in Mumbai; how to arrest decline in industrial employment and counter obsolescence, and sickness; whether to continue with unrealistic controls on expansion or modernization; whether to continue with the investment-based classification system for location policy or to adopt environment or technology-based criteria; and, how respond to the new initiatives by the Govt. of India in industrial and economic liberalisation.

The revised Regional Plan recommends that

- The new Industrial Growth Policy should be framed with specific economic, environmental, and urban development objectives. It should promote modern, technologically advanced, environmentally friendly industries in Mumbai; encourage changes in Mumbai's industrial structure by facilitating revival or replacement of sick and obsolete industries;
- It should minimize the adverse impact of new industrial growth on environment and civic infrastructure;
- It should help direct industrial growth to the underdeveloped part of the Region to achieve balanced regional development;
- It should help generate new employment opportunities.

On May 4, 1992, the State Government introduced the new Industrial Location Policy for MMR. Making significant departure from the old policy, the new policy has redefined the 4 zones of the old policy into 3 new zones and removed the distinction between small and large-scale industries. Instead, it has classified industries into three groups largely on the basis of their environmental impact. The Policy allows new non-polluting, high-tech, and high value-added industries in Greater

Mumbai, Thane, and Mira-Bhayander areas; whereas, it prohibits any new highly polluting industries or expansion of existing units in this area.

The revised Plan adopts this policy as it meets most of the its recommendations. However, it observes that in the course of time the policy will need further refinement in order to encourage or compel highly polluting industries to shift from non-conforming zone, or compel old, obsolete industries to revive or make way for new ones.

Office Location Policy

Driven by the objectives of containing Greater Mumbai's population and decongestion of south Mumbai the Regional Plan, 1973 recommended restrictions on new office growth in south Mumbai and relocation of offices and wholesale establishment to Navi Mumbai and Bandra-Kurla Complex. It assumed unabated economic growth of Mumbai. In 1977, the MMRDA Notification disallowed new office development in Island City without MMRDA's permission.

These provisions have been adopted in the Development Control Regulations for Greater Mumbai 1991.

Twenty years after the Regional Plan was sanctioned the context has changed both in terms of growth characteristics of Mumbai as well as the broader economic policy framework within which Mumbai's role in the national and global economy has to be defined. Mumbai has shown signs of economic stagnation and the overall establishment employment has grown by only 10% during 1980-90. Except for construction, trade and services all other sectors have recorded a negative growth. The office-oriented sectors have however grown by 78% during 1980-90 and contributed for more than a half of all new jobs.

Although some signs of decentralization of office developments are visible in Mumbai due to blanket controls in the Island City, new offices have also come up in the Island City mainly through illegal land use conversions. Large areas under obsolete economic uses however remain derelict despite high land values due to land use restrictions. Apart from some recent private office developments in Worli, Chembur and SEEPZ in Andheri, large office complexes particularly in Vashi and CBD Belapur through public investment. These two areas particularly the Bandra-Kurla Complex have already emerged as office growth centers with a potential to accommodate 2.5 lakh office jobs.

Given Mumbai's strengths as the commercial capital of India it has the potential to emerge as a global center. The economic liberalization policies of the Govt. of India provide immense opportunities for Mumbai to not only seek its economic recovery but develop as a business and finance center of the international level. Positive steps need to be therefore taken in this direction. A beginning has been made by the state Govt. by announcing the proposal to develop an International Finance and Business Centre at Bandra-Kurla Complex in Mumbai.

The current Office Location Policy which prohibits any new office growth in the Island City of Mumbai will have to be modified in response to the recent macro economic reforms and the resultant increase in demand for office space at central locations. The modified policy could also be linked with the process of recycling of land under non-residential obsolete uses, such as, industries, warehousing, etc. The new policy thrust should essentially constitute the following :

1. Mumbai should be equipped to host international business and financial operations. As a part of this strategy, an International Financial and Business Centre may be developed in the Bandra-Kurla Complex. The possibility of developing Mumbai as an Off-shore Centre for financial market may also be facilitated.

2. It is however of utmost importance that the real estate development that may occur on account of the modified policy must pay for the social costs of congestion and infrastructure strengthening that may be required. For this purpose, assessment of properties at their true market values for the property tax purposes will be the first step. Rent Control and Property Tax Reforms for such assessment of properties should, therefore, be treated as the pre-condition for adopting the following changes in the Office Location Policy.
3. No increase in the existing industrial and commercial zones, which may bring additional pressure on infrastructure, may be allowed in Greater Mumbai. The offices may however be allowed to compete with high-tech non-polluting industries. Office development particularly small offices may be allowed as a part of the commercial development. For this purpose the relevant provisions of the Development Control Regulations for Greater Mumbai, 1991, may be modified.
4. Reconstruction of existing office stock located in old building may be allowed at consumed FSI. Conversion and internal redesigning of architecturally and aesthetically valuable buildings through adaptive reuse for office activities may be permitted.
5. For large concentrations of old buildings in non-residential zones in derelict areas urban renewal may be undertaken to bring about infrastructure and environmental improvement involving changed land uses including office development. Recycling of land and space used by obsolete activities like textiles mills, cotton godowns of BPT. etc. may be promoted through integrated planning and development.

The adoption of the above policy will require necessary amendments to the sanctioned Development Plan as well as Development Control Regulations for Greater Mumbai 1991. Specific amendments proposed in this regard will also have to undergo public scrutiny.

Shelter Needs and Strategies

The Shelter sector of MMR has three important dimensions viz.,

1. creation of new housing stock;
2. improvement of slums; and
3. maintenance and upkeep of existing housing stock

The first dimension is of critical importance as failure in creating adequate housing stock has been the principal cause of proliferation of slums and pressure on existing stock.

On the basis of rates household formations, the annual housing requirement in MMR during 1991-96 is 85,000 units. Out of these nearly 32,000 (37%) is in Greater Mumbai. Similar requirement during 2016 to 2021 will be 99,000 units. However, Greater Mumbai's share in this will be only around 35,000 or 35%.

At the current level of supply of 40,000 units per year, there would be an annual deficit of 45,000 units per year. Unless the supply increases significantly the annual deficit will gradually increase to about 59,000 units a year by 2021.

The proportion of households earning less than Rs. 1290 per month in 1991 was estimated to be 25% which is likely to reduce to a negligible proportion by 2021 whereas the proportion of households earning between Rs. 1291 to Rs. 3230 which was 47% in 1991 is likely to increase to 50% in 2021. However, Despite the improvement in the income distribution, if only modest subsidies are available, a large proportion of households can afford only a serviced site with incremental improvement in the shelter.

The emphasis in public policy in the shelter sector has changed from Government as controller to Government as provider to Government as facilitator over the last 4 or 5 decades. The approaches in which Government has acted as provider, eg., subsidized rental housing or where strong interventions in the market have been adopted, e.g. urban land ceiling, have proved to be outstanding failures. Government's role as a facilitator, therefore, needs to be strengthened which is also in tune with the emerging national economic policy.

The facilitator role in the last decade has particularly emphasized housing finance and many specialized housing finance institutions have been established with National housing Bank acting as the apex refinance agency. This has also provided a specialized saving avenue for households to link their savings with concessional housing finance. However, the critical input to housing activity viz. Land and infrastructure has been overlooked. Availability of housing finance in the absence of adequate supply of accessible and serviced land may yield counter-productive results in the form of excessive rise in real estate prices.

In the overall context of facilitator role, public housing agencies will have to play a selective provider role for the lowest 30% of household. However, in the recent past, it is found that both MHADA and CIDCO have been favouring schemes based on advance contribution essentially catering to the middle and higher income groups. In the context of revision of Regional Plan, therefore, increasing the supply of urban serviced land for housing purposes, particularly for the poor, will be of critical importance.

The land required for housing new households in MMR will be 3,900 ha. During 1991-96, which will increase to 5,500 ha. in 2016-21. A large proportion of 60 to 65% of this land will be required in areas outside Greater Mumbai. The investment required to provide affordable shelter to all new households will grow from Rs. 2,400 crores during 1991-96 to Rs. 3,900 crores during 2016-21. Currently investment of this magnitude is being made in the construction of high cost housing. Changing the existing product mix through public policy intervention in favour of the poor households is therefore important.

Despite the efforts to increase the supply of new dwelling units, it is unlikely that the problem of slums will disappear over the next two decades. Infrastructure improvements and land tenure with full cost recovery will have to be the basic approach to deal with slums. Attempts to redevelop slums through market oriented strategies such as, providing higher FSI, will have limited application where real estate prices are sufficiently high. Even in such cases, the initiative to opt for redevelopment should be left to the slum dwellers' co-operatives. Land tenure to the slum dwellers co-operatives in this context has to be seen as a way of assembling small land parcels into redevelopable entities.

The public repairs and reconstruction programme is grossly inadequate to solve the problems related to old buildings due to limited benefits of repairs, inadequate financial and institutional resources and limited coverage (only in the Island City). It does not address issues related to maintenance and upkeep of buildings and environmental improvement in surrounding areas. Returns to the land owners are also inadequate. It is necessary to adopt urban renewal approach for covering large areas, enabling recycling of derelict land for new activities and attracting private investment. This could be tried through appropriate land use provisions and by formulating a framework for providing land assembly and equity participation.

Main recommendations of the Regional Plan therefore are as follows:

- Facilitate increase in the shelter supply in general through provision of critical inputs of land and infrastructure.
- Minimise subsidies by choosing cheaper supply options like sites and services which provide scope for differential pricing.
- Provide in situ upgrading and land tenure to existing slum dwellers' cooperatives as the basis for eventual redevelopment.
- Adopt urban renewal approach for redevelopment of old buildings by formulating a framework for land assembly and equity participation.

Urban Land Policy

The Regional Plan, 1973 did not explicitly spell out a comprehensive land policy. It considered the land policy issues as a part of housing new town development strategies. In order to make land available for housing in adequate quantity and at adequate prices the plan recommended strict land use zoning and bulk land acquisition. It proposed freezing of the entire development value of all lands in the long run. For effective control it preferred leasehold tenure to freehold tenure. The review of previous approaches to land policy indicates that the heavy reliance on intervening in the land market by empowering the state to accomplish large scale compulsory acquisition, has not been particularly successful. The general approach to land policy therefore has to be market oriented with a view to manage the land resources in an efficient and equitable manner.

Some of the crucial problems that the Mumbai Metropolitan Region faces today like extremely inadequate shelter opportunities, inadequate land for provision of social facilities and lack of resources for local infrastructure are ingrained in the present land policy (or the lack of it). Although provision of infrastructure helps increase the land values, the private land market tends not to provide adequately for infrastructure like roads, parks, schools, hospitals etc. This leads to "inefficient" land use patterns. Further the legal private land market for variety of reasons tends not to cater to the low income sections resulting in "inequitable" distribution of land and shelter opportunities. Thus on account of both efficiency and equity goals of urban development it is imperative to intervene in the private land market. The revised Regional Plan is mainly concerned with bringing about planned development of land which is going to acquire urban development potential over the next two decades and increase the supply of land.

Alternatives to compulsory land acquisition have to be considered in the three types of planning situations.

- Acquisition of an individual plot reserved in the Development Plan, e.g. school, garden. This has been facilitated through provisions related to Accommodation Reservation and Transfer of Development Rights in the Development Control Regulations for Greater Mumbai, 1991.
- Planned development of undeveloped areas through techniques such as Town Planning Scheme, land Readjustment Scheme and Guided land Development encounter various types of problems.
- Redevelopment of already developed areas. Land sharing by land owner, encroachers and for public facilities could be tried. For redevelopment of slum areas in Greater Mumbai FSI incentives are provided in the Development Control Regulations for Greater Mumbai, 1991.

The Regional Plan therefore proposes reorientation of the land use planning and development control system and suitable amendments in the MR & TP Act to achieve the following.

For development of currently undeveloped land:

- The burden of providing land for public purposes should be equitably cast on all land owners and not only on them whose land happens to be reserved in the development plan. This could be achieved by providing incentives for assembling land in larger parcels and stipulating scale of reservations.
- To keep the interest of landowners alive avoid land use allocations that reduce the price of their land. This could be achieved by limiting land use allocations to only arterial road network and major transport inputs like suburban railway stations.
- To minimize the resistance of land owners to part with a fixed proportion of land for roads, services and other facilities provide incentives for additional discretionary requirement of facilities or low income housing. This could best be achieved by controlling the allocation of development rights (by way of FSI) without directly affecting the ownership of land.

For redevelopment of obsolete development:

- Redevelopment should not be confined to reconstruction of buildings alone but should include improvement of layout, provision of basic facilities and recycling of land uses. The planning approach that incorporates the land policy instrument of incentive FSI could be used with suitable variation.

The potential of fiscal measures of land policy has been generally overlooked. Under the pernicious regime of rent control legislation, the property tax neither serves the resource mobilization objective nor does it help capturing land value gains and allocating urban space in an optimal manner. On the contrary it distorts land and real estate market and leads to regressive incidence of taxation. The land and property taxation could be used as a powerful land policy instrument. Reforms in the rent control legislation and property taxation are therefore imperative.

For market oriented land policy, information on ownership, prices, zoning and other restrictions must be readily available. Computerisation of cadastre and zoning and land use information therefore deserves high priority.

Water Resources

Water supply in MMR is characterized by inadequacy of supply and wide variation in the supply standards in different parts of the Region. Whereas in Greater Mumbai the supply is 130 lpcd, it is less than 40 lpcd in outer areas. A number of Government agencies, namely, MJP, MIDC, MCGM and Irrigation Dept. are involved in water resource development and supply. However, these agencies have been developing resources to suit their individual requirement and without any organized plan of action.

The revised Regional Plan reviews the demand projections using realistic consumption norms for domestic and Industrial water supply. The norms for domestic supply, which are assumed to improve with time, range from 200 to 250 lpcd for Greater Mumbai and from 100 to 150 lpcd for smaller urban areas. The industrial consumption is assumed to be 65 cu.m. per ha. The review indicates that the actual water consumption by the industries has been much less than the projections made in the past. The gross water demand for the Region for 2011 is 7959 mld as against the present supply of 3922 mld.

The potential availability of water in the Mumbai Hydrometric Area (MHA) comprising Vaitarna, Ulhas, Patalganga and Amba valleys as estimated by the Irrigation Dept. in 1994 is 10333 mld at

95 percent dependability. In addition, about 2740 mld of water is available in Damanganga basin. Thus potential sources in and around MMR are adequate to meet MMR's water supply demand well beyond 2011. However, severe water shortages may result if water sources are not developed in time.

The revised Plan presents a water account that attempts to match zone-wise demand with availability for the period extending up to 2011. It focuses on the need to develop middle Vaitarna before 2001 and Kalu, Shai, Pinjal, and Gargai before 2011 to provide adequate water supply to Greater Mumbai. It also identifies water sources that need to be developed in order to meet the water demand from other urban areas of the region. The investment requirement for 1991-2001 period is Rs. 1315 cr. and for 2001-2011 period Rs. 2856 crore.

The Plan emphasizes that planning and development of water resources is thus a very urgent resource-intensive and complex task. Since there is no single agency which has a comprehensive mandate in this regard, it is imperative to establish a suitable institutional mechanism. It suggests the formation of a Company to own and manage all resources in the Region. Such a company could be a joint venture between the Government, Local Authorities, CIDCO, MMRDA, etc. on the one hand, and private promoters on the other.

Transportation Strategy

The transportation sector proposals of the Regional Plan – 1973, consisted of a list of transport facilities related to road, rail, water and air transport. Some of these have been implemented but most others are still being debated because of the inadequacy of resources and lack of institutional framework dedicated to metropolitan transport.

During the 70s and 80s, a number of plans and projects for transportation sector were formulated. In April, 1994, a Comprehensive Transportation Study for MMR was completed. This provided valuable insight into the current transportation problems in MMR and suggested a long-term development strategy. The revised Regional Plan supports this strategy and dovetails with it the proposals for other sectors.

Between 1976 and 1991, vehicle registration in MMR increased by 3.25 times. The increase has been largely due to increase in private vehicles, particularly, the two-wheelers. By 2011, it is expected that the private vehicles will more than double their 1991 levels. The number of private vehicles during this period is expected to increase from 44 to 61.1 per thousand persons.

The total number of peak period passenger trips in 1993 were 21.55 lakhs of which 88 percent were performed by public transport. By 2011, these trips are expected to increase to 32.6 lakhs, with public transport still accounting for 85% of trips. The road network in Mumbai is dominated by three major north-south corridors that carry high volume of traffic. These corridors, along with railway tracks of the Central and Western Railways, restrain east-west movement of traffic.

The roads in Mumbai serve not only as a means of transport provision but also function as parking areas for vehicles, sites for hawkers, hutment dwellers, and other commercial activities. These activities, along with frequent disruption caused by maintenance of services buried in the roads, severely reduce the traffic capacity of the roads.

With its 3030 buses, the BEST provides bus service in Greater Mumbai and upto 20 km. Beyond its boundary, carrying about 45 lakh passengers per day.

Mumbai is served by Western and Central Railways that carry 40 lakhs passengers per day, besides long-distance passengers and freight traffic. In May, 1993, on a typical week-day, the Western Railways operated 923 suburban train service and central Railway operated 1072 services. During the peak period i.e. between 9 and 11 a.m., 1,18,000 passengers arrived at Churchgate Station and 1,26,000 at V.T. Station. The average occupancy of the trains during peak hours is 4,000 passengers as against the designed capacity of 1750, indicating extreme conditions of over-crowding and consequent discomfort to commuters. Inadequate rate of fleet augmentation, and constraints such as, squatter settlements along the tracks and numerous level crossings, severely limit the prospects of improvement in services.

The strategy for the development of transport infrastructure should aim at ensuring adequate level of accessibility and thereby assist economic development of the Region. The strategy should also aim at improving the safety record of the transport system. These should be achieved keeping in view the environmental concerns and the availability of financial resources. The accent so far has been on carrying out major road improvements. Continuing this policy as against improvement in railway system would prove to be costly and short-lived, as such improvement often attract additional vehicular traffic.

After evaluating a number of alternative strategies, the one with substantial investment in railways and modest investment in road system is favoured. The revised Regional Plan supports this strategy. The strategy emphasizes the need to improve rail capacities to reduce acute over-crowding. This is sought to be achieved through following measures:

- Construction of 5th line between Santacruz and Borivali and additional corridors from Borivali to Virar, and Kurla to Thane.
- Construction of Bandra-Kurla link and expansion of railway services in Navi Mumbai.
- Elimination of level crossings by road-over-bridges.
- Introduction of new rolling stock with radically improved design.
- Introduction of longer rakes and running them with 3-minutes headway.

The strategy for development of road network is focused on suburbs and outer areas of the Region. It includes construction of some critical links in Greater Mumbai, such as, Anik-Panjrapol Expressway, east-west links between Western and Eastern Expressway, Malad-Dahisar relief road, widening of Tilak Bridge at Dadar, and Airoli bridge. In outer region, it recommends Mumbai Trans-harbour link and its connection to NH-4 Expressway as a BOT project, construction of Panvel by-pass as BOT project, duplication of Panvel creek bridge and improvement of a number of other links.

The strategy does not favour any substantial road improvements in South Mumbai because of the high cost, and because rising vehicular traffic may nullify the benefits in the long run. Hence, it suggests demand management measures, such as, parking control and cordon pricing.

The strategy introduces a concept of publicly-managed private bus service for the future. Under this arrangement, bus stations and depots can be owned by a public agency, whereas, the bus services can be operated by private companies using bus stations and depots as hired facilities. This would enable the public agency to monitor and regulate the bus operations by the private agencies. The strategy suggests that this concept should be tried in New Mumbai.

The foregoing strategy will involve, during 1995 and 2000, an investment of Rs. 2059 crores with the railway component of Rs. 1328 crores. The strategy calls for integrating suburban railway planning and operations and visualises establishment of Urban Metropolitan Transport Authority in the long run. It however points out that such a step at the present stage may complicate the

issues and add to delays in the implementation of the strategy. It therefore recommends that in the short run, MMRDA could play the role of planning, co-ordinating and investment programming agency for implementing the strategy.

Environment

The quality of a region's environment can be largely determined by the quality of its water bodies, its ambient air, the standard of upkeep of its urban areas, the richness of its ecologically sensitive areas, such as, wetlands, forests, wildlife sanctuaries, etc., and the quality of its rural landscape. On most of these counts, the situation in MMR is highly unsatisfactory. The MMR, particularly Greater Mumbai, suffers from high level of air pollution from industries and automobiles, high level of pollution in rivers and coastal waters, unsatisfactory refuse collection and disposal, exploitation of wetlands, and risk of industrial disaster.

Upper reaches of the rivers in the MMR, which are used for drinking water purposes, are relatively free from pollution. The lower reaches of these rivers, and the creeks and coastal waters are used for discharge of industrial effluent and domestic sewage. This has severely affected the quality of these waters and has rendered them unfit for swimming or other recreational use.

The ambient air quality in MMR is adversely affected by the air pollution from domestic, industrial, power, and transport sectors. The concentration of SO₂, NO_x, and SPM in Greater Mumbai are within the prescribed standard, though maximum values sometimes exceed the standard. The trends over time indicate that the SO₂ levels have declined on account of use of natural gas and LSHS oil. NO_x levels are rising because of growing automobile traffic, but the levels are still within the standards. SPM values are usually very high and frequently exceed the standard. Besides industrial and transport sector, the SPM is also contributed by smoke from cooking in slum areas, open air burning of refuse, construction activity. The combination of smoke, dust, humidity, and gases create oppressive conditions, which are responsible for Mumbai being perceived as a highly polluted city.

The MMR generates 6800 tones of refuse and debris every day. About 75 percent of it is generated in Greater Mumbai alone. Sanitary conditions are very poor because of inadequate collection frequency, inaccessibility of slum areas, throwing of refuse in open drains and storm water channels, scavenging by animals and waste-pickers, and defecation on the road-side and in open areas. Large quantity of solid waste, i.e. 500 tones per day, is generated by industries in MMR. Municipal waste along with industrial waste is disposed of by dumping and not by sanitary land-fill method. Dumping sites are located in the low-lying areas, along creeks. They are poorly managed. They pollute creek waters, and cause dust and smoke nuisance.

Increasing traffic on roads and railways, and at the airport is a major cause of noise pollution in Mumbai. Noise pollution is also caused by industrial and commercial activities, and by variety of public activities, such as, processions, festivals, open air meetings, etc.. Noise levels of 90 to 94 dB have been recorded at major traffic junctions.

The MMR has a 167 km. long coastline that consist of sandy beaches, exposed rocks, cliffs, marshes, mudflats, mangroves, and salt pans. Some stretches of this coastline, have beautiful plantations, horticultural farms, and flower gardens. Intermingled with these plantations are small village settlements that add interest to the picturesque coastline. The coastline has undergone many changes over the past several decades because of the reclamation of the wetlands for urban expansion, agriculture, salt-pans, fish-farms, and because of dumping of solid waste. This has also caused destruction of some mangrove forests.

Hilly areas in the Region are unique in their charm and aesthetic quality and offer great opportunity for out-door recreation. Indiscriminate quarrying activity in the vicinity of urban areas have ruined the aesthetic quality of the landscape, and created problems of air and noise pollution.

The state of the Region's environment and the problems of environmental management have been exhaustively assessed in the series of studies carried out under the Metropolitan Environmental Improvement Programme (MEIP) and URBAIR in the past two years. These studies have dealt with a number of issues and made detailed recommendations on technical issues, environmental planning of issues, legal and institutional issues, and issues relating to information system or environmental management. Focusing mainly on the environmental planning issues, the Revised Regional Plan has made the following provisions:

- Recognising the importance of environmental planning as a tool for environmental management of MMR, the plan supports the view that the MMRDA should assume the central responsibility as a strategic environmental planning agency.
- The Plan emphasises the need to adopt environmental measures as a regular and consistent activity at each stage of the development, namely, planning, designing, and execution to achieve environmentally sound development.
- In order to ensure that the environmental considerations are consistently applied to the future plans and projects, the Plan makes Environmental Impact Assessment (EIA) or Environmental Screening (ES) mandatory for certain specified developments which are likely to give rise to significant environmental concerns. Appropriate provision in the revised Development Control Regulations is proposed.
- The Plan recommends that the wetlands should be preserved in their pristine state. In exceptional circumstances they may be used for setting up waste treatment and disposal facilities, slum rehabilitation, new housing for the urban poor, and critical infrastructure works. Mangrove areas should be declared as reserved forest and handed over to the Forest Department for maintenance.
- Separate Quarry Zones are proposed and detailed guidelines prescribed for systematic quarrying.
- The Plan endorses the recommendations of the Study on Environmental Management Strategy and Action Plan for MMR that the MMRDA should create an environmental cell to strengthen its environmental planning and environmental information capabilities, act as a statutory consultee in the approval of Development Plans in MMR, and monitor their implementation to ensure attainment of environmental objectives.

Land Use Plan

The Regional Plan-1973 aimed at containing Greater Mumbai's growth to 70 lakh population, reducing congestion and over-crowding, and restructuring the Region's mono-centric pattern of growth. This was sought to be achieved by developing Navi Mumbai as a counter-magnet to Greater Mumbai, and creating new growth centres, such as, Bandra-Kurla Complex and Kalyan Complex.

Since then, despite much effort and investment in the development of new growth centres, relocation of economic activities, and creation of new infrastructure, the Regional Plan's objectives have not been achieved: By 1991, Mumbai's population reached 99 lakhs and Navi Mumbai could achieve a population of only 6 lakhs as against the target of 21 lakhs. Measures to restructure Mumbai's growth by restricting growth of offices, warehousing and industries, and relocating wholesale establishments achieved modest success. But, in the process, they have

denied the City opportunity to renew, adjust and keep pace with the changing technology and changing demands on its products and services. The spread of urban sprawl into 'G' zone could not be checked. New pattern of urban growth emerged, bringing Vasai-Virar, Bhiwandi, Thane, Kalyan, Panvel, Rasayani and many areas along transport corridors into forefront development.

Departing from the normative approach of the Regional Plan-1973 (in setting population or employment target and allocating land for Urbanisable or Industrial Zone using predetermined densities), the revised Plan proposes zoning system and land use policies not strictly by land requirement for development, but by the development potential of an area. The Plan also aims at facilitating Mumbai's economic revival and creating employment opportunities for growing population, and support measures, such as, allowing recycling of the land locked under obsolete uses, encouraging new non-polluting, hi-tech, high value-added industries, and promoting modern office centre for the growth of international business and trade.

The salient features of the revised Land Use Plan are as follows:

- The zoning system of the revised Plan distinguishes 'development areas' from 'conservation areas' and makes appropriate provision for regulating development in each zone. Instead of the Urbanisable Zone of the Regional Plan – 1973, two new zones, namely, U1 and U2 zones are introduced in the revised Plan. U1 covers areas of intensive urban development and economic activities, such as, existing urban centres, new towns, and growth centres. U2 covers extensive areas having development potential generally outside urban centres.
- "An area of 42.66 sq. km. East of Khopta bridge is earmarked as U-2 zone with a population of 1 lakh by the year 2011. This is considered to be a good location for Science and Technology Park and related residential development. CIDCO should be appointed as a Special Planning Authority (SPA) for this area."
- "In view of the existing and future industrial development in Patalganga area, Rasayani is recognised as a Growth Centre. In addition a new Growth Centre is proposed near Pen to provide township support to industrial development just outside MMR boundary."
- The Plan recommends that environmentally-friendly, hi-tech, high value-added, export-oriented industries should be encouraged and fostered in Greater Mumbai. Similarly, old, obsolete, or sick industrial units should be encouraged to revive or make way for other industries. The Plan suggests development of Export Processing Zones on Mumbai Port Trust land in Mumbai, near Jawaharlal Nehru Port in Navi Mumbai.
- With a view to creating adequate employment base, the Plan suggests establishment of 3 new industrial areas with total area of 560 ha. In Vasai-Virar sub-region, and extension of MIDC's industrial area on Bhiwandi-Kalyan road. The Plan also suggests following in U2 Zone industrial areas of 10 ha. or more for non-polluting, hi-tech industries.
- The Plan proposes creation of Recreation and Tourism Zone of 500 m. radius around places of recreation and tourism value, such as, archaeological monuments, religious places, places of natural or scientific interest, wild life sanctuaries, etc. Some of these areas are delineated on the Plan. The Recreational Zone (R1 & R2) of the Regional Plan for Extended area of MMR-1985 is proposed to be deleted in view of the introduction of Coastal Regulation Zone for areas up to 500 m. from the high tide line under Environmental (Protection) Act, 1986.
- The range of activities proposed to be permitted in the Green Zone of the revised Plan is enlarged to provide for space extensive activities, such as, large institutions which are no longer possible in urban areas because of high land values. The Plan also suggests permitting certain other selective developments, such as, farm houses, week-end houses on plots of 2000 sq.m., holiday homes, resorts, amusement parks, film shooting sites etc. with very low

intensity development.

- A special Green Zone (G-2) is however proposed in environmentally sensitive areas where only restricted type of development will be permitted.
- In order to prevent indiscriminate quarrying activity, the revised Plan delineates Quarry Zones and prescribes environmental guidelines for systematic and scientific quarrying, and for restoration of the site after quarrying.

Development Control

Much of the Regional Plan's policies and proposals, especially, those which have land use implications get implemented through the Development Control mechanism. The legal framework controlling development is primarily provided by the MR&TP Act, 1966. The Regional Land Use Plan and the Development Control (DC) Regulation are the two basic instruments that regulate development. There are, however, host of other instruments, such as, MMRDA notification, Industrial Location Policy, MLR Code, forest conservation Act, 1980, Environment (Protection) Act, 1986, etc. which have played important role in regulating development in the Region.

Despite these regulatory instruments, the development control in the Region has remained weak and many unintended and undesirable developments have occurred. The problem lies in the inadequacy of the DC regulations, their improper interpretation, inadequate institutional set up, and lack of monitoring of the development control function by a central agency.

The revised Regional Plan seeks to remove these inadequacies through well-laid out comprehensive DC regulations, and new mechanism for development monitoring. The reforms suggested in the revised Regional Plan are as follows:

- Where U1 or U2 zone of the revised Plan falls just outside the boundaries of the Local Authorities, their planning jurisdiction should be suitably extended to enable them to Plan and regulate development in such areas. For this purpose, the MR&TP Act, 1966 may be amended to enable the Local Authority to function as a Planning Authority or Special Planning Authority (SPA).
- CIDCO should be appointed as a Special Planning Authority for the 42.66 sq.km.area of the proposed U-2 zone east of Khopta bridge.
- Frequent changes in the jurisdictions of Local Authorities in the Kalyan Complex, and uncertainty of MMRDA's continuance as an SPA have been responsible for virtual absense of planning in the area. No further change in the Planning Authority should be made until Development Plan is prepared.
- For out-lying areas having good potential for urban growth, the Plan suggests appointment of either MMRDA or CIDCO as an SPA. The Plan emphasises that all areas in the Region should be covered by one Planning Authority or other to ensure better planning and regulation and to enable levy and recovery of the Development Charge. Besides appointing SPAs for all residual areas, this objective can be achieved by amending Section 18(1) of the MR&TP Act, 1966 and empowering MMRDA to function as a Planning Authority for the residual areas.
- The revised Plan recommends that the MMRDA should be entrusted with the responsibility of monitoring development control. The State Government has already issued a directive making MMRDA responsible for appraisal of the Development Plans and monitoring of their implementation. This action will go a long way in improving development control system in the Region.

Development Control Regulations

As a measure to tone up the development control mechanism for the Region, the revised Regional Plan proposes a new, comprehensive set of Development Control Regulations. These Regulations will replace the regulations associated with the Regional Plan, 1973, Regional Plan for extended MMR, 1985 and others introduced from time to time along with amendments to the Regional Plan. The salient features of these Regulations are as follows:

- A two stage approval is introduced for development in new growth areas zoned as U2 Zone. The applicants will be required to submit an Outline Development Proposal. After it is approved in principle by the Planning Authority, the applicant will be able to submit the detailed application for Development Permission. This will help Planning Authorities to regulate development even where detailed Development Plan is not available.
- In U2 Zone, Organised Development will be encouraged by allowing higher incentive FSI for land pooling. Incentive FSI will also be offered for allocating land for social facilities and low income housing.
- Industrial areas for non polluting, high value added, and high tech industries on minimum 10 ha. land will be permitted anywhere in U2 Zone.
- Quarrying for building materials will be permitted in specially defined 'Quarry Zone'. Detailed guidelines are prescribed for planning, operations, and restoration.
- Many new activities, such as, houses on plot of 2000 sq.m., institutions, film shooting sites, amusement parks, outdoor sports facilities will be permitted in Green Zone.
- Severe restrictions on activities along Expressways, Highways, and State Highways are proposed. A set back distance from these roads, ranging between 30 m. and 15 m. is prescribed.
- Environment impact Assessment is made mandatory for certain specified developments. Other developments whose environmental impact is significant will be required to submit information for environmental screening.
- Applicants in the newly developing areas will be required to provide all necessary infrastructure at their own cost, and even maintain all the services for certain period after the development is completed.

Institutions, Infrastructure and Investment

The institutional structure envisaged by the Regional Plan-1973, did not favour a single development authority for the entire Region. It envisaged that various proposals of the Regional Plan would be implemented by the concerned existing agencies. It suggested that for co-ordinating regional development, a high powered coordinating agency, preferably headed by the Chief Minister, should be appointed. For micro-level planning and management, the plan suggested various arrangements including appointment of New Town Development Authority and New Town Municipal Councils.

The past two decades have witnessed the rise of many new statutory agencies, such as, MWSSB, MPCB, MHADA, CIDCO and MMRDA and a number of local authorities for urban areas in the Region. The 74th Constitutional Amendment has brought about 2-tier Local Authorities and Metropolitan Planning Committees in the Region. The most significant institutional change has been the establishment of MMRDA with wide ranging inter-sectoral mandate to plan and coordinate regional development. However, MMRDA has not been able to play that role effectively because of a number of institutional reasons, such as,

- Inadequate representation in the MMRDA's Executive Committee of the Industries and Environment Department and of the Local Authorities in the outer areas of the Region.
- Lack of information flows from various development agencies and Local Authorities to MMRDA.
- Absence of investment programming at the regional level as a part of the 5-year plan formulation process.
- Absence of modern accounting practices in the agencies and the Local Authorities in the Region, making it difficult to review financial plans and coordinate investment programmes.

In view of the foregoing, the revised Regional Plan calls for a more formal institutional mechanism for integrating investment programmes of various agencies. It recommends that

- All agencies should adopt commercial accounting and prepare standard financial statements including sources and balance sheets.
- All agencies should prepare computerised finance and operations (FOP) models and submit 5-year forecast of their financial statements to the Executive Committee of MMRDA for review, and take its comments into account in formulating the annual budgets.
- As regards the provision of infrastructure, the revised Regional Plan advocates a more coordinated and comprehensive approach. It observes that traditionally a single agency was responsible for different components for infrastructure provisions, namely, financing, execution of capital works, operation, maintenance, and setting standards for delivery of service. The experience indicates that such bundling of functions gives rise to many problems and creates inefficiencies. The revised Regional Plan therefore suggests vertical and horizontal 'unbundling' of services making more than one agency, including private sector agencies, responsible for different components of the service. This would introduce competition and consequent improvement in efficiency and reduction in cost of services.
- The revised Regional Plan estimates that for the next fifteen years the investment requirement for housing and other infrastructure facilities would be about Rs. 35,000 crores. Against this, the average yearly investment in the recent past has been less than Rs. 600 crores. This calls for concerted efforts in resource mobilisation through increase in local taxes and user fees, devolution of funds from the State Government to Local Authorities, commercial borrowings and inviting private sector to share service delivery responsibility through build, operate and transfer technique (BOT).
- The revised Regional Plan also suggests that MMRDA should play a significant role in financing urban development by acting as a municipal urban development bank for the Region. The plan however cautions that this should not be a purely banking operation but MMRDA should get actively involved with the Local Authorities in the preparation of financial and operation plans, capital investment programmes, formulation of projects, and in bringing about administrative reforms to build up their capacities.

Information System

Installation and maintenance of a Regional Information System is strongly recommended. It would help monitoring the implementation of revised Regional Plan and indicate the corrective actions or policy revisions from time to time. The databases to record the changes in land use, housing, employment, industry, transport, water, environmental conditions and so on, organised according to desired level of spatial disaggregation would form the core of this system. The system would be computer driven and built around a standard geographic information system software which would allow an integrated analysis of spatial and attribute data.

Since MMRDA is a strategic user and not a generator of information it will have to depend on various agencies of State and Central Government to obtain the data. These agencies however collect and process the data keeping in view their own specific needs. Considerable efforts are presently expended in reconciling the collected data. It is however possible to extract more useful information from these existing sources if suitable modifications are introduced in their data collection formats and tabulation schemes. In the first phase, therefore, the aim should be to improve the existing data collection systems to achieve the uniformity in scale, measurement unit and quality of information. Redesigning the data collection formats, devising new strategies for verification and analysis and deciding the appropriate dissemination schedule are the actions to be initiated. In the first instance the necessary financial and technical help to the primary data generating agencies to streamline their data organisation systems could be extended. In this manner an arrangement with other agencies to ensure continuous data flow in say, summary form and on computer compatible media to facilitate further processing would be established.

Establishment of transport and environmental information systems as a part of overall regional information system deserves special attention. For this purpose it is desirable to strengthen the capability in these areas by augmenting the necessary technical manpower and equipment. In addition, a photo interpretation and mapping cell to process the data now available in non-conventional forms like aerial photographs and satellite imageries should be set up whose services could be extended to all the agencies in the region in due course.

A reporting schedule to disseminate the results to various controlling bodies and public must be prepared. The establishment of GIS nodes at other important agencies in the region should be encouraged so that spatially referenced data can be subjected to distributed processing. Linking of all such nodes to form a regional information network is to be done at a later stage when databases are well established.