

## MANAGEMENT OF URBAN ENVIRONMENT IN INDIA

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### ABSTRACT

In this article, the issues involved in improving the urban environment in India have been analyzed and the state of legislation and existing levels of control have been highlighted. Using general systems theory, possible options have been identified for improving the rapidly deteriorating urban environmental quality.

### INTRODUCTION

In India, of the 680 million total population, about 140 million live in urban areas. The rate of urbanization growth has been increasing and by the end of the century more than 350 million will be inhabiting the urban centers [1, 2]. Between the years 1920 and 1960, urban population in the developed countries little more than doubled, whereas they increased fivefold in the developing world [3]. This fast growth of the population intertwined with overcrowding, lack of sanitation, and physical facilities has put the infrastructure into severe strain. On the other side – the already unclean, overcrowded and undeveloped slums – face the pressure of population growth. The growing unemployment among the rural population and the inability of the rural agricultural infrastructure to absorb the labor force that is being added, are accelerating the rural to urban migration. This article is a study of the issues involved in managing the urban environment of India. This article also suggests possible policy alternatives that can help in improving the environmental quality in urban areas, using systems theory.

Table 1. Growth of Cities: Size vs. Numbers

<i>Population Size</i>	<i>1951</i>	<i>1961</i>	<i>1971</i>	<i>Growth Rate 1951-71</i>
100,000 and above	76	107	147	+93
50,000 to 99,999	111	139	185	+67
20,000 to 49,999	374	518	583	+56
10,000 to 19,999	675	820	874	+29
5,000 to 99,999	1195	848	680	-43
Less than 5,000	629	268	172	-63

### POPULATION GROWTH

The most critical variables that determine urban environmental quality are the rate of addition of migrants and the internal growth rate. In India, the major problem is overgrowth of the overcrowded large cities. The growth rate of smaller cities have been on the decrease, whereas the larger ones are growing faster. Table 1 indicates the percentage of urban population in cities of different population class. The large cities house 55 per cent of the urban population. Smaller cities with populations less than 20,000 have been stagnant. The large cities are already overcrowded, and they lack physical facilities like housing, transportation, and water supply. The overcrowding without such facilities intensifies psychological stress among the poorer sections of the society. The unemployed rural population migrates to the urban areas in large numbers because of population pressure as well as increasing unemployment in rural areas. The dropouts from schools are also increasing and since they cannot be absorbed easily in the rural economy, they migrate towards apparently greener pastures. The physical living conditions, in larger cities, where poorer sections of the society live are unhygienic, congested and poorly planned. It has been reported that 41 per cent of the urban population live in one-room dwellings in India [4].

The Urban Development Authority is the agency which looks after the physical planning of urban centers. The existing Urban Development Authorities are inadequate, poorly manned, and technically ill-equipped to manage complex and large scale problems. Since there is no professionalized cadre of technically competent urban development planners, these Urban Development Authorities are purely agencies for allocating resources. The urban development plans derived for many cities are short term oriented, compartmentalized, financial plans. The Urban Development Authorities have political heads having tenures of three years. The politicians who thus manage the authorities have no long term concern about the urban environmental quality or long term population growth. The urban migration and population problem are of little immediate

Table 2. Housing Shortage

<i>Housing Shortage</i>			
<i>Year</i>	<i>In Rural Areas</i>	<i>In Urban Areas</i>	<i>Total Shortage</i>
1951	7.7	2.5	10.2
1961	6.6	3.6	10.2
1971	11.6	3.1	14.7
1974	11.8	3.8	15.6
1979	14.8	4.9	19.7

consequence to the politicians. The short term perception or bias of the administrators and politicians are the major impediments working against any long term planning in urban areas.

## HOUSING

Housing is a major problem area in urban regions. Because of the high population density prevalent, there is always pressure on housing sites. The better localities are costly and hence the majority of the population live in congested areas. Table 2 illustrates the housing shortage in urban areas. The magnitude of shortage has been continuously increasing [5]. Lack of coordinated planning, lack of recreational and physical facilities make these urban areas unhealthy. Lack of proper physical facilities like lavatories force the people to pollute the environment. The number of toilets in major cities per 1000 persons is only eighty-four [6, 7]. This makes these areas highly vulnerable to parasitic infections and epidemics. Though the housing shortage is similar in degree in urban and rural areas, the shortage does not manifest itself in degradation of environmental quality in rural areas. The carrying capacity of urban areas being lower, higher intensity of population combined with housing shortage and lack of sanitation becomes a major cause for deterioration of environmental quality. Even in urban areas it is the lowest income group that suffers the greatest due to the housing shortage – this manifests itself in the growth of slums and other overcrowded and unsanitary conditions.

## TRANSPORTATION

Transportation has been another major determinant of urban environmental quality. In India, there are no specific emission standards for exhausts. It has been reported that the population levels of vehicles in certain Indian cities are on the high side [8]. Combined industrial and auto emissions lower the urban

air quality. Though the government of India passed an air pollution control bill at the end of 1980, it contains no provisions for monitoring pollution from mobile sources. Overcrowding, lack of ventilation, and improper constructions in conjunction with auto emissions and dust increase pollution and derivative diseases. Very little effort has been directed to noise pollution control.

Transportation has another major implication in urban systems. Unless the direction of urban growth, industry location, and population dispersion are systematically integrated, wasteful transportation systems, and highly energy intensive growth will be the end result. A study of transport policy in India has stated that with regard to medium sized and large cities no comprehensive traffic and transportation studies have been made [8]. Development of medium size urban areas is haphazard, tentative and as yet devoid of any comprehensive planning [8] – hence the physical environment is not likely to improve in the near future. Duplicity of agencies related to transportation, lack of linkages between urban development and transportation agencies, and lack of coordination among agencies dealing with transportation, housing, utilities, location of educational institutions and industries, etc., magnify the problem. It has been shown that the existing modes of urban growth are not suited for an energy-short world [9]. Both integrated high rise systems and diversified systems are unsuited for the developing world. Urban Planning itself has gotten attention in India only in recent years and that was because of the persistence of international agencies. The newly set-up agencies are engaged in solving old and existing crisis situations and have little expertise or resources to look into long term issues or optimal solutions which are likely to yield results only after some years. This problem is compounded because of the absence of a cadre of professionalized managers capable of planning and controlling complex urban systems.

## ENERGY

The majority of urban energy needs are satisfied using resources coming from outside the urban areas. Even in urban areas, 45 per cent of the domestic energy needs are satisfied by firewood grown outside the urban communities [10]. In other words, the urban firewood demand causes extraction of wood resources from the nearby areas. It has been reported that about 15 per cent of the firewood consumed is collected illegally and not purchased. The United Nations Environment Program has reported that the forest quality in the vicinity of most urban areas have been degraded to a distressing level [11]. Forests have regulatory functions at the agroecosystems level and decimation of forests have deleterious impacts on microclimate. The unprecedented urban population growth, along with non-integrated energy planning, coupled with absence of forest regeneration programs cause serious environmental quality deterioration. Decimation of forest systems affect water resources systems and induce instability into water resources availability. In certain Indian cities, like

Hyderabad, Bangalore, Pune, and Bhopal, there has been severe recurring and fluctuating water shortage. There are inseparable links between forest ecosystems and the water storage capability [12-16] and excessive disturbances of the ecosystems in the vicinity of urban areas may result in irreversible and, hence, catastrophic changes in the water table, thus affecting the urban systems very seriously.

## WATER SUPPLY AND SEWERAGE

Water supply and environmental quality go hand in hand and anything which decreases water quality or water availability reduces the environmental quality. In India, only 40 per cent of the population receives domestic water supply or water borne sanitation [17]. Per capita water supply is inadequate in many cities. In Karnataka State, the per capita consumption in major cities is 78 litres per day per person [18]. Forty per cent of the urban population receive much less than 273 litres per day which is the absolute minimum [19]. About 30 per cent of the urban population is not served with any organized water supply. Out of 3119 towns only 1890 have protected water supply facilities in India [20]. Further, one-third of the population living in slums does not have any major protected water supply source. In recent years there has been a large influx of population into urban centers. The urban corporation or municipal administration is not geared to undertake augmentation of physical facilities to match both the needs of increasing population and migrating new entrants. In a developing country like India, where the basic needs of the existing urban population itself have not been satisfied, continuous addition of people as well as new areas due to industrial expansion only result in widening the gap between the slum dwellers and others. To add to this, industrialization causes water pollution, further decreasing the quantity of fresh water available. In and around urban areas no fresh streams exist which are not polluted [21]. Since pollution control laws are not very stringent in India, this distressing state continues. Hence in India we have environmental degradation caused by lack of development as well as by industrial development [22]. This paradoxical situation is likely to continue since this forms a vicious circle.

Sewerage facilities are grossly inadequate. Out of the 3119 towns of India, only about 217 are seweraged and these only partially. In terms of population covered, this comes to only 33 per cent of the urban population, i.e., about 7 per cent of the total population. Further, inadequate sewage systems cause unsanitary conditions. Rovani has shown that in developing countries though the service levels of water supply reach a larger level of population, waste disposal facilities are very meagre and do not reach the poor sections of the population, resulting in endangering their environment and their public health [23]. Until the end of 1980, only 80 per cent of urban and 30 per cent of population in rural areas had access to water supply and 27 per cent of urban

and 2 per cent of rural areas have been covered by sanitation schemes. As many as 72 of the 142 Class I cities (with more than 100,000 population) and 147 smaller cities of the 190 Class II cities have no sewerage systems. Nearly 63 per cent of the waste water in Class I cities and 95 per cent of the waste sewage water in Class II cities are untreated [24].

In recent years there has been a growth in the incidence of malaria and encephalitis in urban centers. Malaria incidence has increased from 49,151 cases to 45,65,617 cases between 1961 and 1977. It has been reported that malaria and cholera incidence have risen due to poor environmental conditions in a number of urban centers [25]. Malaria – endemic and epidemic – will be widespread if DDT usage is stopped. This problem is compounded because of the pesticide resistance of mosquitos [26]. Similarly, chloroquine-resistant malaria has also been observed recently [27]. Lack of sewage facilities, poor sanitary conditions conducive to mosquito growth, and growth of the number of mosquitos thus increase the incidence of endemic and epidemic malaria. This problem is a complex one: integrated environmental control, increased public health education, proper water resource and sewerage programs, and industrial water pollution control can ensure water quality standards. In large urban centers water availability is not likely to improve to any greater extent since the availability of water near large urban centers has already reached its limit. Further, augmentation of water supply requires large financial resources in terms of long distance pumping or desalination facilities. This will thus reduce the availability of funds in other areas since water is a critical need. The situation is more or less one of a zero-sum game where benefits in one sector presuppose losses in another [13]. For example, the Bangalore city Municipal Corporation with an annual expenditure budget of Rs.200 millions has to invest Rs.1500 millions for augmenting the city water supply and it has to resort to a huge loan from the World Bank as well as managerial assistance. Urban water systems planning capable of dealing with the great complexity of the problems is needed, if urban water problems are to be solved.

## PUBLIC HEALTH

Unhygienic living conditions, lack of protected water supply, absence of proper sewage systems, and the existence of largely crowded slums cause complex and intricate public health problems. Because of the lack of protected water supply and overcrowding, contagious diseases are transmitted quickly. The lower income population groups are vulnerable to diarrhea and gastro-enteritis. Diarrhea disease is probably the biggest single cause of death in children under five and is a major cause of illness among adults. Similarly, hookworm and parasites affect children, since sanitation, protected water supply, and public health are very closely interconnected. Public health departments come under state governments and their budgets are very small. State

governments give priority to medical education and hospital systems – public health systems which are highly neglected. The public health management systems in India are not geared to the population explosion of the urban systems.

The poorer sections of the society are the ones suffering from deficiency diseases and malnutrition. The combined incidence of these and the parasitic diseases, along with unhygienic living make these populations highly vulnerable to endemic and epidemic diseases. A large number of diseases that arise due to deficiencies in water supply and sanitation are prevalent in India [23]. Five groups of diseases have been identified under these conditions:

- |                           |                                   |
|---------------------------|-----------------------------------|
| 1. water borne diseases;  | 4. water related vector diseases; |
| 2. water washed diseases; | and                               |
| 3. water based diseases;  | 5. fecal disposal diseases [23].  |

By merely providing protected water supply and sewerage it will be possible to improve the public health and living conditions in a much more effective way than can be obtained by any other curative measures. Malnutrition acts synergistically with disease agents to increase the incidence of clinical diseases and aggravate their severity [28]. In India, in urban areas the incidence of sexually transmitted diseases has been increasing [29] though steps have been taken to arrest such growth. The management of public health has to be improved considerably using modern monitoring and control practices. The areas of local self-government, water supply, sanitation, pollution control, public health, urban development, and road transportation planning are all primarily the responsibilities of the state or provincial government. State governments are usually starved for funds and these areas are neglected. The management of public health systems needs reorientation to become preventive in nature.

## SOCIAL ENVIRONMENT

Social environment is becoming pathological in many cities of the world [30]: this trend is prevailing the Indian cities as well. Increasing densities cause severe psychological stress. The negative effects of overcrowding and increasing densities can be compensated for by improved housing and public utilities, to a certain extent. But in Asian countries where high urban densities are coupled with a lack of facilities, the density effects on welfare cannot be mitigated by socio-economic development, since space itself is a welfare entity which cannot be improved by better provision of other commodities [13]. In other words, the socio-pathological symptoms become aggregated under stress [31]. Noise pollution and community noise have deleterious effects on mental wellbeing. [32]. Very severe living conditions, along with adverse social environment created by community noise, emotional stress, lack of facilities, overcrowding, lack of privacy, etc., produce severe problems in society in the form of deviant behavior. India, engrossed in trying to satisfy the basic needs of the population,

has no institutionalized procedures for taking care of the social environment. Poverty, along with the lack of facilities and overcrowding, may produce symptoms of aggression and, as such, socio-pathological conditions are not going to decrease in the coming years. New institutions and new methods of relaxation have to be resorted in order to improve the social environment.

## SLUMS AND DEVELOPMENT

Historically, most big cities have locations called civil areas where rich persons, administrators, and other well to do populations are endowed with the best urban amenities in terms of electricity, water, sewerage, roads, and trees [2]. Other areas were largely neglected, and this resulted in extreme congestion, filthy slums, unplanned development, and lack of facilities. In India, one-fifth of the urban population lives in slums which are physically very distressing [2]. The subject of slum clearance has been exclusively under the state governments since 1969, though the programs have been operational on paper since 1956. In 1972 an additional scheme — environmental improvement in slum areas — was introduced. Central government assists the state governments by providing funds. Though these schemes are operational even today, nothing substantial has been achieved because of poor coordination between various agencies, lack of public participation of slum inhabitants, corrupt practices and misuse of public funds, and poor integration of developmental programs.

Urban slums are the manifestation of economic duality and on the whole, up to 20 per cent of the population have been living in highly congested, unplanned, unventilated, and physically poor environments. Removing slums and transferring them to other localities is not a realistic solution. Most of the earlier slum clearance programs have failed because of this transfer and lack of public participation of the affected persons. Slum dwellers have to be provided with more physical facilities in proportion to its population. Environmental improvement of slums will have a positive effect on public health and living conditions. Providing improved physical facilities is the most realistic solution but a difficult task since the population in these areas are continually increasing. Providing permanent housing is not the solution since this subpopulation change their residence depending on their place of work.

## INDUSTRIAL SITING DECISIONS

One of the reasons for worsening of environmental quality has been industrial siting policy. Certain cities are highly polluted and no possible remedy is currently available. Vizag is a city fairly congested and with relatively high pollution. Recently the government has decided to install a new three million ton steel plant in the vicinity of Vizag. The site was selected without much concern for environmental factors. Similarly, a synthetic pharmaceuticals plant



was located near a large city and on the upper portions of a stream which flows into the city. Industrial concentrations near large urban areas can be controlled by planned industrial siting. More industries have to be located near small towns so that migration can be reduced. Further, the carrying capacity of the ecosystem will be higher in the vicinity of small towns. In the industrial siting policy, environmental concerns and carrying capacity of the environment are not major criteria today.

Another major factor has been the continuous outward expansion of large cities, resulting in the continuous expansion of twilight zones [33, 34]. Industries which were located at the outskirts of the city gradually came within the city. This in a way leads to inefficient land use practices. The expansion of large cities outwards has to be controlled and planned since concentric expansion increases the need for transportation exponentially. The mixed land-use pattern induces inefficient transportation modes. For an energy-short world, this has serious implications. Land-use planning, housing, transportation, and industrial siting are intricately linked and unless various possible options and their impacts are studied in depth, the hazard of expansion will continue. As has been reported, land-use planning is particularly important for small and medium size cities where, fortunately, the position is not irretrievable as in major cities. There is no land-use policy [35] or systematic coordinated land-use plan effective for long term today. Further, new integrated centers incorporating employment, housing, shopping, recreation, and education at a single location have to be planned and promoted. The need for transport may be reduced by limiting requirements for mobility, by placing groups having maximum interactions close, by using traditional patterns and mixes of use, consuming less specialized settings, and producing more localized systems. There should be an objective impact assessment before selection of any sites for industrial location. Today there is only a limited site selection exercise. A rational industrial siting policy will go a long way towards achieving reasonable environmental quality with regard to air, water, density of population, and transportation.

## POLICY ISSUES

A number of economic and related activities are directly or indirectly responsible for the deterioration of the urban environmental quality. Table 3 gives the matrix of relationship between activities and possible factors of environmental quality that are being affected. The matrix also identifies the existing state or level of control in Indian urban centers. To clearly understand the problem level, the matrix indicates whether the state can be easily controlled, whether the problem is very serious, or whether the problem cannot be solved immediately. Further, to analyze the existing framework for improving urban environment, the matrices relating to control measures and agencies are derived.

Table 3. Managing Urban Environment in India: Activities vs. Factors

Activity Factor	Industries	Road Transport	High Rise Buildings	Peripheral Expansion	Water Supply	Sewage	Electricity	Fuels	Population Growth	Public Health
Water pollution	EN	-	-	-	L	L	-	-	-	DC
Air pollution	EN	N	-	-	-	-	-	DC	-	-
Industrial congestion	N	IL	-	N	IL	IL	N	-	-	-
Energy waste	DC	IL	-	DC	-	-	N	N	-	-
Inefficient land use	N	NC	N	NC	-	-	-	-	N	-
Crime	-	-	NC	IL	-	-	-	-	NI	-
Refuse dumps	NP	L	-	NI	-	-	-	-	IL	-
Sewage and sewerage	NI	-	DC	DC	LS	L	-	-	DC	-
Poor support facilities	IL	NC	NC	NC	NC	NC	NC	NC	IL	-
Poor sanitation	-	-	-	DE	R	NC	-	-	NC	NC
Adult education	-	-	-	-	-	-	-	-	IL	NI
Unhygienic slums	IL	-	-	NC	LS	IL	-	-	DC	NC

LS = Long term supply problems; NC = No coordinated efforts; NO = No incentives; NP = No institutionalized procedure; N=No legislation currently; NI = No institutionalized procedure; IL = Interconnected closely; DC = Difficult to control; EN = Laws exist but implementation weak; L = Only in large cities.

This is given in Table 4. Vacant spaces indicate legal and linkage lacunae in the case of control measures. Multiplicity of agencies, multiplicity of roles, lack of coordination, lack of legal mechanisms, lack of public participation, and frequent organizational changes are the major factors that are responsible for the deterioration of environmental quality. There are certain situations in which a delay in every stage of decision will result in wrong decisions and urban development management seems to be one that is caught by this dictum.

## **MANAGEMENT OF URBAN ENVIRONMENT: A SYSTEMS PERSPECTIVE**

Using general systems theory, a number of possible action imperatives are derived which can help in improving the managerial effectiveness of urban systems.

1. Segregation increases conflict among subsystems or components of a system and a higher proportion of adjustment processes must therefore be devoted to resolving such conflicts which means they cannot be devoted to advancing goals of the system as a whole [36]. Duplicity of planning agencies, starting newer and more specialized agencies for each functional activity, and lack of coordination plagues urban management systems. Better coordination, coupled with increased decentralization will require a high level of expertise in urban systems management. Developing countries have yet to reach this level of coordination of inter-disciplinary expertise.
2. No regulator can actually work in a complex system unless it contains a model of whatever is to be regulated [37]. The regulator or the decision-maker has to have complete knowledge and information regarding the inputs, outputs, and the interactions between them completely and clearly. This requires continual translation between the state and process descriptions of the same complex reality [38]. This will be possible only with the help of very large integrated information systems, providing data on the variables of the subsystem, its inter-relationships, and modes of interactions among the subsystems. In very large urban systems, the cost of the integrated information systems are likely to be prohibitive. In other words, large urban systems tend to be inefficient and wasteful. This is corroborated by another condition that, in complex dynamic systems with more than eight channels for information transmission between the various subsystems, the noise has a tendency to drown out the original signals [39].
3. Only variety can absorb variety – Ashby's Law [39]. In the case of urban systems, constellation of relatively diversified and integrated cities [40] involving more concentration than the present form, which provides subregional integration resembling the commercial cities of the 18th

Table 4. Managing Urban Environment: Measures vs. Parties

<i>Measures</i>	<i>Parties</i>												
	<i>Air/Water Pollution Board</i>	<i>Urban Development Authorities</i>	<i>Municipal Corporations</i>	<i>Forest Departments</i>	<i>Slum Clearance Boards</i>	<i>State Planning Boards</i>	<i>Public Health Authorities</i>	<i>Central Government</i>	<i>Ministry of Industry</i>	<i>Sewage and Sewerage Board</i>	<i>National Planning Commission</i>	<i>State Road Trans- port Undertakings</i>	
Effluent control legislation	LW	NJ	NJ	—	—	PC	NJ	CA	—	NJ	—	—	
Noise control legislation	—	NL	NL	—	—	—	—	—	NL	—	—	NL	
Dust control legislation	LW	—	LW	—	—	—	—	—	PC	—	—	—	
Air pollution control legislation	LW	NJ	NFL	—	—	—	—	PC	—	—	—	—	
Effluent monitoring	LW	NJ	NFL	—	—	—	PC	CA	—	PC	—	—	
Noise level monitoring	—	NL	NL	—	—	—	—	—	—	—	—	—	
Dust level monitoring and measurement	—	NJ	NL	—	—	—	—	—	—	—	—	—	
Land-use planning	NFL	NL	NL	NL	—	NSP	—	NL	NFL	NJ	NF	NFL	
Facility planning and industrial site selection	—	NJ	NFL	—	—	—	NFL	—	NSP	—	CA	NFL	

Refuse collection and treatment	NL	NJ	NSP	-	-	-	PR	-	-	-	CA
Sewage and sewerage systems	NJ	NFL	PR	-	-	-	PR	PC	-	PR	CA
Public health monitoring	NJ	NFJ	LW, FR	-	-	-	PR	PC	-	PR	-
Community sanitation	-	LW	PR	-	-	-	LW	PC	-	PC	-
Energy conservation in urban systems	NSP	NSP	LW	LW	-	NSP	-	PC	-	NSP	NI
Integrated housing work place planning	-	NL	NI	NSP	-	-	-	NSP	-	NFL	NSP
Transportation planning	-	NFL	NFL	-	-	-	-	RD	-	-	CA
Dispersal of industries	NJ	NJ, NL	NFL	NFL	-	NSP	NJ	NSP	NL	-	NS
Long range systems planning	-	NSP	-	NSP	-	NSP	-	NSP	NSP	NFL	NSP
Slum improvement	NJ	RD	PR	-	RD	-	PR	CA	-	-	NSP
Integrated Urban Systems Management	NL	NL	-	-	-	-	-	-	NFL	-	NSP
Crime control	-	NJ	NJ	-	NJ	-	-	NSP	-	-	NSP
Employment policies	-	-	-	-	-	-	-	NSP	-	-	DR

NJ = No jurisdiction; CA = Central agency; LW = Legislation exists but implementation weak; NL = No legislation; RD = Role duplicity; NI = No incentives; NFL = No formal links; NSP = No systematic procedures; FR = Poor resources; PC = Poor coordination.

century, and allowing particularly for a close location between spatial systems of residence and employment may be a better alternative than high rise (concentrated) or fully dispersed subsystems. Urban subsystems must plan for more and more heterogenization [41] through dependence and complementarity. Urban systems will tend to become suboptimal unless the subsystems move towards heterogenization through mutual interaction and dependence. Only hererogenization will provide stable systems, since heterogeneity produce coexisting, mutually reinforcing morphogenetic systems. The entire basis of urban planning must become mutual reinforcement and dependence through heterogenization.

4. To improve our environment it is necessary to take into consideration the factors that lead men to degrade the environment [42]. The existence of slums is the effect of economic duality and rural unemployment. Unless migration is reduced and smaller cities are made to grow with strict control the slums will continue to grow. Slums cannot be abolished by legislation. By rigorous planning, environment of slums have to be improved, similarly to reduce migration into urban areas, rural employment programs have to be initiated. Only an integrated program will work and not piece-meal legislation.
5. The higher the level of a system, the more correct or adaptive its decisions are [43]. In a complex hierarchical system, decisions cannot be made at the lowest level since they tend to become ineffective. Urban policy decisions which cut across many administrative agencies have to be made by the highest agency – National Government. Absence of uniform legislation, rules, and procedures currently hamper urban systems development. The most suitable mechanism for making environmental policy-type decisions is by a government of general jurisdiction and not by a specialized government body [44]. The central government has to formulate a rational urban policy so that all cities and states adopt uniform policy measures in India.
6. The network of information flows serving both short term and long term decision processes merits close scrutiny as we lay plans to protect our environment [44]. Information systems designed to support planning and decision-making must take care of all the major environmental factors. The existing information systems for decision-making have very little data on environmental parameters or constraints.
7. The dialogue between government and governed has become an immensely difficult exercise in communication [30, 45]. Better means must be found to communicate to the populace and to governmental decision-makers the range of complex factors that should bear upon their actions [46]. Public participation is very critical in urban management and unless effective feedbacks are designed and incorporated, urban systems tend to become non-goal seeking. New institutions must be designed

which best aggregate preferences and find effective ways of opening communication [33, pp. 12-36, 47] between electorate, elected representatives, administrators, and urban planners.

8. Large urban systems tend to become non-optimal. As the size of the systems increase, the costs of coordination and information are bound to increase, whereas the reverse is true for the costs of decentralization and self-reliance [48]. Neither large systems nor small systems are likely to be optimal. The environmental degradation is the cost of overgrowing and occurs due to a lack of carrying capacity. Systematic efforts to develop smaller cities have been initiated. Policy measures with proper incentives have to be derived so that planned regional development occurs rather than concentration. Long range land-use plans have to be made for each region so that inefficient twilight zones between urban centers and rural areas are not continually created due to the outward expansion of cities.
9. Growing systems develop in the direction of:
  - more differentiation of subsystems;
  - more decentralization of decision-making;
  - more interdependence of subsystems;
  - more elaborate adjustment processes;
  - sharper subsystem boundaries;
  - increased differential sensitivity to inputs; and
  - more elaborate and patterned outputs [43].

Urban systems management has to be made more effective by reorganizing the existing outmoded subsystems with more decentralization, but rigidly planned and controlled inputs and outputs. In other words, management and planning of urban systems have to be remodeled to take care of the complexities and fast changing dynamics. Before rushing for technology hardware [49] third-world countries have to improve their software relating to urban systems, i.e., environmental planning, systems management procedures, organizational design, and urban systems planning.

10. Finally, there are basically six levels of hierarchy in urban systems management, namely:
  - inputs and micro-elements;
  - planning procedures at microlevels;
  - objective setting and micro-level coordination;
  - the strategic planning of the urban systems;
  - regional political interactions; and
  - national government and linkages.

There has to be improvements in policy-making procedures rather than policy implementation. It has been shown that in the Third-World, little attention is being paid to urban policy-making, urban policy analysis, and policy evaluation,

whereas the thrust today is on policy implementation. Unless all the six hierarchical steps given previously are considerably improved, mere strengthening of implementation will result in strong enforcement of wrong policies. Here again, coming to the urban systems, proper linkages have to be designed, developed, coordinated, and evaluated between different subsystems in a more meaningful way. Public health departments, pollution control departments, population control departments, industries departments, land-use planners, urban planners, transportation planners, energy systems groups, education planners, and water planning and reuse groups have to be coordinated through an Integrated Urban Development Authority vested with the function of overall regional development. There should be better coordination and integration of physical, economic, and social planning in urban areas [50]. Mere addition of parts do not produce the whole. To guide Integrated Urban Development Authorities, there must be uniform national urban system policies and regulations.

In India, Urban Development Authorities do not have any systems planning role since they have derived their origin from tax collection and reinvesting functions for new developments rather than from reorienting and redefining developmental functions.

## CONCLUSIONS

Reorienting the existing trends of growth and undesirable patterns will be resisted by the existing groups since institutions [51] are nothing but social groups which have intensive interest in self-preservation and survival. Organizations tend to resist remaking themselves and only through designing of newer institutions caring for public participation and systems planning, urban environmental quality can be improved. This will not be possible without sincere public participation and political leadership with commitment. If the existing patterns of growth continue, urban crisis of catastrophic dimensions will prevail in urban settlements. Urban problems are not resources-oriented, but are related to self-preservation, resistance to change, and lack of human perspective and integrated planning.

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