GLOBAL KNOWLEDGE CITY – ENVIRONMENTAL SUSTAINABILITY

An important aspect of the USP of the proposed Knowledge City will be its promise of upholding environmental responsibility.

The Global City's infrastructure and building systems will be developed and managed on the principle of environmental sustainability. It is asserted here that this fundamental principle will underpin its long term economic security, while it provides a competitive advantage in the emerging global market for investment in urban development. Particularly with Knowledge being adopted as its principle economic activity, the Global City would be addressing a clientele which already endorses and values environmental responsibility as being central to the enterprise of urban development.

Environmental sustainability is compatible with economic security as it promotes efficiency in the use of energy and material resources. It is compatible with health and recreation as it ensures the protection and regeneration of the natural environment.

The operational structure of Environmental Sustainability for Global City is outlined below.

1. UNEP Incentive for Reduction in Carbon dioxide Emission

The United Nations Environmental Programme (UNEP) offers an economic incentive through its global carbon trading mechanism. Reductions in carbon dioxide emissions below the prescribed benchmarks for developing countries, which are achieved by afforestation or by efficiency in energy utilization in transportation system or building & infrastructure operation, – can be sold in the international market and earn foreign exchange.

The City Development Corporation shall engage an agency to monitor and evaluate savings and manage the transactions provided under the Kyoto Protocol of the UNEP.

The economic advantage/incentive can be transferred to or shared with investors and can be ensured by adopting an appropriate energy policy for the city, and by establishing development controls and building bye-laws that fix benchmarks and encourage energy efficiency.

2. Energy Efficiency as an Economic Measure

Energy supply and its efficient utilization will be the backbone of the urban infrastructure. The complementary strategy to mobilization of electricity supply from the national electricity grid would be a proactive strategy for controlling energy demand. There is a potential for reducing demand by 30% of current norms even while providing for modern standards of service and comfort. This saving is translated into triple benefits – first reduction is in the cost of building the plant capacity for supply, second, is in the saving of primary fuels for production of energy, and the third, in converting this saving into a tradable commodity that earns foreign exchange.

3. Six Levels of Strategy toward Energy Efficiency

i) Energy Tariff Policy

Distribution of electricity in the city should be managed by a contracted business corporation. The tariff policy should be designed to encourage efficiency in energy utilization, balancing out variations in demand and incentives for cogeneration through environmentally sound measures. The following elements of the Tariff Policy are identified.

- **Differential tariff for bulk consumers for day and night uses:**

Bulk consumers will tend to be those who have elaborate production and air-conditioning facilities. If the consumption of electricity is encouraged to be spread evenly over the 24 hr. day/night cycle, by charging night-time consumption at lower rates than day-time consumption, then the peak demand for the generation and distribution system is brought down. This measure is adopted world-wide. The containment of peak demand is translated into smaller capacities required for the distribution infrastructure and also reduction in the demand for additional generation capacity.

- **Disincentive for inefficient use:**

Efficiency norms have been established for technically and economically achievable levels of electricity consumption for various categories of consumers. These can be translated into an incentive/disincentive based tariff structure, which does not subsidise electricity, and charges heavily for inefficient consumption. This regime, supported by an

advisory and technical consultancy service, will discipline electricity consumption and reward efficiency.

- **Co-generation of electricity by alternative technologies:**

Co-generation by consumers should be permitted provided they use non-polluting technologies. Biogas, bio-mass based gasifier and wind turbines would be encouraged. Consumers, especially those for whom "environment" is an important constituent of brand identity, would adopt solar photovoltaics for electricity.

Sale of excess production by a consumer back to the electricity provider's grid, through reverse metering will be permitted. This system has been installed in many cities. Low/medium density Middle-income housing with photovoltaics systems can become "zero energy" consumers when reckoned on an annual cycle.

ii) <u>Transportation systems</u>

- **Inter-City**

Rail transport linkages and enhancement of capacity for inter-city travel – especially to the international airport should be developed as the preferred primary transportation mode. This is the safest, quietest and most cost-effective mode of inter-city travel. Connecting this system to Delhi & Gurgaon Metro through the Indira Gandhi International Airport will facilitate commuting. This will improve the information and economic exchange and bring a wider net of services crucial to the initial stages of the City's development. The payback of this investment in energy-savings and CO_2 emission reductions alone is very attractive.

- **Intra-City**

A public transport network based on airconditioned and non-airconditioned bus service, run on CNG as the engine fuel, for major intra-city transportation routes, coupled with electric trolley or vans, and cycle rickshaw for feeder transport is proposed. Special attention is to be paid to safe, convenient and comfortable pedestrian access to transportation nodes. This infrastructure will reduce dependence on individual motor vehicles, thereby minimising air & noise pollution. The reduced CO_2 emission at an

aggregated urban level for such a system will be significant and may be eligible for CO_2 trading through the UNEP CO_2 trading mechanism.

An intra-city transport system based on comfortable and convenient public transport also reduces the demand of land for vehicular rights of way and parking. At the neighbourhood level, giving priority to safe and comfortable space for pedestrian and cycle movement would promote an inherently compact form of planning. This compact pattern, in turn, reduces both the demand for land as well as the cost of laying urban infrastructural services. It is essential, however, that an integrated transport system precedes demand to obviate the necessity of private transport for day-to-day journeys.

Therefore, a transport policy preferring public transportation based on rail and CNG buses tends in many ways to an overall economic efficiency of the City.

iii) Design & Operation of Public Utilities

Street & Public space lighting, conveyance of treated water and collection and treatment of water-borne or solid waste are the three Public Utilities where considerable efficiencies over present rates of consumption can be achieved.

- **Street & Public Space Lighting**

Design of illumination levels, selection of efficient fixtures and automated controls should be planned from the outset. The Indian Society of Lighting Engineers has demonstrated a saving of 30% over current consumption, in demo installations in New Delhi.

- **Conveyance of Water Supply**

To reduce consumption of electricity in conveyance of water the first strategy is to establish a decentralized re-cycling system of treated waste for non-potable uses. The second strategy is to use subsoil water of acceptable quality within the limits of ground water recharge rates in a decentralized pattern. These two together reduce the water demand for primary source development and conveyance from outside the City. This results in consequential savings in the electricity required for treatment and conveyance of this imported water.

- **Waste Treatment of Water Borne Effluent**

A decentralized system for treatment of water carrying biological wastes is amenable to natural systems of oxygenation requiring very little electricity. Such systems also obviate the need of pumping sewage to distant treatment plants, when ground gradients are small. The complementary benefit of this decentralization is the relative ease of re-cycling treated water for non-potable uses. The land required for such treatment can be integrated with recreation and green zones, and with careful management can become an aesthetic asset rather than being a liability.

Toxic, non-biological wastes will not be allowed into the public utilities network and must be treated by its producer at his own expense.

iv) <u>Development Controls & Building Bye-laws.</u>

Development Controls determine the intensity and distribution of buildings and their uses on a given tract of land. These controls have a bearing on the consumption of energy in the construction and operation of buildings in the following way.

To convey materials and people from one place to another takes energy. To roll or flow things along the ground or horizontally requires the least energy. To take things upwards against gravity requires the most energy. This simple observation when translated in the development controls prescribes horizontally compact low to medium-rise (upto six stories high) form of buildings. The horizontally compact structure makes walking or cycling a preferred mode of movement. And not building tall has the double advantage of saving energy first in carrying building materials at the time of construction and then saving energy for as long as the building lives, in taking people and materials up and down several storeys.

So, Development Controls should favour low-medium rise compact patterns of building.

v) <u>Building Bye-laws</u>

There are areas of energy consumption which Building Bye-laws can help to curtail – electric illumination and indoor air-conditioning.

For residences, and buildings of public service such as schools and hospitals, insistence on day-lighting of at least 70% of the built-space can be enforced. Building bye-laws can be designed for this purpose. Electric illumination during daylight hours can and should be avoided.

The need for air-conditioning or air-cooling is related directly to the transfer of heat through the external fabric of a building. Where buildings are likely to be air-conditioned or air-cooled the bye-laws will insist on a minimum standard of insulation in the roofs, walls, and windows, and minimum standard of shading against the hot sun falling on windows.

These two measures, which are a norm in many parts of the world, are a benefit for the user at little or no extra cost. Together, in a typical office building they can reduce peak electricity demand, compared to current norms, by 30%. This means that the demand on supply capacity of the energy provider is also 30% less. And similarly the consumption of electricity over time is reduced by the same factor.

vi) <u>Water Management, Vegetation and Microclimate</u>

On the whole, vegetation has a stabilising effect on the microclimate of its immediate surroundings. This improvement in microclimate has a compounding benefit. Outdoor temperatures near 'green' areas are found to be 3^0C lower than in barren areas of the same city. This means both a reduction in the duration of the need for air-conditioning as well as a reduction in the amount of airconditioning to be delivered, due to lower external temperatures, during the period when air-conditioning is required.

A micro-climate of a semi-desert area can be modified by simple management of water for establishing permanent, hardy vegetation. This has been achieved with dramatic benefits in Israel.

Summary

The conservation of Energy and Water, and the protection of the environment – air, water & ground from pollution – must be an integral part of the Global City Development Plan. Although this section looks at environmental sustainability primarily from the standpoint of energy efficiency – water, forestry and waste management would play an equal role.

This value if built into the Plan and the city management mechanism, is eminently saleable in the progressive knowledge industry world-wide.

Further it works in the direction of economic advantage and long-term sustainability of a modern city.

The systems and techniques for implementing it on the ground are available and can be readily adapted.

Ashok Lall

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