

Future Urban Environment of Dhaka City

CITIES are man made landscapes. It is what we make of it or allow it to be. Dhaka city, with all its good and bad aspects is our own making. Dhaka possessed all the ingredients that could make a great city. Among many, depths of history, richness of culture, a potential landscape with lakes, canals and changing flood plains — all within a natural setting bounded by the rivers Turag, Balu and Buriganga. And of course a favourable tropical climate. Unfortunately these factors were not duly taken into account while the city was being developed. Quite a few of these ingredients are lost or under-vent irreversibly transformed, many of these can still be identified and incorporated in our schemes. A deep understanding of its qualities and an active commitment towards its future can revive Dhaka city to its appropriate standing.

Over the years Dhaka city has grown rapidly and extended enormously. Today Dhaka has expanded over an area larger than that of greater London or Berlin. Bigger than the cities Vienna, Oslo, Geneva and Budapest put together. It has a population density comparable to that of the city state Singapore and much higher than that of New York, that is if you consider the area under Dhaka City Corporation (DCC). It is indeed a megacity in the making. Dr Janice Perlman of New York University has pointed out megacities around the world have more in common with each other than with smaller towns and villages in their own countries. This may set the spirit of intervention when we envision a future for the urban environment of Dhaka.

Problem Defined

However, today's problem with increased population density is largely due to an inadequate urban infrastructure and severe planning and management limitations. Progressive degradation of the physical environment is the most visible effect of such patterns of urbanisation. With diminishing public open space, air pollution, increased urban air temperature, flooding, depletion of soil moisture etc. pose serious urban environmental problems. The urban dwellers are inhibited to form any meaningful relationship with their present urban outdoor setting and lifestyles are increasingly becoming introverted. The city dwellers are dissociated from the natural cycle of seasons, local flora and fauna. The city has become a bi-seasonal environment and only relevance that we have of the seasons summer and winter is when to switch on and switch off the ceiling fan or the air-conditioner, that is to those who can afford them. While a

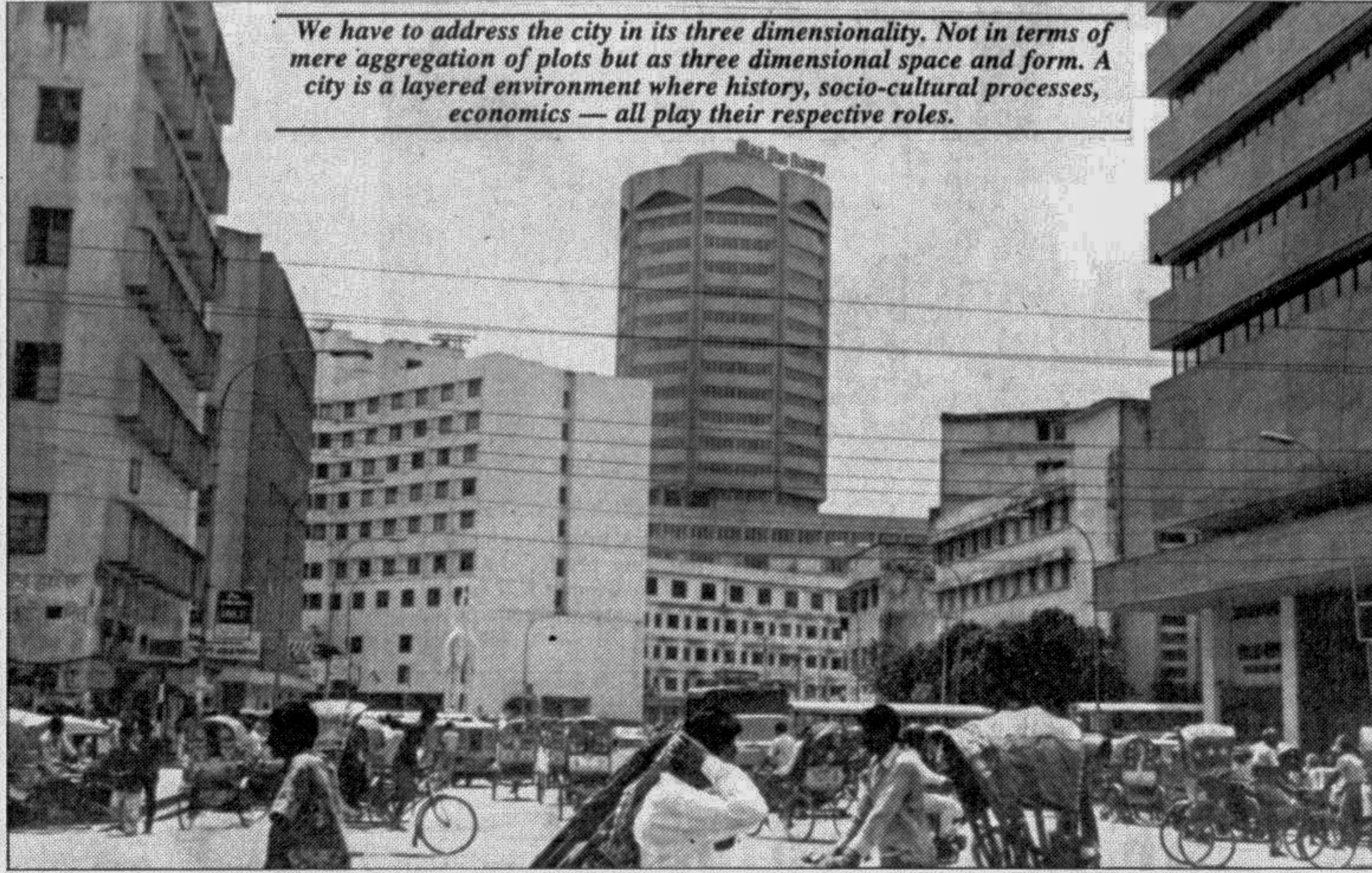
great number of people remain exposed to the ill effects of urban climate, there are ample reasons to revive urban spaces and secure their future in our socio-cultural domain. Ensuring an acceptable standard in the quality of urban life in the present dynamic urban environment is a great challenge for the architects, urban designers, planners and policy makers.

It is interesting to look at available land in terms of city population. The gross population density of old Dhaka is 1,52,719/sq.km. At this rate it would take only 1.27 per cent of the total land area of Bangladesh to accommodate the entire population of the country. While the rest 98.73 per cent can then be allocated for industry, agriculture, conservation etc. Similarly, you can put the entire population of the country in an area of about 8 per cent of Bangladesh at the population density of Dhaka city (DCC area). Things are not that bad even for a small country like Bangladesh with such a large population if we look at the mere numbers. This does not mean that we can start putting people at that rate. These are mentioned only to highlight that with strategic thinking and judicious land use we can still manage and support our large city population. It is not the scarcity of land but the lack of adequate land management that is to blame for the urban ills.

We must rise to the fact that we are dealing with a destined megacity and develop an appropriate design response. It has already grown beyond all previous projections. Decision makers and relevant experts can address the causes of this phenomenon and related issues. But whatever may be the cause of such a demographic shift, the problem at hand for the architects, urban designers, planners, developers and policy makers remain the same. That is to cater a large population and provide a quality environment.

Way Forward

What is evident from it all is that we can only secure a future for Dhaka city and ensure its sustainability by developing it as a high density city. In the process we may be able to retard and contain the urban sprawl. High density living is often associated with pollution, traffic jam, poor sanitation, crowding, low environmental standards, dwindling urban open space. But whatever notion that we have of high density living is based on our experiences with unplanned ill regulated cities or parts of cities. Whenever we think of high density living tall blocks of apartments along with associated social disadvantages tend to inhibit our imagination. This is not only true in the case of Dhaka but



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also in the case of many cities around the world. But it has been mathematically proven that with low rise buildings greater density can be achieved. Low rise high density city can provide a good contact with nature and is less expensive to build and change.

Having said that high rises are not bad altogether, we can still use this building type where appropriate and surely for offices and commercial purposes. The challenge is to make the city a high density high quality city. We have to design and build so as to ensure a climate, responsive built environment, less dependent on conventional forms of energy, higher standards of sanitation and hygiene, good safety regulations and protection from natural hazards.

We have to discard ideas of strict zoning of the city and promote a mixed use city. In this way all of the city area and its infrastructure will be in use at all times. Distance between place of work and homes will be minimised. In a high density city travel distances will be reduced thereby causing a reduction in burning fossil fuel, many people will be able to walk to their respective destinations meaning less cars, less pollution, more interpersonal contact, city services will be easily viable, many private enterprises will develop as there will be concentration of buyers,

by Dr Khandaker Shabbir Ahmed

As people will take to walking and to other non-motorised vehicles outdoor spaces will be reclaimed from cars and a demand for leisure spaces will grow. Government will be encouraged to invest in mass transportation systems such as trams, subway, railway etc. Such can be the nature of future urban environment of Dhaka.

Environmental Strategies

The question is how can we get there? Many of our building rules are arbitrary and lacks sound research foundation. None of the building regula-

tions currently in practice address the city in its mass perspective. There is no notion of blocks nor any other form of urban matrix. Everything is considered in terms of plots and dimensions and there is no concept of urban space or public space. No matter how many nice buildings we put up, the aesthetics of the city can only be improved dramatically by appropriate urban design strategies. We need to change our approach and adopt suitable environmental design methods for the growth of Dhaka city.

Our first task will be to identify a set of environmental strategies for Dhaka city. We can then develop necessary planning and building regulations to promote and control building activities so as to develop a desired built environment.

Instead of providing allocation of large parks, small neighbourhood parks distributed over a large urban area should be considered. As these will have greater access hence better used. Small parks scattered in the urban area have greater microclimatic impact over the adjacent area.

Design Strategies Related to Water Bodies

All forms of water bodies contribute to evaporative cooling, hence should be considered

Design Strategies Related to Human Comfort

Factors of urban microclimate must be included in the development agenda. So that appropriate considerations are given for urban outdoors as well as indoors.

Human comfort issue should be given utmost priority when designing urban space. We have to provide rest areas, drinking fountains, street furniture, overhead shade for instantaneous thermal relief.

Provide all weather pedestrian access in urban areas. Solar shading devices should be considered in conjunction with rain-sheltering. In the case of Dhaka, solar shading is required between the hours 1100 and 1400.

Property development incentives should be in favour of provisions for pedestrian comfort at building level, such as arcade, freeing up ground floor etc.

Increase airflow in urban spaces by appropriately orienting buildings with respect to gradient flow direction.

Design Strategies Related to Urban Greens

Tree canopy should be where possible close to pedestrian areas and not at the centre of the street. Rows of trees can provide adequate shading, particularly during the mid hours of the day. Trees also have cooling potential.

Vegetal cover should be provided to all possible hard surfaces. Vegetal covers such as grass and shrubs contribute to the total quantity of evapotranspirational cooling and reduce surface temperature. Airborne dusts and other particulate can be reduced by stabilising soil surfaces by vegetal cover. Irrespective of building height, roof surfaces should have vegetal cover.

Street canyons aligned with the flow direction or identified to function as wind corridors should not have tree canopy below the building roof line, as the collective roughness of the canopy will reduce airflow. Small or ornamental trees can be planted in wide canyons or open spaces. Suitable location would be near the down wind building.

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Design Strategies Related to Water Bodies

All forms of water bodies contribute to evaporative cooling, hence should be considered

as an important landscaping element.

Canals should be given particular attention along with providing leisure spaces in the city. With appropriate orientation, it can also be considered as wind corridors.

Fountains, sprinklers and microrisers can be used for cooling during hot and dry conditions.

In situations with large open space, flood plain or rivers located in the upwind direction of the urban area, street canyons should be designed to function as wind corridors having minimum aerodynamic roughness (projecting building mass, uneven building setback, large trees etc).

Design Strategies Related to Buildings and Streets

Encourage construction of free running buildings and reduce energy demand of mechanically ventilated building by adopting climate responsive design strategies.

Appropriate design strategies at urban as well as building level needs to be developed to improve daylighting, thereby reducing the use of conventional energy for artificial light. Narrow streets (1:1 H/W) perpendicular to flow direction with elevated blocks or sides have a greater shading and ventilation potential hence should be used where building density is to be achieved.

Urban streets with arcades provide shading and are effective irrespective of canyon orientation. Wide canyons should invariably have arcades.

Northwest-southeast (up to a deviation of 22° from due north) oriented street canyon is the most appropriate alignment; in addition to providing reasonable solar shading, ventilation requirements of the buildings as well as that of the canyons are addressed. This alignment should be used in area layout as it ensures increased ventilation for the longest seasonal period (i.e. hot-weather).

To achieve what we desire for ourselves and for the city, we have to change our present approach of developing and managing our city and look at it in its environmental context. We have to address the city in its three dimensionality. Not in terms of mere aggregation of plots but as three dimensional space and form. A city is a layered environment where history, socio-cultural processes, economics — all play their respective roles; but to develop a liveable city, we must start from the environmental imperatives. I would like to end with a Chinese proverb. Unless we change the direction in which we are headed, we might end up where we are going.

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Development Challenge Flood Management

by N Shams Choudhury

To alleviate flooding requires either to reduce overabundance of water, or improve drainage capability and mobility, or plan human activities, or any combination of the three. This needs to state that flood is a natural and temporary phenomenon, but human activities exacerbate that to uncertain dimensions.

Development depends upon availability and use of natural resources including land and water. Bangladesh with limited land area and regular water shortage during winter fails to satisfy people's needs of both for various socio-economic activities. Floods compound the situation further and pose the most serious threat to her development efforts. Though flood is not new phenomenon in Bangladesh, and bring some beneficial effects to agriculture, fisheries, etc. but most often the benefit is outstripped by the total damage or loss incurred to the nation. Some recurring major flooding events inundate millions of acres of land, turn thousands of villages into islands, maroon countless of people, disrupt and halt normal activities, take toll of lives and livestock, destroy and damage properties and devour or erode substantial land mass. Billions of people displaced and uprooted from their homesteads and livelihoods, are forced to become environmental refugees, and cram in urban fringe areas subjecting themselves to debilitating diseases. The severe devastation of major floods forces the nation to start the development works all over again. The floods, in general, bring no relief to the problem of water shortage during drought.

The challenge is how to cope with the floods that perpetuate continuous, ever enlarging cycle of damages and losses, and undo past and jeopardise future development efforts? The clarification call of the moment is flood management. The purpose of this article is to discuss briefly floods and causes, and various flood related complexities implicating the flood management process; and the range of probable solutions for flood management.

Floods and Causes

In a global sense, the total quantity of water including ice or snow, vapour, rain, etc., available in the terrestrial and atmospheric reservoirs is fixed. Natural forces continuously transfer water from the land and the sea to the atmosphere and back again. Although water

is neither created nor destroyed in this overall cycling process, the amount available at any given time or/and location may vary widely depending upon the effects of different climate and physiographic features singly or in any combination. Such as climatic temperature influence precipitation and melting of ice or snow; increase in temperature, wind, storm, tide, earthquake and volcano swell or produce huge waves of water that sweep land; soil characteristics, vegetation, topography, etc., of surrounding areas and channel bed influence runoff velocity and accumulation. Flood literally refers to partial or complete inundation of land areas normally not covered by water and traditionally usable by man from overflow of inland or tidal waters or from the unusual and rapid accumulation or runoff of surface waters from any source due to effects of natural variations in the climatic and physiographic features. Inland floods are said to have occurred when floodway of established boundary, that includes channel, natural such as river or man made facilities, and the flood plain, fails to drain to a sea or an outlet excessively accumulated water i.e., base flow traversing a channel in any given time falls below its possible maximum. Sea floods are common in coastal areas when its banks are overflooded under the tidal effect.

However, human activities are of most concern that cause climatic and physiographic variations: such as increase in urbanisation, unplanned infrastructure, floodway alterations, deforestation, or industrial activities may influence the climate by greenhouse gases, etc; imbalance the natural process of rainfall or melting of snow or ice; and increase runoff velocity or raise sea water level eventually resulting into flood. Flood will also occur as long as human activities encroach or reduce the lowland and relatively flat areas adjoining inland and coastal areas known as flood plain. To alleviate flooding situation then requires either to reduce overabundance of water, or improve drainage capability and mobility, or plan human activities, or any combination of the three. This needs to state that flood is a natural and temporary phenomenon, but human activities exacerbate that to uncertain dimensions.

Complexities

The flood management process of Bangladesh is susceptible to numerous and diverse complexities. In the domestic arena as well as in the regional and the global arenas. A few significant complexities evolve in the domestic arena from the needs for undisturbed flood plain for flood water discharge, more land to accommodate unbearable multitude of population and their activities, and water during drought. The lands that once belonged entirely to the rivers have now been encroached by villages, agriculture and farm lands, industries, urban and development activities, etc. About two thirds of the total land area are subjected to inundation time to time by one or other kind of severe flooding. Land uses in Bangladesh is substantially flood plain centered. Any alteration of flood plain will definitely influence either drainage capacity or the land area for uses. Flood plain activities or uses influence the extent and consequences of flooding.

On the other extreme, land uses and socio-economic development activities are closely linked with water availability. Winter drought baffles Bangladesh's development activities. For adequate water supply in winter, reservoirs and good irrigation system are necessary. But, her inherited topography, mostly of low-lying deltaic flat plain with a maximum height from sea level less than 100 feet on the north, drainage system of rivers with

entire reach most of which not under her domain alone but shared by four other regional countries, and outlet to Bay mainly one, aid little to relieve her drainage and flood problems during summer, and drought problem in the winter.

The flooding problem of Bangladesh is due not only to her own share of rain precipitation raising the water level, implication of tidal back water effect at the coastal area of drainage impasse, etc., but the natural runoff of a basin area of 625,500 square miles, of which Bangladesh represents only seven per cent, that drains down to the Bay through her land area. Land uses in the riparian countries and global human activities especially that of the developed and industrialised countries also plague her with uncertain nature of floods. Her difficulty to drain and vulnerability to flood are exacerbated manifold from increased and uncertain runoff due to ever increasing unplanned human activities, land uses, flood control measures and other facilities of the riparian countries in the upstream; such as, urbanisation, deforestation, infrastructures, flood control structures, barrages and dams for unilateral withdrawal of water during drought and release during flood, etc. The developed and the industrialised countries cannot deny their responsibility to some extent for the flooding woes of Bangladesh due to their industrial, deforestation, and other activities producing substantial amount of greenhouse gases leading to a major climate change. It is time to reckon that riparian and the developed countries are benefiting themselves at the cost of increasing suffering of Bangladesh.

Probable Solutions

Flood management has evolved primarily from the need for improved drainage capability and elimination of inconveniences to drainage, to emphasise more on the need for protection of life and property, and finally to embrace the need for efficient use of land and water resources with comprehensive approach. The probable solutions thus may be supply or demand oriented, or a combination of both. Traditional approach is supply oriented and provides flood, drainage and erosion control structures with emphasis to modify flood behaviour and restrict the movement of waters beyond a flood plain of designated risks.

Long term supply measures usually contemplate for larger and stronger structures such as dams and reservoirs to decrease peak flood stage downstream and for various uses of water; earthen embankments or concrete flood walls to prevent encroachment of floodwaters; by-pass channels and spillways to divert excess flows, channel modifications to carry off floodwaters quickly in a particular location; small dams, embankments, or excavations to control runoff and work as small detention basins; watershed improvement to control, decrease or delay runoff, and reduce erosion by employing vegetation cover, regrading forest; and others. Short term approach includes repair, maintenance and reconstruction; emergency measures like sand-bag barriers to divert water, pumping to remove water, etc. Structural measures, in general, are expensive. While some measures may increase flooding magnitude downstream, others are vulnerable to the tendency of rivers to change

course after each flooding, or cause dysfunction consequences and negative environmental and ecological impacts. The flood behaviour is found not always amenable to control.

On the other hand, human activities — socio-economic, etc., that create demand are more amenable. Various measures and adjustments based on degrees of risks may influence demand of land uses, control activities in flood plain areas, limit exposure of both lives and properties to floods, reduce susceptibility to flood damage and disruption, and minimise adverse impacts of floods on the individual or the community. The long term demand may be influenced by regulations and ordinances covering planning, zoning, development, flood proof and protection codes, etc., for various land uses including construction of infrastructure, transportation, installation of utilities, public facilities and institutions, etc., in the flood plain areas; subsidised land or housing, raised ground with infrastructure, flood protection and other facilities or various encouragement to avoid isolated development and high risk flood plain; no development without environmental impact assessment, impact or drainage fee, or other measures to maintain original downstream flow; discourage private levee or flood proofing that guarantees no appropriate maintenance and long term protection; and flood insurance of properties to the extent of flood exposure.

Short term demand measures are involved with various agricultural, fisheries, livestock, forestry, etc., activities and practices; and related incentives like financing, agriculture subsidy, etc. Dissemination of information on flood hazards boundaries and vulnerability, flood warning systems, and disaster plans like shelter, relocation, income rehabilitation; food, drinking water, and medical aid programmes, training people to respond and evacuate are also short term demand oriented human exposure control measures. This demand oriented non-physical approach requires flood plain uses to cause no drainage inconvenience or increase of water surface elevation to flood properties located adjacent upstream or downstream.

However, increase in population, urbanisation, economic development, demands for alteration of flood plain for more land and more water supply, and concerns for economic and environmental costs have resulted to favor more comprehensive and integrated approach with a combination of supply and demand oriented structural and non-structural measures. The approach leads to build a system of several components, which all together act as a single unit to effectively and efficiently strike a balance among multiple purposes i.e., to improve capability and mobility, reduce flood damages and losses, and control water flow in response to various land and water related needs of the people instead of several separate single purpose projects.

Remarks

Flood management of Bangladesh to complement development process needs to expend substantial effort to balance between the needs of flood plain for drainage and land uses, with coordinated planning, not independent, of the two within the country; share multipurpose storage facilities upstream to circumvent the local topographical limitations; and contain uncertain nature of and accommodate flood impacts and risks due to activities in the riparian and the developed countries.

What approach is the best to cope with and manage the flooding situation in Bangladesh? Is it only supply oriented structural measures or

demand oriented non-structural measures? The answer is definitely a combination of measures but with the philosophy that more structures may not provide better solution. The choice of options is not a simple one to resolve easily and requires development of Master Plan with comprehensive, integrated and basin-wide approach; and that addresses all the complexities — domestic, regional, and global, and other aspects that might in any way influence the extent of flooding. Master Plan in hand will prepare Bangladesh for implementation of most suitable options or measures not only for expected flood, but to accomplish desired results and also prevent uncertainties and avoid crisis to occur.

It is an enormous task for Bangladesh alone to make her flood management effort effective and beneficial for the entire region and the global community. It is only rationale to push for and expect appropriate cooperative response towards her efforts of flood management from riparian, the developed and industrialised countries. In an increasingly interdependent environment there is no substitute to cooperation of all the parties concerned; falling otherwise, may lead to infinitely larger crisis or disaster for all and jeopardise everyone's welfare and well-being. However, if good sense of the parties prevail neither the problem of floods should be accepted with equanimity nor the needs of the people to be side-tracked, rather Bangladesh should proceed with the local segments of Master Plan.

ADDENDUM

The article "Keep an Eye on the Distressed Pockets" by Atiur Rahman published in this page on Tuesday (Oct 27) was based on information collected and analysed at the Nagaraj Durjog Mokabilla Uddog led by Prof Rehman Sobhan, Dr Binayak Sen, Dr Imtiaz Ahmed, Dr Saleh Uddin Ahmed and Dr Syed Hashemi contributed directly to the identification of the most vulnerable areas.

