Working Paper 186

Resource-Conserving Urbanism in South Asia V: Further Explorations of Potentials for New Bombay

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July 1972

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$7.00

RESOURCE-CONSERVING URBANISM IN SOUTH ASIA V: FURTHER EXPLORATIONS OF POTENTIALS FOR NEW BOMBAY

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The work reported in this paper was supported in part by U.S. Public Health Service Grant MH-18030.

PREFACE

This working paper was prepared as a follow-up to No. 154, subtitled "The Development of Greater Bombay." That effort was drafted in haste last summer prior to a short visit to Bombay, was revised upon my return and made available to a new set of students taking the course "Futures of Urbanism and the City." Some of the faults in the previous work lie in the crudity of the sketches depicting some of the complexes expected to be feasible in the near future. Improved versions had been prepared but were lost by the draftsman at the last moment. These improvements have now been incorporated and Working Paper No. 154 is released more or less simultaneously for comment and criticism.

Altogether twenty-eight students contributed to this attempt to identify the opportunities available to a pace-setting metropolis such as Bombay. Two of them, Arthur Stamps III and Gordon H. Praeger, stayed on to assist in the condensation and analysis of the 1972 studies. Those which appear to be novel, or more thorough than existing literature, were incorporated in this report after a reconsideration of the urban future for South Asia. We have not striven for a high degree of coherence or comprehensiveness in the specific proposals because that was provided, for the students at least, by the gaming simulation described at the end of this paper.

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I. A REVISED FUTURE FOR SOUTH ASIAN CITIES

No formal study seems to have been carried out in South Asia that describes the massive urban implications of economic development. For different reasons, in each country involved, the outcomes would be too controversial to be published by a responsible press. Most people want the benefits of economic development without experiencing drastic social change, so they shrink from assessing the full range of consequences of the policies they advocate. (They are not alone in such ambivalence, as this hesitance is paralleled elsewhere on the Asian continent and in most of Europe; on the other hand, such reluctance is forthrightly rejected in Japan.)

Therefore, a little more than four years ago, I was able to undertake a simple extrapolation of the dimensions and the locations for future urbanism in India which should have been carried out long before.[1] That extrapolation was forced to assume that strong levels of tension would continue along the borders between India and its neighbors, thus creating a zone inhibiting balanced urban-regional interaction because part of the natural region for a metropolis would be cut off. Those conditions have not yet disappeared, but now there is considerable hope that the international borders will gradually become as permeable to traffic as those in North America and the Common Market portions of Western Europe.

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[1] R.L. Meier, Resource-Conserving Urbanism for South Asia. Regional Development Studies VII, Department of Resource Planning, University of Michigan. Available at University Microfilm-Xerox, Ann Arbor, 100 pp, $2.50.

It is time then for a new extrapolation of the location of urbanization in the future. Diminution of the significance of boundaries means, however, that the whole Indian sub-continent must be considered, rather than India by itself. In addition, over the last four years, a new census has been reported as well as marked progress in programs of population growth limitation through family planning. Parallel experience in China Southeast Asia[2] now gives greater confidence that a demographic transition is under way in South Asia even though many regions are still experiencing an accelerating rate of population growth.

An exercise of this sort is useful for anticipating the needs for ultra-permanent installations such as deep water harbors, double track electric railways, reservoirs, canals, airports, electric power generation sites, national parks, and others, where the commitment of the land or shoreline to a specific use is likely to last for several generations, because it suggests how much urbanism and where in approximate terms.

The Underlying Assumptions

The foremost presupposition is that the sub-continent would develop in a manner increasing economic efficiency. Overall production of goods and services would increase markedly more rapidly than population. The rate of development is not specified as a target because the maximization of GNP expansion rate through national planning is now coming under a cloud as being over-simplistic. At the same time there is no readily agreed upon set of successor indexes to take its place. Nevertheless, it is informative to point out that a rate of capital

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[2] S.M. Keeny, ed. "East Asia Review, 1971," Studies in Family Planning 3, No. 7, July 1972, pp. 125-62; Anibal Faundes and Tapani Luukkainen, "Health and Family Planning Practises in the Chinese People's Republic," ibid, Supplement, pp. 165-76.

accumulation is required for this development that is roughly half that which has occurred in Japan since World War II and in South Korea since 1955, and is relatively close to that achieved by Malaysia, Taiwan, Thailand, and Australia in the immediate past. Given the development history of India and Pakistan, these assumptions about savings rate and investment are optimistic but inherently feasible.

Policies that lead to less rapid rates of capital accumulation incur high risk of precipitating a Malthusian crisis, which in South Asia could produce more casualties than World War II. Envisioning a future involving famine, epidemics, and a breakdown of public order is a different kind of exercise that is of some interest to urbanists, but less so than a representative of the best set among feasible paths into the future as undertaken here.

The basic assumption was that if a precedent existed some time in the recent past anywhere in the world, and no feature of it was incompatible with the environment of monsoon Asia, either that mode of organization, or some improvement upon it, could be adopted in South Asia. Thus the demographic transition to an equilibrium between low birth rates and low death rates was assumed to be accomplishable with only (approximately) a <u>trebling</u> of the present very young population once family limitation began to be accepted -- an achievement equal to that of Japan and which might be slightly improved upon by China, Korea and Taiwan. Similarly, the maximum dimensions of a metropolis that is served economically by electric railways and buses are suggested by Tokyo of the early 1960s, which demonstrated that it could be exceedingly effective

competing with other world metropolises given the infrastructure and urban densities of the day.[3]

Thereafter it was assumed that the metropolitan areas (centers greater than 100,000 population) of the subcontinent would grow steadily, averaging about 5-6.5% per year, until 85-90% of the total population was urbanized, since experience shows that even with relatively labor-intensive technologies only about 10-15% is needed to produce the foodstuffs and other primary commodities. Smaller rates of urban growth would cause a dangerous buildup of surplus population in the villages and towns where population limitation techniques are known to make slow progress; therefore, the time for achieving population equilibrium would be extended and the size of the urban population at equilibrium would be enlarged.

The simplifying assumption used in locating a Tokyo-size metropolis (10-20,000,000 people, but averaging 13,500,000) is that it begins from a nucleus which is an optimally located center, grows an infrastructure and adds most of the population over a period of about three decades. The decade in which it appears on the map as a hexagon for the first time is the middle one, and the one in which it should experience maximum growth.

Metropolis Placement

Each metropolis of 13.5 million average is represented by a hexagon with radius equal to 15 miles, yielding an area of 675 $mi.^2$ and a density of 20,000 per $mi.^2$. Each half hexagon represents 6.75 million

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[3]The basic data are provided in the Tokyo Statistical Yearbooks published by the Tokyo Metropolitan Government. See also R.L. Meier and Ikumi Hoshino, "Adjustments to Metropolitan Growth in an Inner Tokyo Ward," AIP Journal, July 1968, pp. 210-22.

and therefore has the same population density. (Lozenges on the water surface are floating cities of 10 million people with densities of 15,000 per mi.^{2}.) In any given decade, metropolis placement is constrained by one or a combination of the following factors: (1) Water Supply Conditions: there must be sufficient water of varying quality to support residential and industrial use requirements even in times of monsoon failure. (2) Flood Security: cities may not cluster within or encroach upon flood plains without economically justifiable expenditure to secure them from danger of inundation during flood seasons. (3) All other factors being held equal, it is assumed that one location possesses a relative growth advantage to another where the former may expand into contiguous areas of flat land while the latter additions must be more uphill or grow into unreclaimed marshes. Likewise (4) better access to harbor facilities and (5) superior rail connections are taken to impart relative advantage to candidate centers. Finally, those locations in close proximity to (6) abundant labor reserves in the villages are likely to experience either faster or earlier growth. To these climatic, geographic and demographic factors one might also add an index of the historic industriousness of the native population in a given area. Present urban growth rates could serve as a proxy for such an index if these growth rates were free of the influence of political forces which have produced economic inefficiency in the past and present.

The series of urban growth maps which follow (Figures 2A and 2B) depict the decade-by-decade development of hexagon-size cities from 1980 to 2050 for India, Pakistan and Ceylon. Total additions of cities in a decade are governed by average per annum urban population growth rates consistent with the most rapid, reasonably optimistic attainment of

stability for both total and urban populations in the year 2050. Figure 1 and Tables 1 and 2 provide the numerical basis for these urban growth maps.

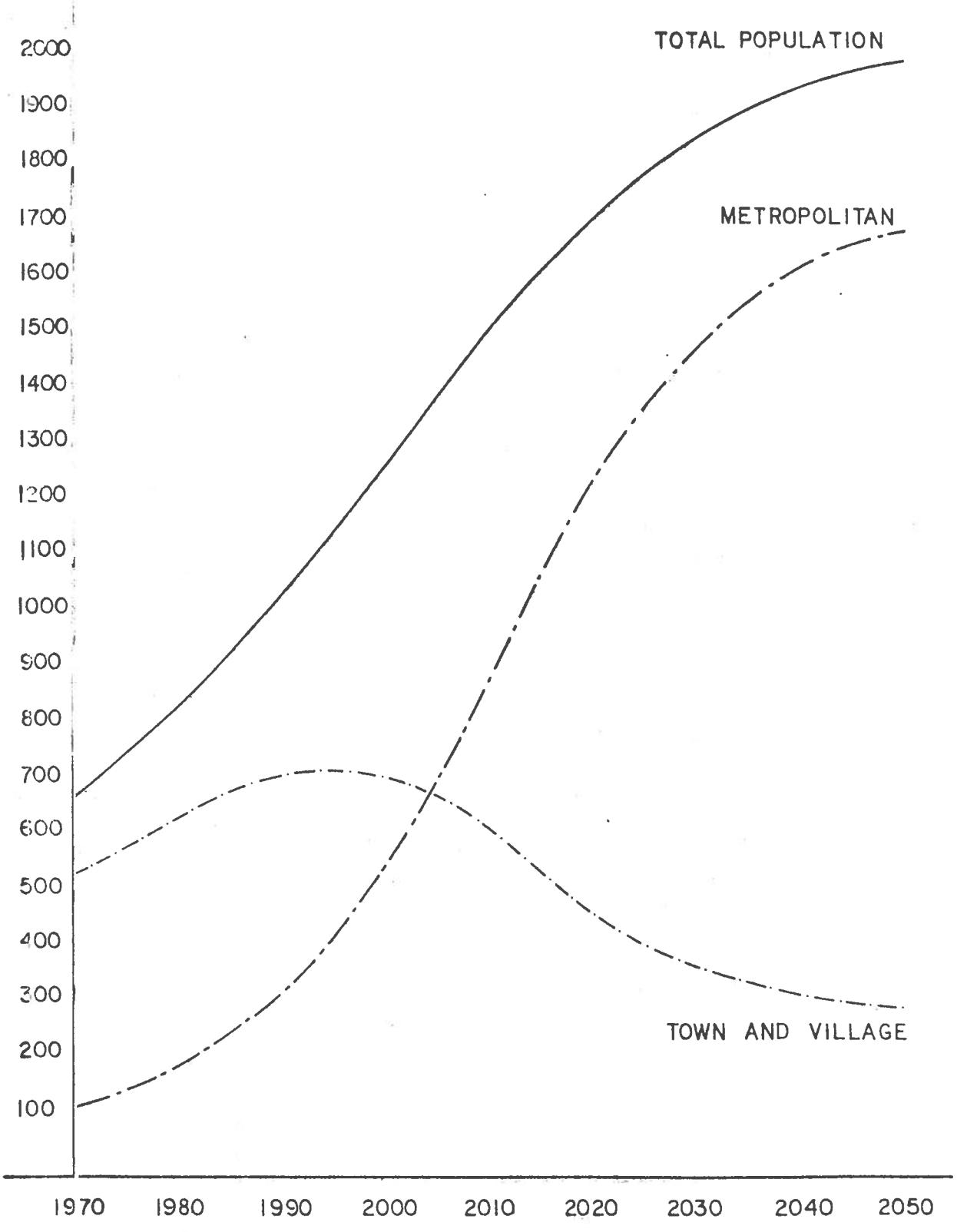
Total population of the subcontinent is expected to expand from 677 million in 1970 to 2 billion in the year 2050. While per annum rates of growth for Pakistan differ markedly from those of India and Ceylon in the early decades, they are assumed to become substantially equal shortly after the year 2000, at which time the total population has doubled. It is during this 40-year doubling period of total population (1970-2010) that cities experience annual growth rates of 5% on the average. During the second period (2010-2050), as total population stabilized while growing half again as large, urbanization rates drop markedly. Nevertheless, because these declining "rates" act upon larger and larger urban masses, proliferation of cities continues until the rates become negligible.

Notable developments for each decade are listed below for reference to the maps:

1980: Bombay, Delhi and Calcutta are complete Tokyo-scale metropolises; Ahmadabad and the industrial Jamshedpur-Durgapur area become half sized.

1990: Linear development in the Ganges Valley, including Kanpur-Lucknow. Lahore and Vishakapatnam become metropolises. The Bengal coast is spotted with extra half-size metropolises.

2000: Calcutta-Dacca sprawl quite evident (total of 7 metropolises). Delhi (-Meerut) complex of 3-1/2. Bombay going up and down coast. In Pakistan, growth along Indus brings Sukkur and Multan to half-size. Water shortage is a real problem there.



DEMOGRAPHIC & URBAN TRANSITION FOR SOUTH ASIA

FIGURE ONE

TABLE 1

1970 - 2050
Population, Extrapolations and
Per Annum Growth Rates for
India, Ceylon, Pakistan, and Bangla Desh

Year	Ceylon & India Population (x 10^8)	Rate of Growth Per Annum	Pakistan Population (x 10^8)	Rate of Growth Per Annum	Total Population (x 10^8)
1970	5.63*		1.14*		6.77
1970 - 75	6.36	2.5	1.30	2.75	7.66
75 - 80	7.06	2.25	1.49	3.0	8.55
80 - 85	7.84	2.25	1.71	2.75	9.55
85 - 90	8.62	2.0	1.93	2.5	10.55
90 - 95	9.58	2.0	2.14	2.25	11.72
95 - 2000	10.36	1.75	2.36	2.0	12.72
2000 - 10	GROWING	DECLINING	GROWING	DECLINING	15.00
10 - 20					17.10
20 - 30					18.60
30 - 40					19.60
40 - 50					20.00

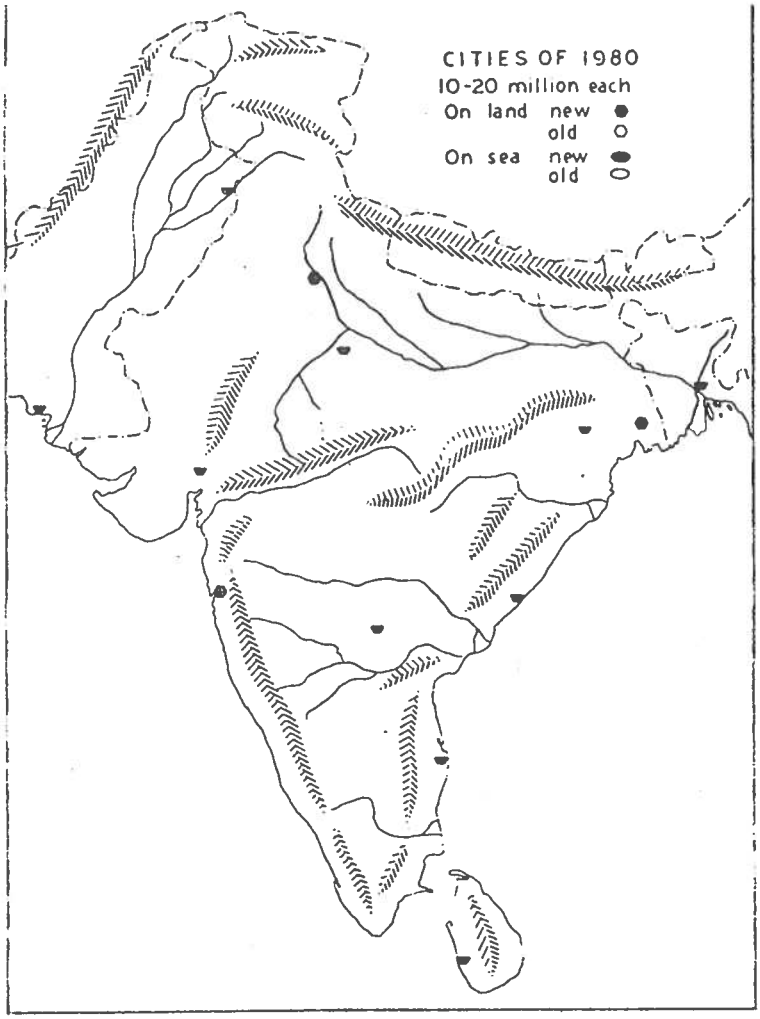
* Based upon Census data for India, and estimates for Pakistan and Ceylon, U.N. Demographic Yearbook.

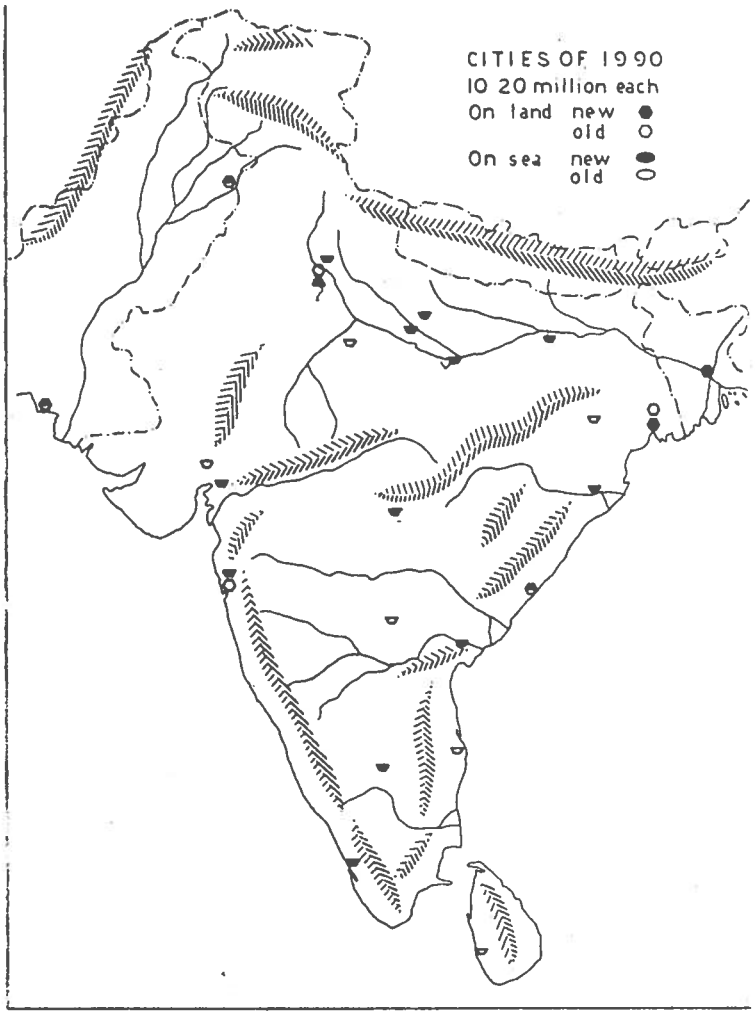
TABLE 2

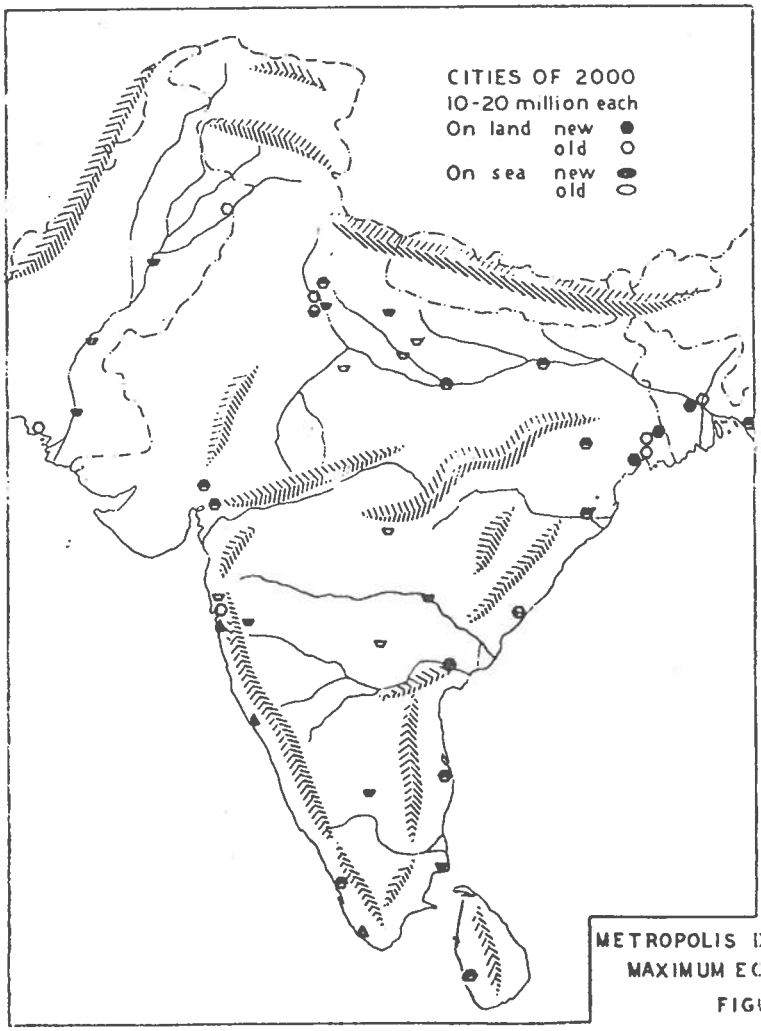
Population in Urban Areas
For Ceylon, India, Pakistan, & Bangla Desh
With Per Annum Rates of Growth
and Metropolises Added in Each Decade

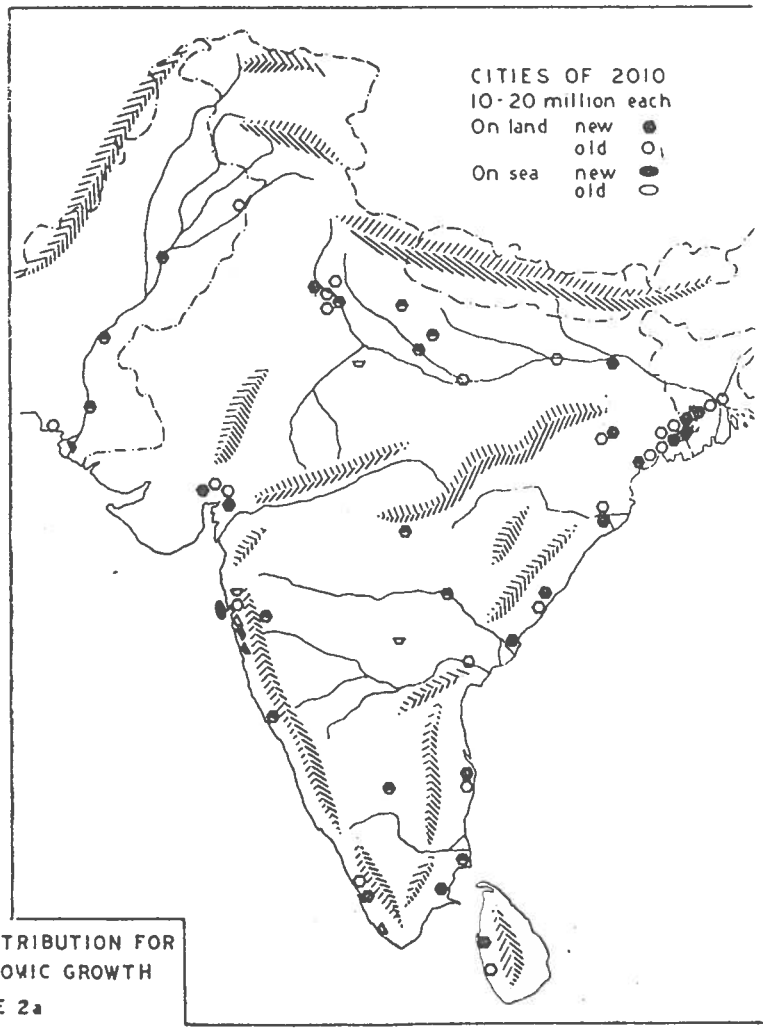
Year	Urban Population ($\times 10^6$)	Per Cent Per Annum Rates of Growth	Metropolises Added
1970	126*		
1980	215	5.0	8
1990	334	5.0	10
2000	545	5.0	17
2010	887	5.0	28
2020	1,260	3.5 (+)	28
2030	1,510	2.0 (-)	20
2040	1,650	.87	10
2050	1,700	.29	4

* Based upon Census data for India, and estimates for Pakistan and Ceylon, U.N. Demographic Yearbook.



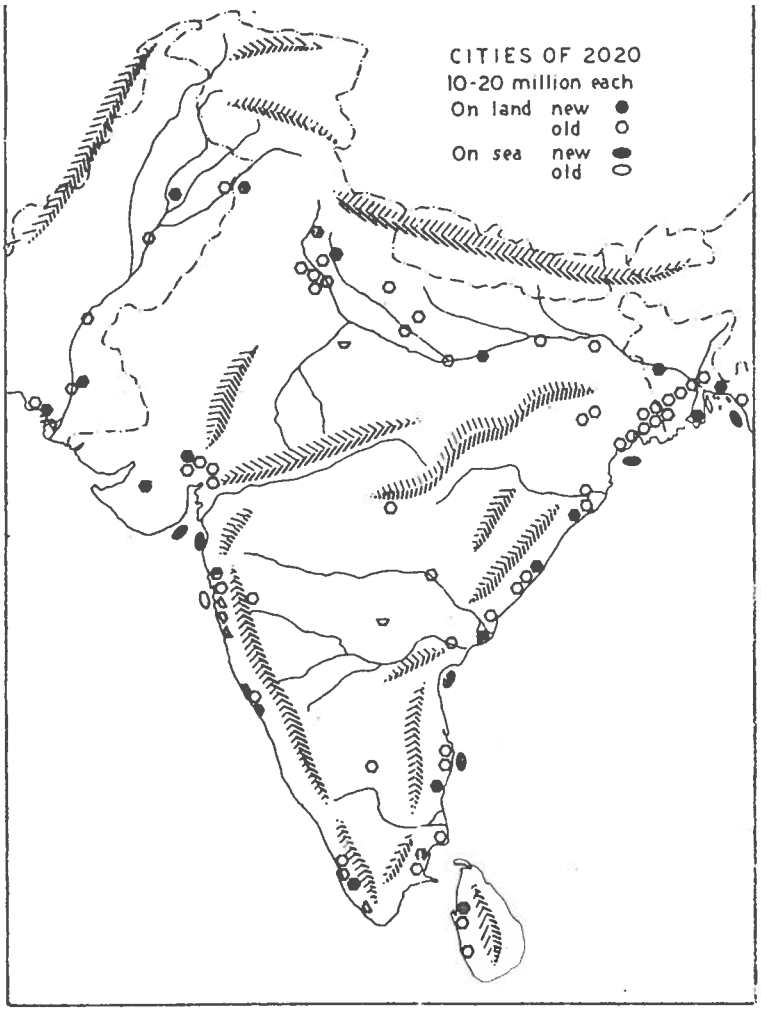


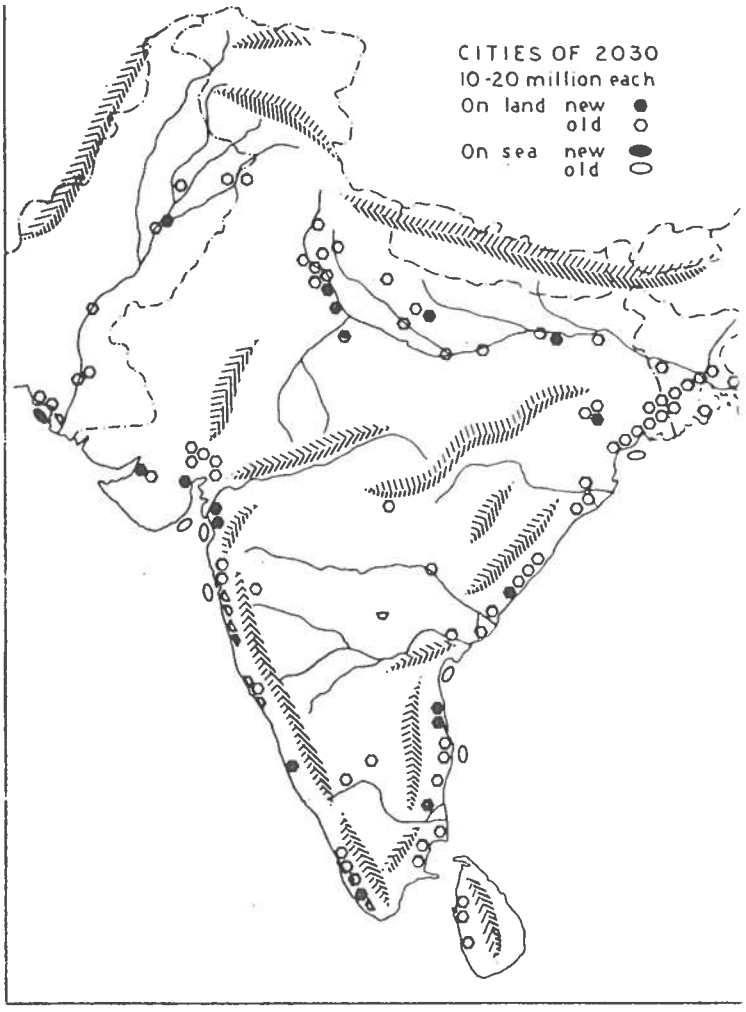


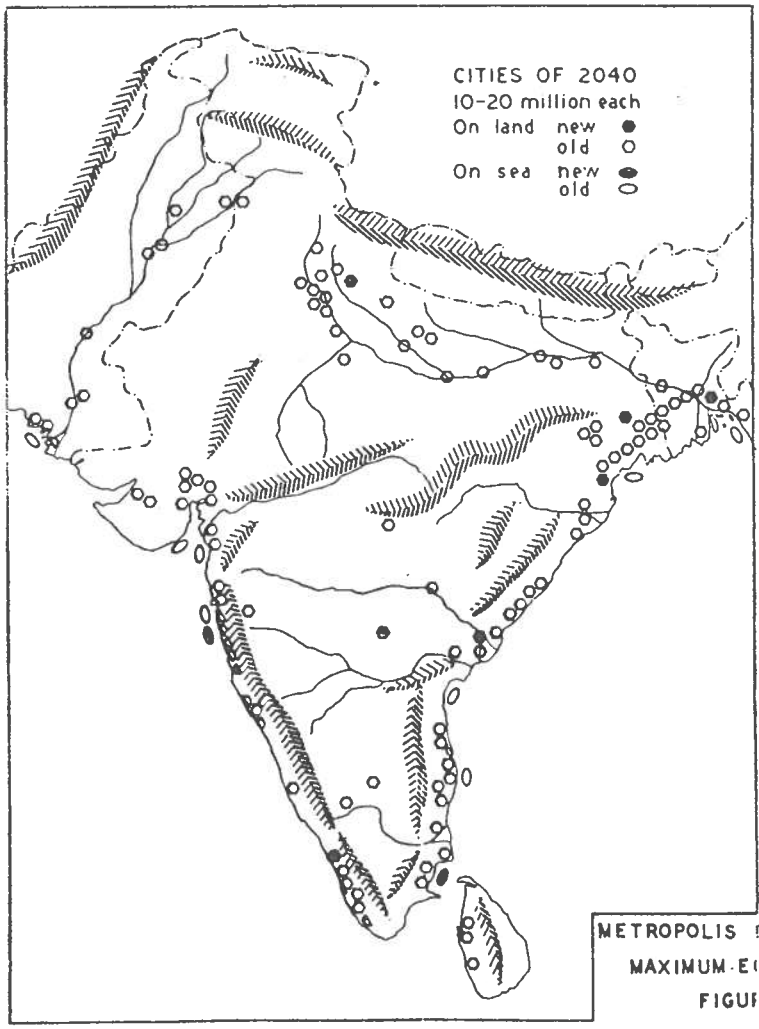


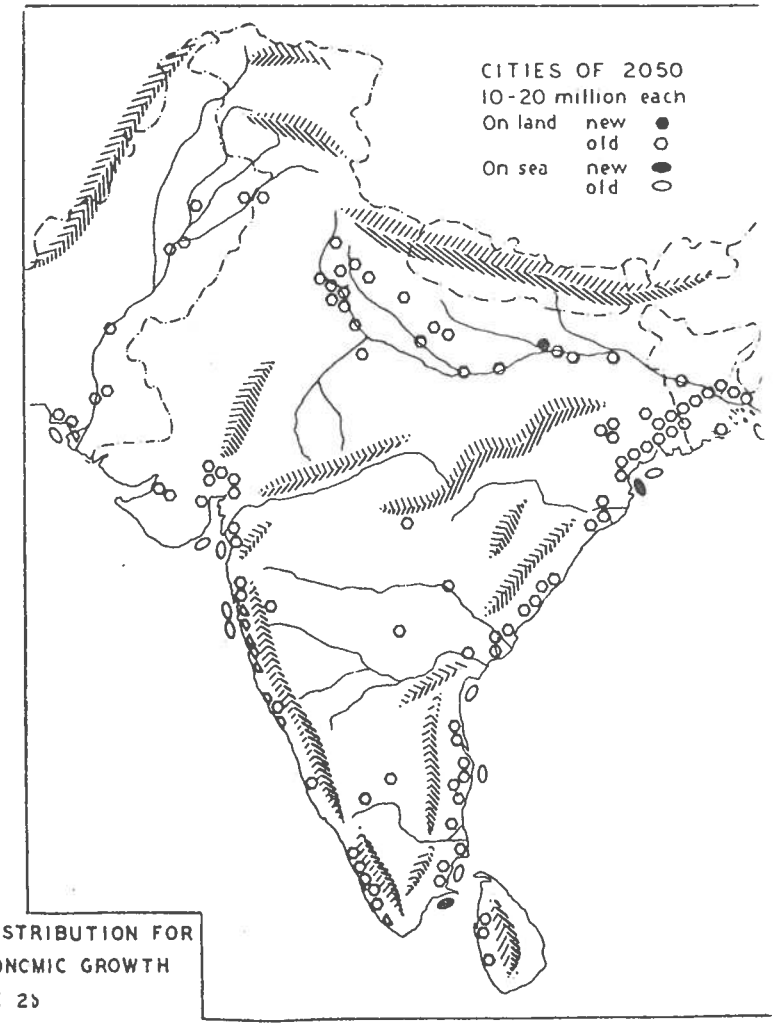
METROPOLIS DISTRIBUTION FOR MAXIMUM ECONOMIC GROWTH

FIGURE 2a









METROPOLIS DISTRIBUTION FOR
MAXIMUM ECONOMIC GROWTH
FIGURE 25

2010: Calcutta-Dacca 14 ("megalopolis"). Heavy additions to Ganges Valley, Jimshedpur, Bengal coast, Ahmadabad crescent. Ceylon at its peak of 3 metropolises. Water-surface cities now outside of Karachi, Bombay, Calcutta and in Gulf of Cambay. Linear growth of south of Bombay. Continuing growth in Indus Valley.

2020: Continuing trends from 2010. Cochin area is now 4-1/2 metropolises by filling land.

2030: Madras filled with 4 metropolises and one water surface community. Vishakapatnam 3-1/2, Kampur-Lucknow 3. Major additions north of Bombay and in south India.

2040 and 2050: Marine communities receive a strong impetus because neither hills nor floods restrict their growth.

When putting Bombay's anticipated development into the context of the developing economy of the Indian subcontinent we see that the really strong flows of population will swing to the East, mainly because water is more dependable and the land is more level. Nevertheless, before its urbanization is complete the Greater Bombay population is expected to reach 50 - 60 million people, or only a little fewer than reside now in Japan's Tokaido megalopolis. The Twin City proposals therefore represent only a small beginning if India is to develop and not succumb to catastrophe.

For Bombay the principal limitation, as elsewhere, is water, but if it were not water slope (really the energy cost of overcoming it on a day-to-day basis) would have intervened to halt the development. Other places in India would be more promising at that time. Even then this projection implies (1) a much greater network of reservoirs, pipelines, and collection systems than is ever envisaged at present, (2) a recycling of water, improving its quality by the new water-conserving technologies, (3) the institution of a water pricing system that reflects its true scarcity, (4) the installation of sea water distillation systems not only on the offshore platforms and urban facilities but also by coastal power stations, which produce much of the potable water for the urban population, and (5) the introduction of a sea water system for flushing away many of the industrial and most intractable domestic wastes accumulating in the urban region.

The income level in this Greater Bombay of the future is difficult to appraise because people would be consuming many services not available today. The comfort and convenience should be equal to that experienced in Western Europe at the moment or, more likely, greater. Bombay would

remain that part of the sub-continent that was most closely in contact with Europe and was at the same time supervising the industrialization of Africa, a territory expected to follow a decade or two behind Western India.

If mistakes are made in development policy, so that catastrophes do result, it appears now from the analysis for historical examples that Bombay would become much larger due to an influx of refugees, but the level of living would be more than proportionately reduced. The pressures for survival are likely to lead in addition to New Maharashtra type settlement in empty places of the world, such as North Australia, Somalia, and Arabia as well as Indian enclaves in Occidental cities.

Once the urbanization is completed, and communications with the rest of the world are intense (by present standards) people have a new decision to make. They may wish to abandon the great cities, as many intellectual Japanese now intimate, or they may undertake to reconstruct them. At any rate it appears that the present state of technological experience is far enough advanced to suggest how either of these ambitions should be within their means, as judged by the limited availability of natural resources expected to be available at that time.

These larger considerations, viewed from many angles, will hopefully appear in 1974 under the title of The Design of Resource-Conserving Cities. This study of Bombay was designed to serve as a test of the state of technological knowledge and of the developmental concepts.

The remainder of this report deals with the features of an urban structure that could evolve toward a developed future for India and Bombay. It reviews some of the latest thinking that would contribute to efficiency in the provision of human services.

Planning Philosophy

A meaningful and knowledgeable program for growth requires much more than possession of a set of rules and good intentions based upon an eclectic array of disjointed "facts" and data. Spontaneous promulgation of organizations as is advocated here for cities to succeed may produce interesting and even exciting vehicles for specialized growth, but such spontaneity is unlikely to spawn a comprehensive set of specifications necessary in project evaluation, team interaction and balanced growth. Similarly, though spontaneity in the sense of flexibility -- adaptability to changing political and economic conditions -- is a valuable component of the simulation, such flexibility may produce erratic departures from a balanced growth path unless participants possess information rooted in prior study or intelligent gaming experience. Presuming seriousness of purpose, team interaction (joint study of organization proposals to obtain approval, funding, or compatibility of plan) requires a great deal of "spadework" or of advance design.

Design-in-advance for the complex of organizations that constitute the Asian city of the future requires assimilation of best technique, coordination of organization inputs and outputs, and a willingness and desire to be innovative, to exceed experience and to be bold. The developmental metropolis, growing rapidly and avoiding the pitfalls and bottlenecks that so often bring deceleration, must be constituted by organizations which (1) promote communication flow, (2) are purposeful for multiple ends, and (3) ease social and cultural constraints to viability. In a word, these organizations must conserve, not simply in the narrow economic sense of producing a given output at minimum cost, but rather in the broad, forward-looking sense of maintaining the momentum of growth and minimizing the likelihood of breakdown.

This larger sense of conservation provides a relationship between traditionally scarce physical quantities, which are to be minimized in use, and measurable, though sometimes abstract or intangible, outputs. An example of an intangible output would be information flow, which is more in the nature of a measure of cultural process, or of individual freedom to choose, than a final product.

Resource-conserving urbanism, then, calls for the type of design which makes exchange- and life-sustaining levels of inputs not just tolerably low relative to current average amounts, but which establishes these input levels as fully functioning and expected standards. In what follows, we present a variety of resource-conserving strategies and organizations whose place in the developmental metropolis will underwrite sustained rapid growth toward the demographic transition.

II. TRANSPORTATION

Personal Transportation

In the first stages of building a city most transport falls into the personal category. It delivers one to the end of the line of the metropolitan network, both rail and bus, and enables the completion of local trips. Later on, as the metropolitan network expands into the periphery, some of these trips will be displaced by mass transport services and those remaining at peak periods are likely to be markedly shorter. Three overlapping modes of transport can be identified: bicycle, motorbike, and automobile.

Costs

The principal cost of operating a bicycle is the original cost. If a proper systems analysis were to be made it would add repair cost, tires, accessories, insurance, and even the amount of caloric food required to propel it. The figures given to us include:

Original cost	Rs. 150-500
Repairs	20-100
Tires	100-200
Food required 50-100 kg.	50-150
Insurance, license, etc.	20-50
Mean life	2-5 years
Distance traveled, mean	10,000-20,000 miles
Total cost per mile	Rs. 0.03-.10

We have not incorporated the value of human time, because this must be considered in comparison with other forms of transport. It should be noted also that cost to the individual on a bicycle is greatly reduced (by a factor more than half) if good quality bicycle lanes and paths are

provided. Similarly, the "all included" costs for a motorbike (Rs. 2000 when new) and motor scooter (Rs. 4000) would run three to ten times higher, again greatly depending upon the quality of the roads. The cost of the Indian-made Ambassador is said to run Rs. 0.60 - 1.00 per mile and about half that, therefore, per passenger mile. For people of low to middle income the bicycle will always be preferred, but New Bombay must plan on a mixture.

Compatibility

The principal problem is safety. Mixing cycles and motor scooters with automobiles and with trucks and buses leaves the riders of the small vehicles highly vulnerable. They suffer most of the casualties from a collision. Thus wherever the volume permits, separate lanes should be provided for the small vehicles, since the damage they can do to each other is usually superficial.

The first improvement that is possible is the provision of separate ways for the cyclist that cannot be invaded by automobile. A four to five meter path, lightly asphalted, and rounded enough modest ditching on both sides is usually sufficient. Intersections then become the dominating hazard. Signal systems provide a standard means for cycles (and pedestrians) to cross thoroughfares. They are expensive, but almost always cost much less than the kinds of overpasses that are designed to allow the cycle mode of transport to get across.

There will be some incompatibility discovered when handcarts and toiling pedicabs are mixed with scooters and motorcycles. The two latter types have the option of taking regular roads. They will move around on the network designed for the cycle mode when road traffic is too dense or where important short cuts occur. Movement of this marginal

traffic back and forth between the network of roads and the network of improved paths requires that the road signs and vehicle operation regulations be strongly overlapping, and not independent of each other. Capital expenditures per unit of capacity (potential high for trips or shipments per day) in the cycle mode of transport is expected to be approximately a tenth of what it is for the automotive mode, but in the tradeoff one also takes into account an accident rate that is difficult to reduce below a level that is triple that exhibited by the automobile.

In the central areas with heavy bus, taxi, minibus, jitney, and electric railway movements the cycle mode may have to be banned unless it became economical to raise that network above ground level. Since all traffic tends to congest to a stage where average flows are no greater than those obtained with bicycle, and the bicycle uses only a tenth to a hundredth of the parking space, this alternative should be an attractive one to design and test for feasibility. The Stanford Institute proposes Rs. 100/sq. ft. plus land costs. Compare 600 sq. ft., or 40 linear feet, of such overhead lanes with a set of traffic signals.

System Evaluation

The ideal situation is to provide bicycle routes at the very start which make the bicycle the most convenient mode of movement most of the time. They should parallel the road or else constitute a shortcut. Maintenance of the routes should equal or exceed that of the road network. Very soon the slower moving three-wheel and four-wheel cycles will enter the network and the scooters and motorbikes would invade from the road network.

Then the investment in rental facilities at the terminals would occur early. The shops and residences would be designed to accommodate

cycle and scooter parking, and houses would have gates or doors allowing convenient storage at home.

The biggest single problem in continuously promoting the more economical bicycle in the face of an increasing ability to afford the more prestigious auto is the relatively low status of the bicycle. Next to it, but much simpler than for the auto, is the need for security.

The evolution of personalized bicycles should be encouraged. It can be accomplished not only with color but also with a variety of new solid state electronic devices that could serve as electronic keys to open up gates in advance, turn on lights and in other ways activate a responsive environment. Status is attributed to the person with a master key to industrial or commercial facilities; a powerful person in a democracy controls the environment rather than issuing orders to a servant. The bicycle can be used as an image that distinguishes the democratically inclined from the autocratically oriented individual.

The security measures can also be vastly improved by solid state devices. A threat could lead to a silent signal being generated by radio waves which allows police to converge on the micro-sending unit. Theft is likely to be frustrated by similar devices. They are likely to cost about the same amount of money as the cheapest transistor radio, so they are well within the means of the average bicycle owner. These solid state devices are only just now appearing in prototypes in the United States with questions asking "What are they good for, besides toys?" Rather elaborate small computers are likely to be used in the autos of the 1980s to control performance of various sub-systems, so there will be a great deal of interest in the equivalent for bicycles.

III. TRANSPORTATION AND COMMUNICATIONS: THE FERRY COMPLEX

On a technical level alone, transportation between Bombay and the East Bay must move people and cargo efficiently and cheaply. But no matter what the operating cost of ferry transportation proves to be, the cost will be met only if load factors are consistently high. Load factors, in turn, depend upon prices charged, the level of investment in the East Bay, and rates of growth of both resident population and production capacities in the East Bay.

Stimulation of transbay movement through the establishment and promotion of East Bay employment opportunities and recreational centers will act to keep up load factors. Insofar as the ferry complex is designed to handle traffic and attract it, load factors are at once enhanced by such "on site" stimulation and negatively affected by higher prices (via higher overhead costs). The cost of "on site stimulation" (indirect subsidy of shops, restaurants, displays, etc.) will be smaller, however, the more permanent and firm is the commitment to East Bay growth. The ferry complex is thus more than a necessary facility for the movement of people and goods. Its success is intimately connected with the success of East Bay development, and the complex cannot be simply a minimal and tentative servant of development requirements. The ferry system must encourage development in order to profit from it.

The Ferry

Below we give capacity, performance and cost specifications for four types of ferries:

(1) Single, Wide-Hulled Ferries

50-200 autos
500-2500 passengers
15-25 knots, 30-45 km/hr

The State of Washington Ferry:

160 autos and 2500 passengers
25 mph, 40 km/hr

Capital cost: $6,000,000 per boat

Operating cost: $3.10 per km (in U.S.)

(2) Double-Hulled (Catamaran) Ferry

2500 passengers
30 mph, 50 km/hr

Capital cost: $4,000 per boat

Operating cost: $9.50 per km

(3) Air-Cushioned Vehicle

30 autos and 250 passengers or 0 autos and 600 passengers
35-90 mph, 55-145 km/hr

Capital cost: $1,900,000-4,100,000 per vehicle

Operating cost: $1.05-9.40 per km

(Air-cushioned vehicles require large areas for maneuvering around docks and do not operate on rough seas.)

(4) Hydrofoil

8 autos and their occupants or 250 passengers
40-60 mph, 65-95 km/hr

Capital cost: $600,000-1,350,000 per boat

Operating cost: $1.85-4.35 per km

(Hydrofoils do not operate on rough seas.)

The single-hull, 2500 passenger ferry is favored for its relatively low operating cost and superior maneuverability. It is also easily adaptable to the type of double duty service described in the next section.

San Francisco has finally authorized the purchase of ferries to add to the capacity for getting across the Golden Gate (August, 1972). It had the experience that every cost estimate offered by engineers was too low; the ultimate contract was 30-50% higher than the highest end of the range submitted by any consulting group. The cost estimates for terminals seem to deviate even further from ultimate contract awards. This experience suggests that the contemporary administrator of ferry services must be ready for severe budgetary shocks. Specifications of San Francisco ferries were specifically set for the local runs and so are not relevant for Bombay.

A uniform design at both terminal points is desirable but such a design must address itself to different conditions, the most important of which is the high price of land on the Bombay side. (Creating a fill is one solution which provides space for other activities in addition to the ferry itself.) Other considerations include providing cargo storage and loading capabilities for off-hour use, providing necessary peripheral services to the ferry such as fuel and maintenance facilities, and providing an impetus for recreational uses and promotional activities related to East Bay development.

The initial building is a simple three-story structure which separates first and third class passengers upon approach and keeps them separate until they disembark and leave the opposite terminal. (See Figures 3, 4, and 5.) This is accomplished by having separate floors by means of a ramp for first class passengers to ascend to the second floor. First class passengers remain on that level for the entire trip.

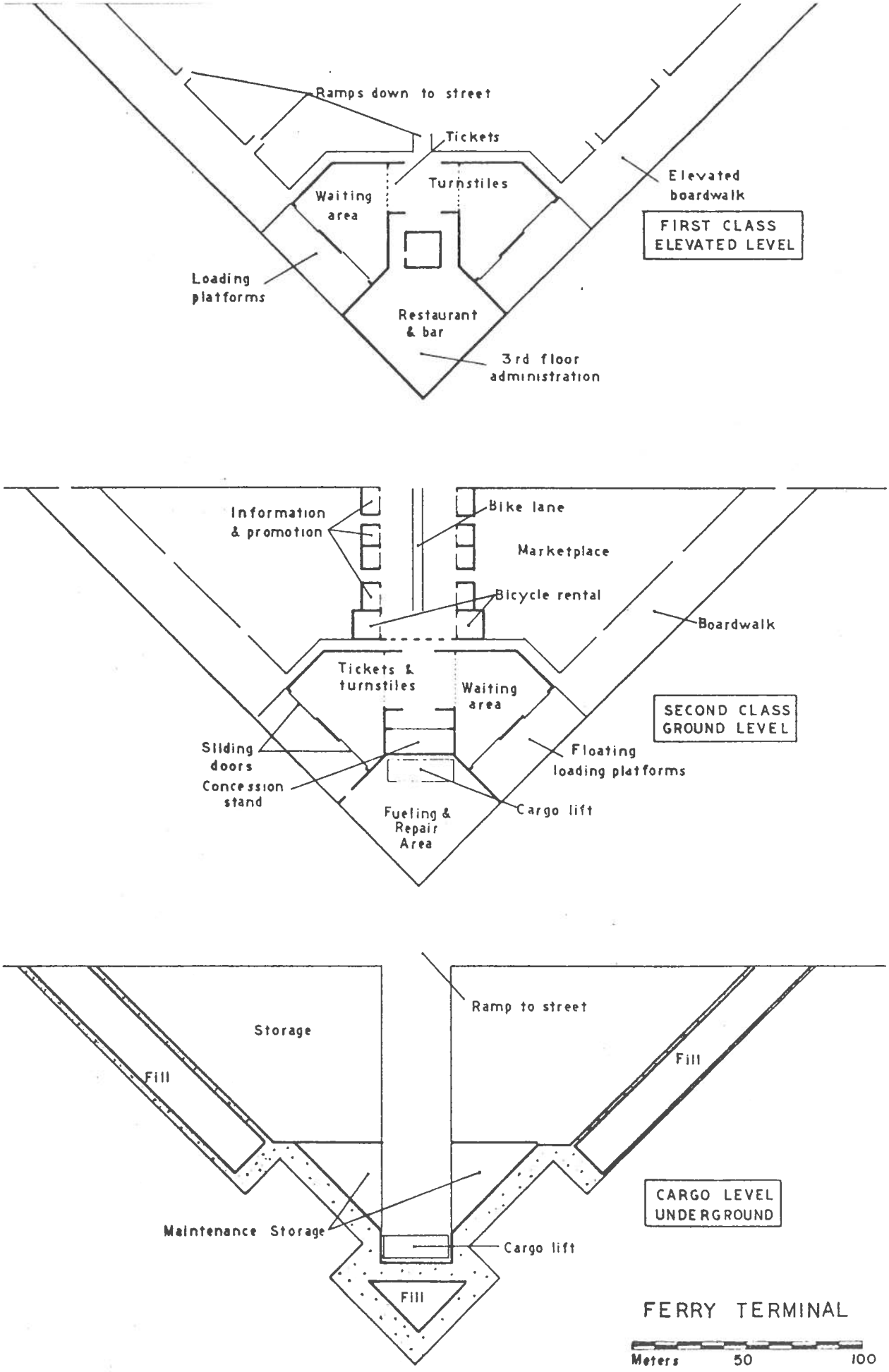

Ramps down to street
Tickets
Turnstiles
Waiting area
Elevated boardwalk
FIRST CLASS ELEVATED LEVEL
Loading platforms
Restaurant & bar
3rd floor administration
Information & promotion
Bike lane
Marketplace
Bicycle rental
Boardwalk
Tickets & turnstiles
Waiting area
SECOND CLASS GROUND LEVEL
Sliding doors
Concession stand
Floating loading platforms
Cargo lift
Fueling & Repair Area
Ramp to street
Storage
Fill
Fill
CARGO LEVEL UNDERGROUND
Maintenance Storage
Cargo lift
Fill
FERRY TERMINAL
Meters
50
100

FIGURE 3

Both levels have concession stands inside the building and in addition, the first class level has access to a restaurant and snack bar.

The embarkation/disembarkation process is as follows: the passenger enters the ticket purchasing area, buys his ticket and then passes through a one-way turnstile into the enclosed waiting area, which is covered for weather protection but open on all sides. When the boat has arrived and is ready to load, the two doors are slid towards one another while the end gate is held shut to prevent entrance by non-paying passengers. To unload at the opposite terminal, the return passengers are held in the waiting area until the passengers on the boat disembark and exit through the open side gate to the covered boardwalk. Once on the boardwalk, the departed passengers may exit to the market place or waterfront at any point along the promenade.

The entire two-deck loading and unloading area is not fixed, but floats with the tide in order to stay at the same level as the boat. Hinged ramps are connected to all gates to account for disparities in height as the platform moves.

Although the terminal may be reached from any access point on the boardwalk, the main entrance has a well defined approach which also serves other purposes. The wide boulevard provides for maximum flow with minimal unwanted interruption from the marketplace hawkers. With the exception of alleys leading into the marketplace area, the street is lined with semi-permanent booths to be leased for promotional and educational activity. In addition, a bicycle path is provided by the middle lane of the boulevard bordered by garden strips. Bicycle rental facilities flank the entrance to the ferry building on the Twin City side while buses handle the flow on the Bombay side.

Since the ferries may be used to transport light cargo across the bay, particularly during late night off-hours, loading and storage facilities must be included. The two gates which open to the fuel and maintenance areas on the ground level also provide access to a cargo lift. The cargo lift descends to a lower level which was left hollow in the original construction of the fill. Although this area is below water level, it would not be difficult to keep water-tight and has the added advantage of high security storage. The only access to this area is the cargo lift or heavy outer doors. A ramp leading to street level at a convenient distance inside the waterfront would be provided for truck traffic. This would also mean that the transport of fuel, supplies and cargo could be kept separate from passenger and personnel movement in and around the terminal.

The advantage of this design is that it allows for incremental development and future growth. The building, with its boulevard access and waiting and loading facilities, could be constructed first, followed by the boardwalk and marketplace. The restaurant is in a prime location and can be added on at any time. With the provision of concrete pilings in the original construction of the fill, a large office and apartment complex could be erected at a later date over the end of the man-made promontory.

Lastly, the marketplace will provide a viable and natural interim use of space while population and interest rises in the East Bay. At some early point in time an entrepreneur might risk building a major trip-generating facility, such as a modern amusement park. The two triangles of land, separated by an existing "midway" could be sold and easily turned to such a use. With an attractive seaside boardwalk

and amusement park, the terminal would become a very powerful draw for more development. Space would have full utilization through each step in the growth process.

IV. TELECOMMUNICATIONS

Developmental India may use telephone and broadcast and cable television systems to make rapid urbanization less costly and stressful for its urbanizing populations. Cable television in particular possesses advantages over other telecommunications systems -- advantages which may be exploited by prior planning.

In the United States, cable television has become more than a city-confined phenomenon. It is a regional network of sorts in that it expands the TV viewing area of a metropolitan population by importing distant signals. It likewise exports central metropolitan area programming, and by doing so may strengthen the outward expansion of the area by reinforcing the existing communication-transportation web. The current services which cable TV sells are improved reception and increased variety of channels. Non-broadcast services such as burglar and fire alarms, financial transactions, Pay-TV, home shopping, information retrieval, etc., have been contemplated. In comparison with broadcast TV, cable TV offers greater reliability, increased channel capacity, and lower TV set cost.

The telephone network differs from TV networks primarily by its switched nature. It does not rely on redundancy or variety of broadcast programs to get messages to certain people at specific times. It provides more direct access to individuals, though not totally direct access to desired information. In the U.S., the telephone system has played a large part in the development of TV, and until now has carried all interstate TV transmissions. But interstate microwave networks and domestic

satellites are emerging as serious competitors. In planning for future television systems, therefore, a telephone system is not a necessary handmaiden.

Cable television is sometimes seen as promoting a participatory democracy, but politically active people have not traditionally been television watchers. Proposals for opinion polling via cable appear unrealistic due to the biased polling sample and the need for education prior to opinion sampling.

We must note, however, that the uses and limitations of cable TV which obtain in the U.S. are not those to be expected in India. If limitations to successfully merchandised content of cable TV programming exist in the U.S. due to prior conditioning of the population to high-cost, star-studded entertainment, then India may create its own set of (favorable) "limitations" which arise from the first set of uses to which cable TV is put. People will expect cable TV to inform them politically, develop literacy, teach self-help skills, promote family planning and entertain to these ends if cable TV begins to attain these ends.

A group looked into the problem of creating organization to utilize the new communications media associated with cable television and related technology. They found that the national superstructure was missing, so it needed to be supplied before Bombay's utilization of the new technology could be projected. They discovered that this area of human activity is due to be one of the most exciting in North America and Western Europe in the 1970s and early 1980s in a way that is hardly likely to be understandable as yet in South Asia. The potentials for communication will, it is believed, fulfill M.M. Webber's concept of the non-place community and thereby transform the standard models of urban

society. These outcomes were not discussed but a rational set of control organizations was elaborated which could learn as they proceed.

The National Communications Policy Board (Org 1) determines programming content policy, the national-state-local programming balance, budgets and systems growth rates. The board will face pressures similar to those faced by the F.C.C. in the U.S. National Television Programming (Org 2) can originate from new or existing facilities, with the former costing two to three crore per studio. The programming will be transmitted nationally via stationary earth satellite, and India will need an earth receiving-transmitting station costing around 2.5 crore.

The National Data Center and Policy Board (Org 3) will determine computer use and development questions and telephone system growth rates. It will also control the computer system serving the national government. In each region a Telecommunications Policy Board (Org 4) will serve as counterpart to the national board and will take an activist role in developing regional telecommunications. Subordinate to Org 4 is the Regional TV Administration and Programming Agency (Org 5), containing a variety of small cells developing programming in specific areas -- education, family planning, public affairs, news, etc. Major costs will be studio and videotaping facilities for limited and national distribution of superior programs. Each Regional Telecommunications Distribution Center (Org 6) will have line of sight capabilities to metropolitan areas. Some will have satellite receiving stations. Each center will receive 4 to 8 signals via microwave from the central business district and from 1 to 4 national signals, and in turn will send via microwave to cable headends 5 to 12 signals.

The Telecommunications Accounting Agency (Org 7) will be the all inclusive billing agency for telecommunications subscriber and user fees. The Telecom Training Agency (Org 8) will coordinate telecommunications training at both the high school and college level to provide native talent to fully replace these foreign technicians which introduce and initially operate complex subsystems. The Telecom Survey Agency (Org 9) will observe, survey and receive complaints to the end of evaluating programming effectiveness and need. The Telecom Wiring and Installation firm (Org 10) will handle hardware installation and repair.

The Television Headend and Local Production Unit (Org 11) will sell sets and cable links to individuals, schools, firms, hospitals,bars, and depots. It will relay programming received by microwave from national and regional circuits and originate a volume of its own programming depending on the quality of its studio. Independent Local Origination Facilities (Org 12) will be used in large schools, firms and hospitals to train personnel and relay valuable experience to smaller professional units.

On a local level, telecommunications administration and technical functions will be handled by The Phone and Computer Administration (Org 13), The Main Switching Center (Org 14), Time Share Computer and Terminal Leasing (Org 15), Local Phone Exchange (Org 16), and Mobile Phone and Computer Units (Org 17). Organizations 18 through 22 will arrange for the procurement of all telecommunications equipment either from native factories or from abroad.

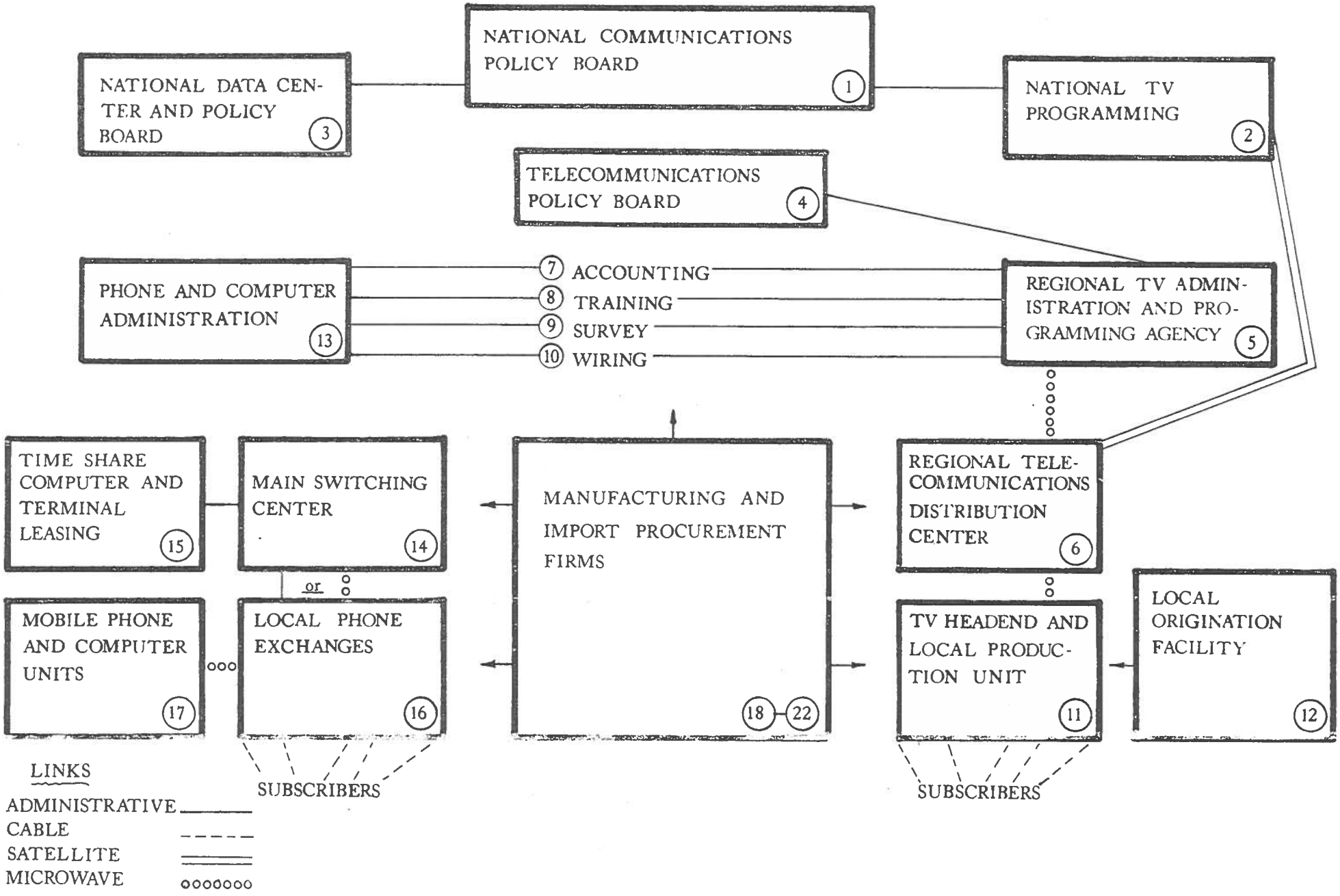


TABLE 3 ORGANIZATION FOR TELECOMMUNICATIONS

V. POLYURETHANE HOUSING

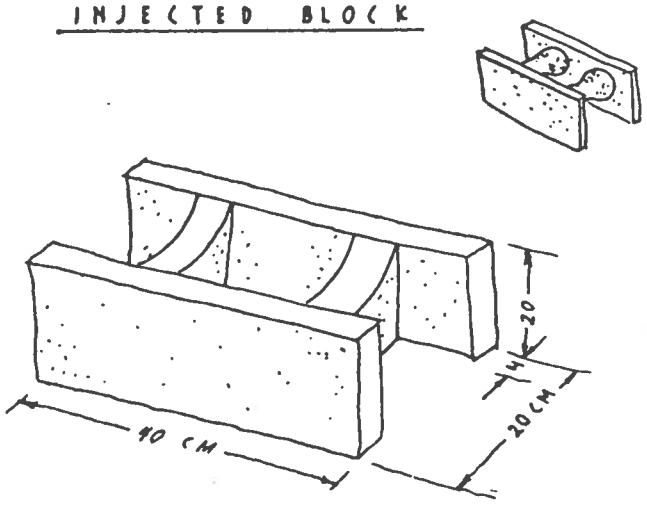
The use of plastics in construction is just beginning to come into its own in the United States. Foamed plastics, especially polyurethane, are currently being used as the major bulk component in the walls of the lowest priced tract housing in the San Francisco Bay Area. This year five plants were set up in the American West to produce sandwich panels of foamed polyurethane with plywood skins.

Plastic panels offer light weight, low cost, and quickly erected housing. Tooling costs are minimal, and may be portable as well. Plastic is easily shaped in the field with ordinary hand tools which allows the self-helper to customize his home. Polyurethane is also inherently the best of the available insulating materials in its foamed state.

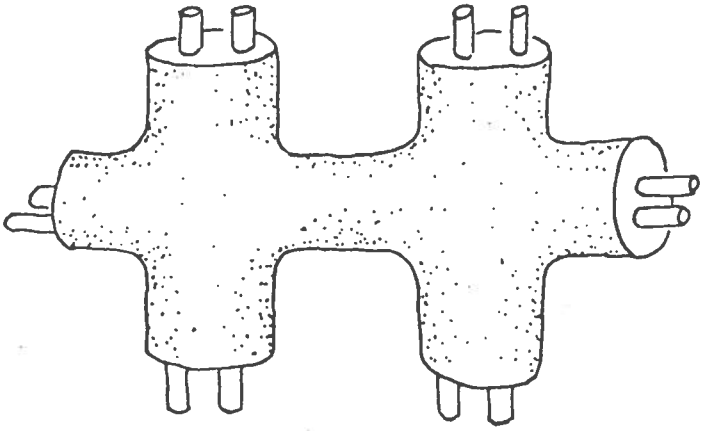
Three systems for building with polyurethane are shown below. The construction sequence is almost the same for both blocks (Figure 4) and panels (Figure 5) but the panel system would go up much more quickly. The joints and cavities may be filled with organic cores such as clay and jute or by foamed-in-place urethane. Glass fibers may be added to the foam if higher strength is necessary. If special reinforcing is required, glass fiber tape or resin may be used, although at higher cost.

Other systems which have been demonstrated to work at full scale are urethane channels and stressed skin folded plates. In view of the extra safety factors required for self-help housing and the high strength joints necessary for folded plates, the better solution would be the channel design.

INJECTED BLOCK

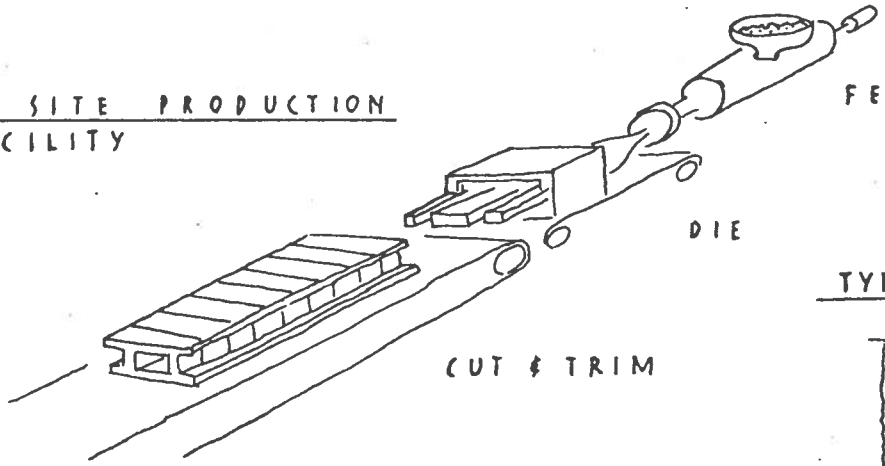


BAMBOO REINFORCEMENT
IN MUD OR DUNG MATRIX
PACKED INSIDE BLOCKS

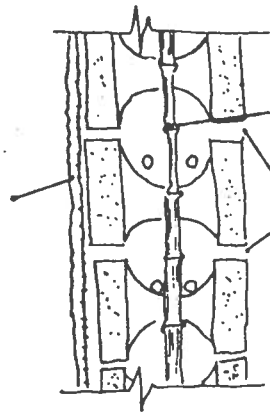


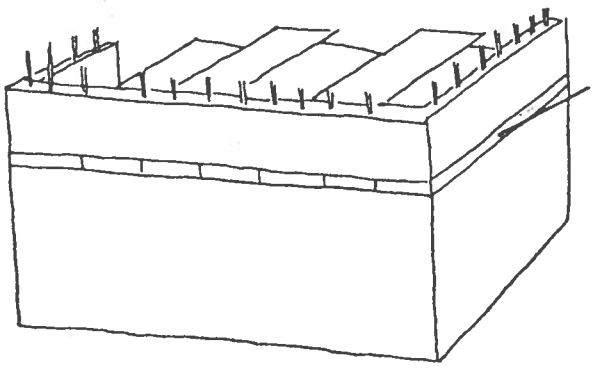
EXTRUDED BLOCK

ON SITE PRODUCTION
FACILITY



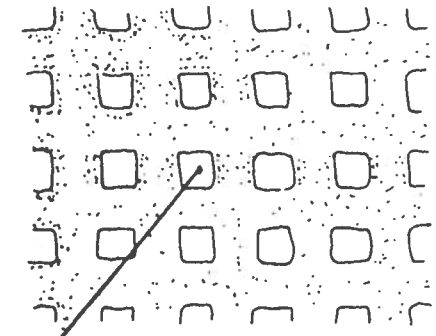
TYPICAL SECTION





TYPICAL MULTI STORY CONSTRUCTION

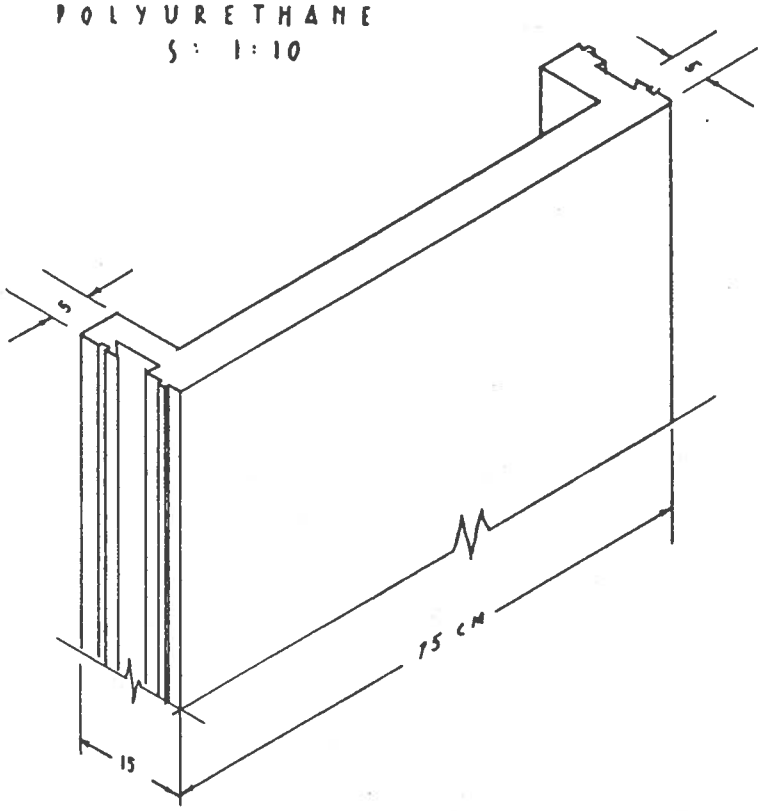
STRUCTURAL LATTICE



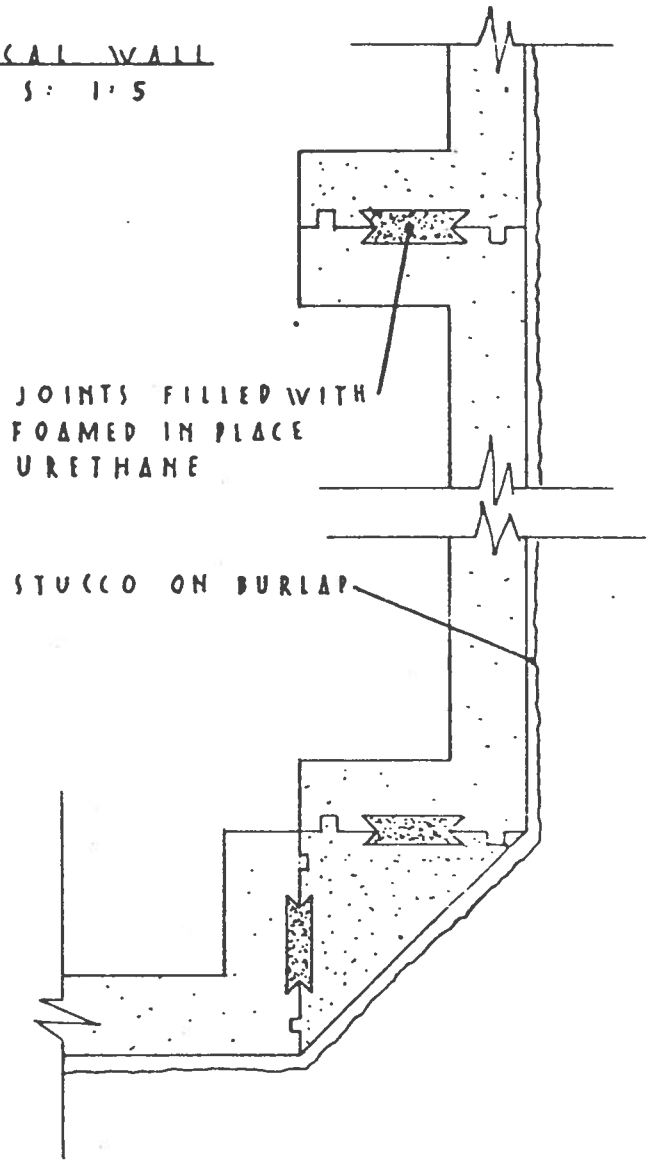
POLYURETHANE HOUSING

FIGURE 4

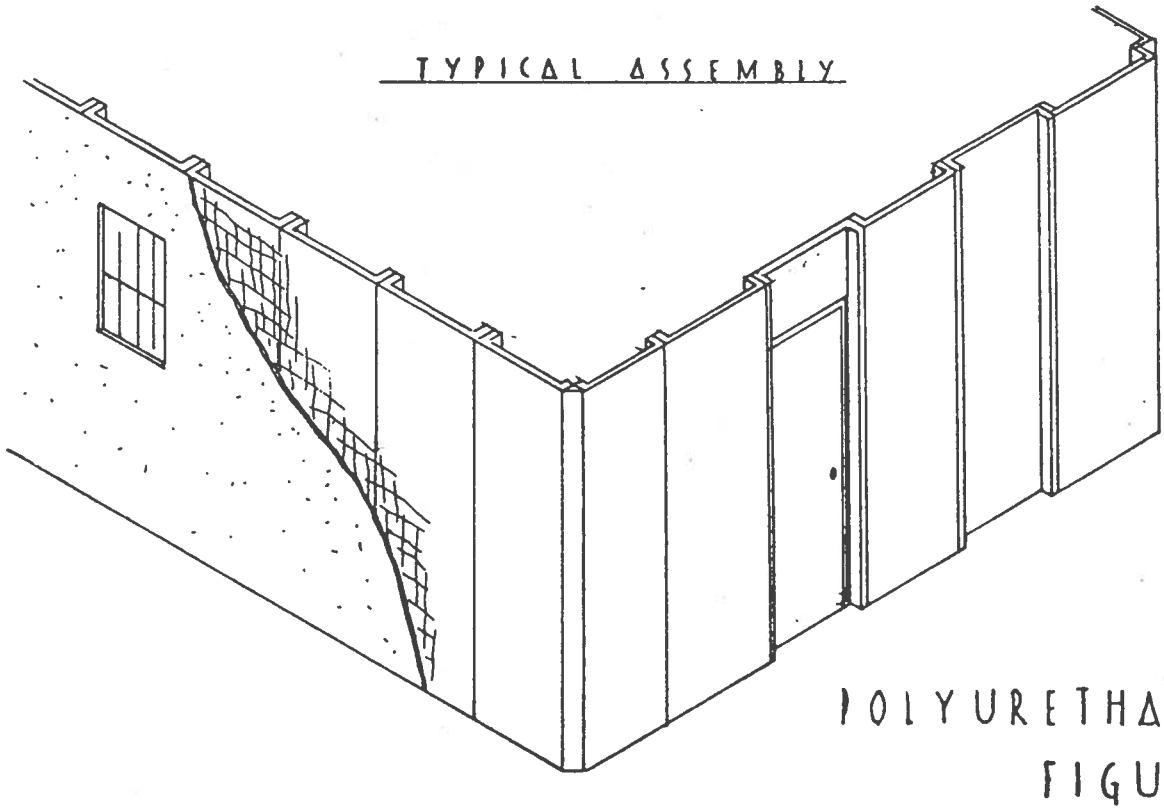
BASIC CHANNEL
EXTRUDED FOAM
POLYURETHANE
S: 1:10



TYPICAL WALL
S: 1:5



TYPICAL ASSEMBLY



POLYURETHANE HOUSING
FIGURE 5

Since the designs listed above do not rely on the skin for structural properties there is a wide range of surfaces which will be effective. The main function of the skin is to resist puncture. Weather protection for the foam could be achieved with several systems. The cheapest would be portland cement plaster reinforced with open weave burlap. Thin aluminum will also bond satisfactorally to polyurethane, as will asbestos cement.

The original house would be a polyurethane shell which is covered with an aluminum, stucco, etc. shell. When the occupant has more money to spend on his house the logical next step would be to build the walls with concrete block, beginning at the front of the house. Thus the second story, if desired, would be easily held up by the concrete walls.

Because the second floor is rarely contemplated initially, the roof need not be flat. This allows the use of complex curved shells of polyurethane foam and membranes, a shape which uses materials several times more economically than any other type of roof. If a second story is desired, these floor panels could easily be lifted up to form the roof over the second story.

Site Planning

The major costs in site planning are the distribution networks, including roads, sewers, water supply and electrical connections. The cul-de-sac pattern of siting minimizes these costs. The basic subdivision is therefore cul-de-sacs of 20 plots with a utility core in the center. Individual families may install private services in their homes when they can afford it.

Assuming a cluster of plots of about 60 square meters each, the houses are estimated to cover about 30 square meters. Gross residential

density would be 100 dwelling units per hectare. This high density is allowable if the bicycle is the primary means of transportation. (A two lane bikeway is 2 meters in width, while cars, excluding on street parking, would require a road of at least 6 meters.) Initial design allows sufficient room for people to have small spaces in front of their homes; these spaces could be personalized and enclosed to form a front yard. This could be as small as 2-1/2 to 3 meters. With a one meter allocation for a sidewalk the building lines would be nine or ten meters apart.

The full elaboration of such a design will appear about January 1973 as a Ph.D. dissertation by Rory Fonseca, Best Fit Configurations for Asian Settlements, and probably also as a monograph of the Department of Architecture, University of California, Berkeley.

VI. COPING WITH DEMORALIZATION, ALIENATION, AND DISCONTENT

A metropolis in India that grows by 5-7% per year will normally contain a third to a half of its residents who have been less than a decade in the city and were not born there. These inmigrants dominate certain parts of the city and its satellites and diffuse thinly into the remainder. Some of the neighborhoods dominated by inmigrants are well organized and stable, but most of them (those that receive a heavy share of new inmigrants with low levels of education) are volatile and threaten to go out of control Trust seems to be lacking; understanding is apparently at a low level. The big problem is to maintain public order in such neighborhoods, since mobs, sabotage, general strikes, and underworld gangs can destroy the well-being of almost all residents. Over the past eight years in America, urban planners have been seeking suitable means of distributing government services to poor people in the city in a way that actually improves their well-being. Surveys repeatedly show that everywhere in the world the poor and the powerless (i.e., unorganized) receive far less than their fair share. Programs planned to reach the bottom 10-30% of the population seem to improve the lot of civil servants, businessmen, students, and even villagers, but affect the target population hardly at all. What follows is an attempt to distill ideas from American experience with social planning.

We start from simple propositions that are as true in India as in America. People who have friends, acquaintances, and helpful neighbors are better able to help themselves, and are less likely to resort to crime

and delinquency. Therefore all newcomers, not just the majority, are to be stimulated, even prodded, into cooperating with others to meet mutual needs. Self-help is most difficult for persons who are demoralized and prove to be alienated. "Demoralized" here refers to a fatalistic response, where the person fails to try to cope any longer. "Alienated" means that the individual is cut off from the common world of experience, is unable to communicate and is often hostile. A few of these people could not get along in the village or the town, so they got on the bus or train and arrived in the city. They exhibit symptoms of schizophrenia, a disease for which medicine can do very little, but the vast majority can function effectively in the city. (However) they need to be given a chance.

We note that in 1957 Bombay could identify 2200 employment bureaus, libraries, orphanages, hostels, and miscellaneous welfare agencies or programs -- probably more than exist in any other Indian metropolis. By now there must be twice as many, and of greater variety. It is argued here that Bombay should move even more rapidly in the direction for which it is already a leader. More agencies, more organizations, but also more closely fitting the needs of people who are regarded by the middle class as the "undeserving poor." Yet not necessarily more government funds need be allocated.

The best solution is an agency dedicated to self-organization that operates directly in the receiving area. It operates very much like the old settlement houses, with meeting rooms that go day and night, language classes, drama groups, groups for celebrating almost forgotten festivals, etc. It should have a group that identifies new people in the area, seeks them out, and tries to get them involved independent of family. The principle is that each person in a city should have more than one

regularly used channel of communication outside of his family and young, active people should have several. It is normally the case, but a comprehensive enumeration of an urban district in a growing metropolis almost always reveals 10-20% social isolates who manage to survive for a while without bonds of human association -- they relate to all persons as if they were anonymous strangers. Interviews with established inmigrants suggest that they have had a hard time getting accepted in the city. Cultural deprivation is a common phenomenon.

Within this concept of a settlement house or community center that stimulates participation in neighborhood and district level organization and achieves recognition for the number it starts up and keeps alive (soon spun off autonomously into the larger community), we wish to introduce a new concept. The place of the architect in self-help housing is being looked into carefully here at Berkeley by a group working with Christopher Alexander (who is known among architects in India, although originally from London) and the Center for Environmental Structure. The technique revolves around the introduction of a "pattern language," an old way of communicating about the design and organization of spaces in which people live that is now being revived and systematized. Each pattern from among the thirty to a hundred needed to define a house specifies a set of physical relationships necessary for resolving conflicts whenever a given situation or context (e.g., entrance, thick walls, food preparation place) is encountered.

In America we have had ordinary people, with varying amounts of education, sit down and learn first to manipulate cards which contain "patterns," finding formulations appropriate for them and their families. They are assisted in this learning by architects who have learned to

design this way, but the solutions are arrived at by the user. Whenever a pattern includes a concept not encompassed by the traditional culture, it tends to be incorporated into another. In about two days of effort, people arrive at a solution that demonstrably fits their needs better than a standard dwelling. Moreover they have learned something about themselves and their immediate relationship to their environment. Simultaneously they are able to communicate this by means of the pattern language to others like themselves and to professionals who would be familiar with much more than a hundred such patterns.

Once a drawing or sketch has been prepared it is possible to discuss materials and sources of credit. Most people do not possess the building skills and do not know how to acquire them. At this point the knowledge that the young architect can easily acquire becomes important. He acts as a go-between, an introducer. His role is parallel to the agricultural engineer in the village parts of India that must take on new seed, pesticides, fertilizer, and irrigation techniques in order to participate in the Green Revolution.

CIDCO has much land that is likely to be squatted upon in a disorganized fashion if it does not allocate it to people who construct their house and joint facilities with their own hands. The task here is to form cooperatives, building societies, associations, and neighborhood groups that not only construct the kind of houses that will improve over time but will also get the water facilities, play area, drainage, electrification, access to television, and public trees installed.

Very likely a team of two -- an architect with a social worker -- is needed. They start from a settlement house and community center and get acquainted with new persons who are trying to make their way in the

city. They would find instances where the job was recently accomplished and find out how it could have been done better and faster in that instance. A group of architects would need to experiment with a pattern language suited to Bombay. Then it would be possible for people to consider the design of a house or a public facility as a unit rather than its respective features and persons with this capacity are more likely to dominate the committee discussions which otherwise get so sterile.

The social return from such effort would appear later when the houses are sold. The flexibility and convenience of a well designed house with good neighborhood facilities raises the resale value. It appears earlier only in the form of convenience in getting things done.

Of course, the formulation of an Indian pattern language and a method for its practical use could very well be a major contribution to Indian urbanization. It could be a way of introducing order into residential areas with a labor-intensive, capital-conserving approach that is needed for the Indian situation in general over the next several decades. It is the kind of contribution to method that CIDCO is in a position to make in the course of finding the best uses to its land. A monograph on this approach to self-help in design is being prepared and will be available from the Department of Architecture under the authorship of Max Jacobson about January, 1973. It is, of course, directed to American contexts, and so far seems to work about half the time with minimum help from architects. It is quite possible that the equable climate and simpler circumstances for housing in New Bombay, as compared to San Francisco, would produce a higher success rate.

One other procedure for stimulating self-organization that very much impressed Asian students when reviewing American institutions is

the "community chest." Voluntary organizations that arose out of settlement houses and community centers and performed public services -- such as Boy Scouts, helping the aged poor, supporting a league of junior sports clubs -- maintain themselves by collecting donations from door to door. Since merchants and factory managers are asked repeatedly, they urge that all the good causes get together and make a joint appeal once or twice a year. Then it can be organized more comprehensively and special accountants can be assigned to see that the funds are not misused. Very likely such a device has been used in Old Bombay and will have been monopolized by fixed interests that prevent any other voluntary organizations from joining the community chest finance drive. At least that has been the experience in North America. However, these associations of voluntary self-help organizations recently have been encouraged to adopt new organizations and to challenge the moribund ones so that at this level the community chest can be assisted with extra funds for its stimulating efforts. The community chest approach would allow good ideas to expand rapidly into newly urbanizing populations once they have been proven on a small scale in several communities. A successful city has institutions which propagate the smooth and rapid growth of social and technical innovations, but that kind of thinking has only recently been applied to self-help organizations.

People who can help themselves, rather than wait for bureaucracy to move to their assistance, are not discontent. They are proud of each small achievement. Morale has its ups and downs but in general stays good. Alienation is reduced to the minimum set by the amount of mental illness and by isolation due to language differences and difficulties or to inadequate communications.

At the strategic level this burst of self-organization must be supported by the mass media and as soon as possible the telephone. Community newspapers and radio stations should be started. This takes some effort in getting licenses. Possibly television neighborhood centers need to be sponsored. Cinema helps a little bit, but it is not as effective in reinforcing face-to-face interaction. Voluntary organization works best in a relatively rich informational environment.

VII. THE SIMULATION TRIALS

Prior to commencement of the first cycle in the second game (conducted in June 1972), the following set of initial conditions were assumed for January 1, 1974: (1) The population of Bombay stood at 7 million, and that of New Bombay at 500,000; (2) temporary equipment and facilities were in use for the transbay ferry, and permanent facilities were ordered and started; (3) containerization facilities would open in the East Bay in mid-1976, with full port development to be completed by the end of the 5-year plan (1979); (4) the existing rail lines were being double-tracked, would be electrified later, and new electric lines were planned to connect the Port to the Bombay-Poona line near Panvel; and (5) the East Bay water supply was 3 million gallons/day and would be 10 million during the second cycle.

Org proposals were distributed to each of the five decision-making groups according to their respective fields of interest. These orgs had been drawn up by the students as members of teams assigned to do research of the latest technical and administrative potentials in nine different development categories. Each group was given an initial budget (in crores): Centre 120, State 50, Chamber of Commerce 20, multinationals 50 and CIDCO 20, for half of a five-year plan.

As Cycle I began, each group spent a good portion of the 45-minute time allotment preparing new orgs to accompany those distributed and preparing its own budget estimates. In mid-cycle, the State and CIDCO began to send emissaries to the Centre, the Multinationals, and each other,

goaded to action by the persistent and energetic messengers of the Centre. The Centre took an early lead in successful arrangement of joint funding of large projects (such as a petrochemical complex), while CIDCO failed to exercise the control possibilities it possessed as sole distributor of land. CIDCO's failures had two sources. First, land-use estimates for most orgs were far too low. Second, CIDCO's chief was so preoccupied with the feasibility of orgs presented to him for joint funding that he demanded (and got) ten to fifteen minute presentations (defenses) of orgs by outside group messengers. The process was time consuming, and land permits were given out matter-of-factly to allow time for these presentations. The State and the Chamber of Commerce were timid in org design, choosing to avoid the pain of interaction in joint funding pursuits, and instead developing a large array of esoteric, small-sclae "specialty" orgs (e.g., half-way home for migrants, floating mariculture communities, etc.). The multinationals spent almost all their time seeking permission from the Centre to repatriate 50 crore on profits as a precondition to any spending on their part.

At the end of the cycle, all org proposals were assembled and "evaluated." Evaluation consisted of a determination of whether or not the org survived the cycle. A probability (from 0.10 to 1.0) had been assigned each org as an estimate of survivability, and a table of random numbers served as the determinator of the org's success. The evaluation procedure yielded the following budgetary results: the Centre spent 115.7 crore; the State 12.9; the Chamber of Commerce 8.8; the multinationals 8.0; and CIDCO 1.9. These budget results can be traced to the groups' behavior as outlined above.

Also, second running of the game occurred well after the results of the New Congress Party victory in India had been analyzed. The student stand-in for Indira Gandhi decided to implement as much as possible the post-election statements of policy. A major consequence, most evident in the 2nd and 3rd cycles, was a reluctance to deal with the multinational corporations and a marked under use of the expanding potentials arising out of international trade. In the last cycle the frustrated multinationals decided to do their best to overturn the government so they financed a variety of orgs intended to have this effect. Meanwhile CIDCO recognized somewhat belatedly that its land was a most remarkable asset that could produce much development and public profit for Bombay if it engaged in active promotion and negotiation.

One clique of students invented a new organization-promoting agency, modeled in part after the idealized American "community chest," and the "settlement house," whose task was to reduce apathy and anomie in the new immigrant and low income components of the population by stimulating a variety of self-help organizations. (Interestingly, its composition was made up of graduate students with overseas citizenship: a Japanese in international relations, a Taiwanese in public health, and a Thai in education; it is therefore a predictor of things that can come to the Southeast Asia first.) This group was greatly dismayed to discover the high mortality of such organizations.

For students what is learned from the exercise is the vast difference between a program of action laid out on paper and the outcome after bargaining with good will on both sides. For the designers and directors of such a gaming simulation the very plausible but unexpected action-derived strategies and institutional arrangements are the principle

payoff, since they often run counter to the conventional political and economic prognostications. Moreover, these exercises reveal vividly the variety of forces that combine to prevent the kind of accelerated development that has been generated in Southeast Asia, when the recipes are transferred to India.

These forces, as they emerged from the simulation, can be identified as follows: (1) Communications breakdown, which occurred when the responsible contractor for a group's participation in joint projects could not be found and other group members were not willing to make even tentative statements of position. (2) Group inertia, which occurred when none of a group was willing to assume responsibility for large project decisions. (3) Failure to use all potential resources, which occurred because rewards and penalties were not sufficiently motivating. (4) Lack of understanding, which was shown when certain technically knowledgeable participants floundered in the commerce-oriented game.

The issue of NEWSFLASH on feedback prepared in advance in case students approximated the performance in Southeast Asia is shown in the Appendix. It appears that India will need to generate many social and political innovations, similar to those inherent in the most recent administration of the metropolitan land planning law (which remains clumsy and slow but still fits the criteria laid down for modern developmental planning, better than other places'),if it is to compete on the world scene.

Summary

An acceleration in social and economic development arising from increasing capacity for the cities to organize human activities has occurred in the past decade. Thus far it has been highly effective in about a dozen metropolises in Japan, Korea, and Southeast Asia. Can this

dynamism be transmitted to other coastal metropolises competing with them in world markets? The answer seems to be that it is possible but not probable. This is one human concern where the quality of planning can make a significant difference in human affairs.

APPENDIX

NEWSFLASH

CIDCO reports that 52 major organizations (each greater than a thousand members or a hundred full time employees within the first year) settled in Greater Bombay last year, as compared to 41 last year and 35 the year before that. Organizations maintaining mailing addresses increased by 17% last year, while those added to the telephone directory increased by 21%.

Surveys show that the number of trips made in Greater Bombay actually increased by 10% last year as against an estimated population increase of 8%. The Metropolitan Transport Commission warns that more equipment must be ordered immediately or breakdown due to congestion will occur along D. N. Road and at Ferry Terminal.

Bombay's vigorous mayor receives strong backing from the Chief Minister of Moharashtra in his program to eliminate encroachment upon public spaces by small shopkeepers, public markets, hawkers, and beggars. Circulation in the region is noticeably improved, and the city is rated the cleanest metropolis in India.

The Moharashtra Industrial Development Corporation (parent of CIDCO and a variety of other promotional units) reports a consolidated accumulation of 550 crores of assets, as against 810 crores of bonds outstanding still, and retains title to 50,000 acres in the valuable Bombay metropolitan area. It has also granted its millionth homestead

privilege for self-help housing, having made available more than 25,000 A., and leased almost 200,000 A. for intensive gardening.

The great burning issue of the period is what to do about starting five new metropolises along the coast that begin as satellites to Bombay. Can India build million-size cities from towns in only a decade?