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Review Article

Concepts for Urban Planning Towards Sustainability and Improved Habitability: Participation of Individual, Society, and Governance

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Abstract: In modern urban life in developing countries like India, many issues are building up due to the irresponsible and careless behavior of the population and governance alike. The wheel of time cannot be turned back to eliminate the sources of these societal problems arising out of modernization. However, there are simple and easy steps which an individual or a residential or commercial society may take to alleviate these problems. It calls for a change in the mindset and slightly modified perspective to implement these changes. The objective here is to inculcate and adopt sustainable and environment friendly practices and habits by modern urban population so that the cities would become a better habitat for the human race in future. There are financial commitments to be made and here, local governance may offer tax rebates to offset the expenses incurred by individual / societies in adopting the eco-friendly lifestyles. Few concepts which may pave the way towards this goal have been discussed with reference to the Indian cities. This would call for educations and awareness, participation of individual and communities, the monitoring role by the governance with reward and penalty system, as the case may be. The concepts discussed are based on the life in Indian cities but could be applicable, in part or whole, for the cities in other developing countries of the world. The models presented here can be considered while planning the infrastructure and stipulations for new / developing cities by the government.

Keywords: Recycle, Habitability, Sustainability, Urban Community, Reuse, Rainwater Harvesting, Composting

1. Introduction

In today's world, there is large-scale increase in the urban communities with rapid augmentations in industries, manufacturing, and services sectors. The living standards of the urban population, in general, are improving with accessibility to technology, health, education, sanitation and other modern amenities. Alongside, there is increasing demand for the resources like power, fuels, water, and space – all of which comes at a high cost in the modern urban era. Urban communities have become largely dependent on gadgets, which are driven by electrical power or fossil fuels. Machines and electronics have infiltrated every corner of their lives. This not only causes exponential increase in power consumption, but also generates the wastes and heat during the process of operation. The effects are often self-propagating. For example, the air conditioners, which have become a normal necessity in the urban life, act as a heat source and elevate the ambient temperature in closely spaced high-rise buildings. This in turn makes air conditioning indispensable and further, increase the load on the air conditioning machines, thereby increasing the power consumption.

The green spaces are conveniently sacrificed for the parking facilities for vehicles and are compensated by artificially created 'play area' in the modern housing societies. The communal green spaces and parks, which are under the control of local governance, also are getting squeezed by the increasing pressures from the 'development' and 'infrastructure'. Though these improve the human life by modern standards, the quality of the life led by the urban population is on a continuous declining trend. Latest medical

facilities, which become available by the improvements in 'infrastructure', become a necessity for majority of the population due to their poor health. People in today's cities have grown used to a life which is far away from the nature from which man had sprung. Technological progress is good, infrastructure development is necessary, advent of electronics and telecommunication in human life is inevitable, but should it cloud man's reasons and senses? It is high time the urban man got wise and started 'using' the improved technologies and infrastructure instead of 'getting used to' them. Man should be in active control, not a passive onlooker or victim of the technologies and improvements.

What is required of the urban man is to be educated, informed, conscious, judicious, intelligent and active in managing the available technologies and resources to the best possible ends. And there is no better place to start than one's home, that is to say, the urban housing societies and office complexes. This article puts forward certain concepts for enhancing the quality of life of urban communities. These are not claimed to be novel or comprehensive or inclusive. Rather, these concepts would provide the direction in which urban people should think and act. The author firmly believes that if genuine effort from intelligent population is there, no doubt many more avenues would emerge for implementation of the concepts proposed in this article. The issues pertaining to the quality of life of urban man, as discussed in this article, are drawn from experiences of the author in the Indian cities. Further, these would be applicable to many developing countries of the world, where urban man would be facing similar predicaments.

After this introduction, some issues facing the urban communities are discussed in section 2. The concepts to address the issues raised in Section 2 are elaborated in section 3. Section 4 contains discussion pertaining to the implementation of the concepts and the concluding remarks are presented in Section 5.

2. Few Issues in Modern Urban Life

Traditionally, movement from rural to the urban areas indicates development and upward movement in life. Just as the standard of life of a country had been judged by the per capita power consumption, or the industrial advancement had been evaluated by the sulphuric acid consumption, the progress of a community is still indicated by the expansion of the urban communities. Urban life ensures access to the modern facilities and amenities like education, sanitation, super-speciality medical centers, and all other advantages that technologies can bring. So the rural population is rapidly getting transformed into semi-urban and then urban population with expansion in the industries, factories, offices, etc. However, there are many flipsides to the rapid urbanization. Some of them are discussed here.

2.1. Space

One of the major issues which urban communities face is the acute shortage of space. The buildings, be it residential or commercial, are closely spaced, have minimum floor to floor height and lack of through ventilation is accepted feature. Above this comes the increased pressure to create more parking spaces, as both at home and office, urban men require space to park their cars. Travel by personal car not only assures convenience and flexibility of transport but also is taken as an indication of personal status and growth in the society.

2.2. Greens

Rapid urbanization and industrialization have forced the greens away from the urban locales. As indicated in the earlier sub-section, space has to be allocated for the various facilities and amenities for the exploding population in urban areas. Now space cannot be created, it can only be reallocated. And in this reallocation, the first and the most tragic casualties are the trees and green spaces. Thus, man is left to live in a concrete jungle which apart from being aesthetically poor, causes further problems like higher carbon dioxide percentages in air and higher ambient temperature. The green spaces are a requirement for the human eye and also for the games and sports, especially for the children and young adults. All these requirements are compromised due to lack of greens in the urban communities.

2.3. Water

Water is life. Be it rural or urban habitation, man needs water for living. In case of urban locality, there are additional concerns about the cleanness or potability of the water, which is supplied in the piped networks. Apart from the failures due to power shortage or machine breakdown, a common problem involving water in urban area is the propensity to contamination.

Another aspect of the water is its scarcity in many places. With high-rises adorning every horizon, the urban settlements try to support a population much beyond the capacities of the particular area. The only possible solution is transmission from distant places with associated troubles of breakdown and transmission losses in addition to the additional expenses which the urban man has to bear.

Coming to the groundwater scenario, the general urban trend is falling groundwater. This is largely because of the paving and concreting of every available space in urban locality for some purpose or the other. This causes more surface runoff and limits the recharge options of the groundwater. At some locations, at least part of the water supply is from the ground water. In order to maintain the supply while facing falling groundwater, deeper bore wells are sunk which further depletes the groundwater. Even where groundwater is not pumped for water supply, the groundwater performs important functions of supporting the flora and fauna of the region, thereby controlling the ambient temperature. Plants and trees draw the ground water for thriving and falling groundwater pushes the shallow rooted species towards extinction. Man tries to compensate by active gardening which adds to the already heavy demand on the supply water.

2.4. Clean Air

As discussed in Section 2.2, rapid urbanization and industrialization have forced the greens away from the urban locales. The plants, trees and gardens perform the important function of purifying the air by consuming the carbon dioxide exhaled by the humans during photosynthesis and giving out oxygen as a byproduct. With the declining numbers of trees, the oxygen level in a locality falls and the carbon dioxide level increases which is unhealthy for the man. Respiratory problems, lethargy, and headaches are common problems of breathing in oxygen scarce air. Additionally, due to the exhausts of the umpteenth vehicle, emissions from the many factories and manufacturing units and poor implementation of the emission standards, the levels of other harmful gases such as sulphur dioxide and carbon monoxide increase, which adds to the human woes.

2.5. Radiation from Transmission Lines/Cellular Antennae

As indicated earlier, modern man living in cities is heavily dependent on electrical power. The supply from the power plants, which might even be away from the city limits are brought to the local sub-stations by the high voltage transmission lines. The radiation effect of these transmission lines are felt up to certain distance from the lines and towers. It has been reported that historical US mortality and electrification data suggest that all the so-called "diseases of civilization" including cancer, cardiovascular disease, diabetes and suicide are caused by electromagnetic field exposure [1]. The same would be more relevant for developing countries where the statutory limits are higher and the implementation of regulations is poor. But due to pressures on space, the statutory distance gets reduced to suit the local governance. As a result, the public residing in these areas get exposed to the harmful radiations. In some cases, children parks and gardens are placed below the transmission lines. It is ironic that the people coming for recreation and relaxation to these green spaces get exposed to ionizing radiation.

Together with cell phone towers, dirty electricity (high frequency voltage transients), arcing and sparking fall among the topmost sources of electromagnetic radiation exposure to human [2]. For example, it was found in study that compared with children whose birth address exceeded 600m from a high voltage power line, those with birth addresses within 200m had a relative risk of leukaemia of 1.69, and those between 200 and 600m had a relative risk of 1.23 [5]. Another case was reported for a patient with six miscarriages after two healthy births, where in her workplace, she later recorded high EMF levels (>140 m Gauss) in the vicinity of her head when fluorescent lighting in her workspace was turned on and high EMF levels (~180 m Gauss) adjacent to her sewing machine. With this rectified, she could overcome the problem [5].

The recent menace is the antennae of the cellular service providers. In India, crores of people live within the range of radiation from cell phone towers. Further, the limit of power density adopted in India is one of the highest in the world (9.2

W/m^2) and signals get concentrated from all directions towards the antennae and affect the well-being of the people living in the adjoining areas [3, 4]. The cellular operators provide large and attractive compensation to the housing societies or commercial establishments for permission to set up their towers. The gullible / greedy management of the society lap up their offers. The unwilling occupants of the respective buildings around the greedy housing / commercial societies are forced to pay the price. For example, taking four operators on cell tower base station, with the gain in directional antennae as 17 dB, 6-7 kW of power may be transmitted in the main beam direction [3]. For 3G and 4G transmission, these would be higher.

Restlessness, disturbance of sleep patterns, and general ill-health are common problems which have been scientifically established to be associated with the radiations from the cellular towers. More severe problems such as increased brain cancer risk, impaired motor function and memory, irreversible infertility, DNA damage, other human health problems as well as harmful effects on the birds, animals, plants and insects are documented in literature [3, 5]. For example, in a building in Mumbai, three transmitters in each direction totaling to 0.1 W/m^2 resulted in cancer to several people in a span of $2 - 3$ years [3]. The safe limits adopted by India for GSM900 band is 4.7 W/m^2, which turns out to be equivalent to 19 minutes exposure to microwave oven per day, assuming a single operator, which is seldom the case [3]. This scenario is alarming and implies that the limits need urgent attention, consideration and revision. Again, the limit should be cumulative instead of individual, as is presently prevailing. There have been suggestions that the self-declaration should be abolished and independent agency should be empowered to monitor the radiation levels at different locations in the cities on continuous basis [3].

Very often it is found that one building would have ten to twenty different antennae installed by several operators at various levels. Compared against the government stipulation of a maximum of one on any residential building, these are colossal violation of the guidelines and increase the hazard manifold [3]. However, just as general public lacks awareness of the menace and the will to lodge formal complaint, the governance is reluctant to implement the stipulations, for their own vested interests. Even medical practitioners are often unaware of the health risks associated with the electromagnetic radiation [5].

2.6. Electronic and Electrical Waste Disposal

Disposal of electronic and electrical wasted is another problem which the urban man if facing today. In most cases, they are unaware of the actual proportions of the crisis looming up due to casual and irresponsible disposal of the electronic wastes. Man has become addicted to gadgets. The manufacturers of these gadgets are introducing new features and creating an artificial demand for new and newer gadgets. Additionally, the electronics of the day are manufactured for a life of around one year, after which due to constant problems, man opts to change to a new model. For example, the average

lifespan of a new computer was reported to have decreased from 4.5 years in 1992 to an estimated 2 years in 2005 and was further decreasing, resulting in much greater volumes of computers for either disposal or export to developing countries [8]. It was mentioned that around 500 million computers became obsolete between 1997 and 2007 in the United States alone and 610 million computers had been discarded in Japan by the end of December 2010 [8]. Interestingly, the major e-waste problem in developing countries arises from the importation of e-waste and electronic goods from developed countries because it is the older, less ecologically friendly equipment that is discarded from these Western countries; 80% of all e-waste in developed countries is being exported [8].

Further, as a part of maintaining their societal status, man is required to go on changing the décor of their homes / offices and also the electronic gadgets. All these forces are working towards creating an abnormal buildup of electronic and electrical waste from the modern urban household / office. Further, treatment of electrical and electronic waste is challenging for engineers, consumer electronics companies and policymakers since it involves the consideration of ecological design, technological opportunities and the price of noble and rare metals [6]. Surprisingly, even with statutory warnings / information on the manuals of these gadgets, man has remained unaware / ignorant of the menace of the electronic waste. The 'throwing away' of these wastes to the local soil or regular disposal of these wastes with the household garbage create multiple ecological problems to the society and these have been well documented [7, 8].

Part of the electrical and electronic waste is made of plastics and polymers which do not degrade for long periods of time. When disposed in soil, they choke up the soil and create problems for the local flora and burrowing animals and insects of the ground. Another part of the electrical and electronic waste consists of metals and compounds which are entirely foreign to the soil. They would slowly leach out into the soil and would have adverse effects on the fertility of the soil. They further pose problems for the animals, worms and insects living in the soil. Toxic metals (mercury, antimony, barium, lead, nickel, etc.) and polyhalogenated organics including polychlorinated biphenyls and polybrominated diphenyl ethers can be released from e-waste, posing serious risks of harm to humans and the environment [9, 10, 11]. They may even spread through the groundwater flow to larger parts of the region. Often, these wastes are disposed with the regular household wastes, which are incinerated in the garbage disposal kilns which yield toxic gases to the atmosphere.

E-waste disposals impact human health in two ways, which include: (a) food chain issues: contamination by toxic substances from disposal and primitive recycling processes that result in byproducts entering the food chain and thus transferring to humans; and (b) direct impact on workers who labour in primitive recycling areas from their occupational exposure to toxic substances [8]. The single largest reason for this growing menace is the ignorance of the modern urban man and their irresponsible behavior.

2.7. Plastics and Polymers: Use and Disposal

At present, an urban life without plastics and polymers is unthinkable. From packaging of grains, provisions, biscuits, bread, milk and milk products, vegetables, fruits and juices, to the ready to eat items are all packaged in plastics. From soap, shampoo and cosmetics, to the dresses and linen – everything comes in polythene covers. These covers keep them fresh, prevent ingress of moisture and dust and thus play a very vital role in hygiene and cleanliness of the products available in the urban market. Plates, bowls and spoons, buckets and mugs, doors and door handles and very other utility item one may think of are coming in high grade polymer compounds. These come in attractive colors and patterns, are easy to maintain, durable, microwave safe and food grade for the use of urban population. During the last 15 years, the global annual production of plastics has doubled, reaching approximately 299 million tonnes in 2013 [13]. Typical distribution of the plastic use may be drawn from that of Europe, where the use of plastics is mostly dominated by packaging (38%), followed by building and construction (21%), automotive (7%), electrical and electronic (6%), and other sectors (28%), such as medical and leisure [13].

The problem with the plastic is their disposal. The ignorant and / or irresponsible urban man throws away the plastic wrappers which get into the soil and adversely affects the fertility. Disposal of plastics and polythene with kitchen waste result in dogs, cats, cows or other animals to eat the plastic along with the thrown away food and cause them discomfort and ill health. The plastic bags often get washed into the drains. They choke up the drainage channels and aggravate the flooding or water-logging problems in the congested cities. Studies have been conducted for evaluating the environmental impacts of scientific disposal options of the plastics [12]. Additives are present in the plastics, which enhance functionality of polymer products. However, they may contaminate soil, air, water and food e. g. food contact materials, such as packaging; or they may be released from plastics during the various recycling and recovery processes and products [13]. For example, plasticizers have been reported, being of comparatively low molecular weight (300–600 g mol^{-1}), to potentially migrate from packaging materials into food, thereby becoming indirect "food additives [13]. Another example may be that phthalates exhibited an extremely high-transfer (migration) rate (350%), when used in gasket material for closures, in a study using olive oil [13].

3. Few Concepts for Better Quality of Urban Living

In this section some concepts have been discussed which would improve the quality of urban life. These are based on simple principles such as respecting nature, reduce, reuse, and recycle. These concepts are not claimed to be novel – they have been advocated over last several decades. Some of them are already practiced in certain localities. The challenge now is to extend these to all the cities and semi-urban locales in the

country. The implementation schemes presented here might be somewhat new, perhaps making them old wine in new bottle. As mentioned earlier, the concepts are presented with reference to the present Indian cities and they would be equally applicable for the cities of other developing countries as well.

3.1. Plantation in Residential/Commercial Societies

It is advocated that in each society, residential or commercial, it should be made mandatory to have a certain number of trees and certain number of plants inside the society premises. The guideline can be, say, one tree and two plants for each 100 square meter of built-up space. The societies may be encouraged to plant saplings to meet the guidelines immediately such that the beneficial effects may be felt within the next few years. Annual audits should be planned to ensure that the existing trees and the new saplings all are properly cared for. More greens to soothe the eyes, cleaner and more oxygen rich air to breathe less dust, more shades and cooler atmosphere would be among the envisaged advantages.

3.2. Solar Heaters

Hot water for bathing, washing, and kitchen is a common requirement. This is met presently by electric heaters or the cooking gas in most of the cases. In countries like India where most of the cities have ample sunlight during the days for better part of the year, solar heaters must be encouraged to replace the electrical and gas-based heating of water. For example, in Pune, India, solar heaters are actively popularized by the governance and many household and commercial establishments have switched to solar heater for the hot water requirements. This would utilize the abundant and free solar energy for years to come. Of course, the installation costs would be on issue but considering the continuous returns in form of savings in energy / gas bills this should appeal to the urban people. Reduction in use of the conventional energy sources and switching over to renewable energies is the need of the day.

3.3. Rainwater Harvesting

Majority of India receives substantial rainfall from the southwest monsoon during four months of the year, from June to September. In the present urban settings, due to the reasons like concreting of most of the available surfaces for parking or ease of 'maintenance', absence of green patches such as parks and gardens, the rainfall accumulates as surface runoff. The surface runoff, in case of torrential rainfall spells as experienced in India, create problems of drainage and often lead to water-logging in many areas. Over and above, this water is discharged into the streams / storm water disposal canals with little replenishment being done to the groundwater.

For last couple of decades, the solution of the aforementioned problem has been proposed as rainwater harvesting. This has to happen at societal levels for maximum impact. Hence, each urban society should mandatorily install and maintain a rainwater harvesting scheme. As a scheme, it is very simple: collect all the rainwater through pipes / channels and drain it to a pit specially made for returning the water to the groundwater reserves. Schemes are available along with schematic diagrams for smooth implementation of rainwater harvesting on the web [14, 15] and they have been promoted in few cities like Hyderabad. The expected benefits would be cooler and greener societies, improvement of the groundwater table and to a large extent, solution of water-logging problems among others. Application of multi-criteria decision analysis and GIS based models have been reported for locations in India [16]. Practical implementation of the experience and knowledge gained during these studies would be required to extract the actual benefits of the rainwater harvesting.

3.4. Reuse of Bathwater and Wash-Water (Grey Water)

The major part of the water consumption in households is for washing and bathing, for which potable water is required. The regular practice is to drain this waste water into the wastewater / sewage canals and dispose it. Another water demand in societies is for gardening and flushing purposes for which potable water is not a requirement. However, for want of information / knowledge as well as the supportive infrastructure, potable water is used for this purpose. Water from the bath or wash from normal household is clean enough to be used for gardening and flushing after some rudimentary filtering operation. In modern day of urban water scarcity, installation of the systems for this sort of reuse and recycle of the wash and bath water have to be taken very seriously and implemented mandatorily.

Of course, implementing this scheme would require a pipeline to take the water from baths and washes to separate tanks after filtering. The tanks for storing the water for reuse have to be constructed and the filtering assemblies have to be installed. Then another pipeline and pumping arrangement would be required to take the water back to overhead flushing / gardening tanks for later use. Installation and maintenance of these additional systems would involve a bit of expenses. Properly implemented, this would not only reduce the water demands of the society but would reduce the load on the sewage system / discharge channels. Any additional water demand due to the mandatory plantation schemes would be easily met from the reuse of the bath / wash water. These would prove to be the intelligent and environment friendly options in the long run. The economic and environmental cost benefit analysis models for harvesting of rainwater and grey water are present in literature [17].

3.5. Composting

A major part of the household waste comes from peels and inedible portions of vegetable and fruit or cooked matter. All these are completely biodegradable. In few cities in India, segregation of biodegradable and non-biodegradable wastes has begun to be implemented. This has been a step in the right direction. What is required now is a step further ahead towards recycle and reuse. The biodegradable kitchen waste can be

composted easily for manure. As plantations have been advocated, supply of manure would be required to maintain the plantations in proper health. This manure can be largely 'manufactured' in the society premises from the biodegradable kitchen waste quite easily.

First a pit of sufficient size and around one meter depth needs to be dug. Households must be encouraged to drop their kitchen waste into the pit. Every couple of days, a bit of soil should be sprinkled over the decaying waste. This soil can come from an adjacent patch of land where the next pit would be formed while the first is being filled up. When the first pit is full, the disposal of kitchen waste should move on to the second. After certain time, say one month, the first pit would be dug up to provide rich fertile manure to the plants in the society and this cycle may be repeated. This would provide totally organic manure and thus would be free from the possible ill effects of the artificial fertilizers. Some cost saving would also be there for the society as less manure would have to be bought from the market. A little effort from all the inhabitants of the society would go a long way in recycling the waste as well as have healthy and vibrant plantations in the society.

3.6. Say NO to Cellular Antennae

In spite of the attractive packages and monetary benefits offered by the cellular operators for their cellular antennae, and the government stipulation of one antenna per residential building, citizen should learn to say NO to this menace. Further, general public should wake up to the hazards posed by the radiation from the cellular towers and insist on continuous monitoring of the radiation levels in the habitable areas, thereby forcing the operators to be careful about the radiation from their towers and base stations. After expiry of the present contracts of the antennae on the residential / commercial buildings, which normally is for one year, the cellular operators would be forced to adopt the alternate options such as setting up separate towers to install their antennae and reduce the power of transmission by having more distributed sets of transmitters and receivers. The mobile tower radiation in the residential and commercial areas would reduce with public awareness. A service sharing possibility may even emerge wherein instead of each operator setting up their antennae side by side in close proximity as is happening today, they would look for cooperation and share their infrastructure in future. The benefits arising from adopting this concept would be intangible and difficult to quantify but would be reflected in general well-being of the community.

3.7. Disposal of Electronic & Electrical Waste

The major activity which is required towards suitable disposal of the electrical and electronic waste is awareness. With the advent of the media though the television, internet, and cellular phone networking sites, this can happen with a little good intent from the concerned citizens / electronic manufacturers / local governments / non-government organizations (NGO).

The correct way to dispose the electrical and electronic waste depends on its nature. The responsibility of the urban man would be to ensure that those wastes are not disposed with the regular household wastes or casually thrown away to the local soil. These wastes should be kept segregated for depositing at local collection centers. These local collection centers can be government funded / managed or run by NGO-s. Their responsibility would be to collect the electronic wastes and transport them to central disposing facilities. These central disposing facilities for electronic and electrical wastes should be a part of the infrastructure set up by the government according to the accepted standards as discussed earlier. In this case also, the tangible benefits would not be apparent to the human eye. But such approaches would be extremely helpful in adopting an eco-friendly and sustainable living in future.

3.8. Creation of Proper Green Parks and Gardens

As discussed earlier, the gardens and children's parks placed below the electrical transmission towers or cellular antennae towers create problems for the people frequenting them. This aspect has to be corrected by the governance as they own the respective lands. Creation of green patches below such towers is good, but when the entry to them is restricted to the maintenance crew for the towers. Gardens and parks for the city dwellers and children should be free from any electromagnetic radiation sources or pollution sources like incinerator or garbage disposal facility. The local population has the responsibility to demand the same and bring pressure upon the local governance to provide the same. They should be encouraged to volunteer their labor for creation / maintenance of the parks. Tree plantation drives might be arranged for sensitizing the population about the need of greens in the locality.

3.9. Car-Pooling

The vehicular emission is one of the major sources of urban air pollution. There had been some governmental efforts in making even – odd days when cars with even or odd numbers would only be allowed to ply on the road. This was deemed to reduce the number of cars on roads and encourage car-pooling. However, this has resulted in increased number of cars in garages and additional demand for parking spaces as the intelligent man opted to have the transport convenience at the cost of purchasing and maintaining two cars, one with even number and the other with odd number.

A car has comfortable seating arrangement for minimum of four individuals, including driver. It is proposed that hefty instant fines be imposed on cars with more than one vacant seat in the car at the check point. Several such check points should be set up in the key locations and intersections of the cities. After a certain number of fines, the car may be banned from the road for a certain time, say one week. Then, in addition to the structured and planned car pools, car owners would prefer at least to give free / paid rides to the commuters waiting for the buses for their transport. This would enable better utilization of the fossil fuel spent for running the car and

the road space used by the car and would additionally improve the transportation of the city dwellers. This might appear to be a utopian concept and there would be difficulties in its implementation. But one should appreciate the simple yet effective method to control the number of cars on the road and thereby solve problems like traffic congestion and vehicular pollution.

3.10. Addressing the Plastic Invasion

As discussed earlier, plastics, polythene and polymers have invaded the urban life and have become an integral part of human existence. The indiscriminate disposal of the plastics is causing severe problems. The only way to alleviate this menace is to reduce, recycle, and reuse. In order to reduce use of the plastics, urban man should be encouraged to use reusable and washable cloth bags for carrying goods. The olden system of storing the provisions in metal and glass containers needs to be slowly brought back into the urban life.

The reuse of the plastic items already existing in the household is another aspect which has to be taken seriously. The regular practice of buying a plastic jar containing some provision and throwing away of the jar later has to be discontinued. Better approach would be to buy refill packs and reuse the jars. Another practice which needs modification is use of plastic garbage bags. The many plastic packets which are coming into the household with the stores and provisions must be reused as garbage bags. Many other simple steps can be identified by the individuals in reuse of the plastics which are coming into their lives.

In few Indian cities including Navi Mumbai, a system has been already established by which the non-biodegradables such as plastics are collected separately in garbage and are disposed according to the nature of the particular item. This has been a very positive step towards the proper recycling and disposal of the non-biodegradables. There have been studies to establish the scientifically correct method of disposal of plastics [18]. This system has to be implemented in all the cities so that the plastics and polythene are recycled to the extent possible and then disposed in a scientific manner, thereby minimizing the harmful effects on the environment.

4. Implementation: A Challenge for Local Governance

The concepts discussed in the preceding section are simple and mainly depends on the awareness and good intent of the urban community in improving the quality of their life and adopting environment friendly and sustainable practices. The awareness campaign has to be taken up by the government as well as the various local citizen societies and NGO-s and this can be achieved in relatively short time. As in other spheres of life, in addition to the awareness 'carrot' there would be necessity for a penalty 'stick' and here the major role player would be the government.

4.1. Education and Awareness

The starting point of all the life altering methods suggested in the article is education and awareness. Public has to be sensitized about the possible ill effects of their present lifestyle on their future / environment. They need to be educated about the simple methods and options available to them for changing the present scenario. They have to be made aware about the possible benefits, which the society would get due to their efforts towards a sustainable lifestyle with the policy of reduce, recycle and reuse.

This would require printing of literature in local languages as well as English and Hindi for distribution. The same information may be disseminated through the television media in form of capsules during the prime time slots / programs. The cellular network along with the social networking sites can be made extensive use to circulate succinct information packs to direct the population towards the information sources such as the printed pamphlets. These would generally fall under the responsibility of the government. Further, the NGO-s and local societies should be involved in this campaign to ensure infiltration of the information to all strata of society.

4.2. Score for Residential/Commercial Societies

A score system may be devised for each residential or commercial society based on their meeting the requirements of eco-friendly practices. For each activity such as meeting plantation requirement, installation of solar heaters, implementation of rainwater harvesting, implementation of bath / wash water reuse, composting for organic manure, absence of cellular antenna, segregation methodology for garbage as biodegradable, non-biodegradable, electrical and electronic wastes, etc. A dynamic component of property tax may be devised based on the score of each society against the threshold value set by the government. Timeframe for compliance may be fixed up judiciously according to the possible funding and construction time schedules. The dynamic taxation may be implemented in a step-wise manner, beginning with the easy activities like composting and segregation of wastes; ending with the complex ones like reuse of bath & wash water.

4.3. Score for Families

Parallel to the society score, family score system may be set up to acknowledge the personal efforts put up by a family in adoption of the sustainable options in urban life. These may include scores for activities like maintaining kitchen garden in roof / balconies, use of in-house composted manure for the kitchen garden or plants, deposition of plastics, electrical, and electronic waste directly to the respective local collection centers, and pooling of cars for commuting. Here also a dynamic component should be offered as a tax rebate based on the annual family score. This would directly impact the finances of the family and would encourage them to adopt the eco-friendly ways of life.

4.4. Score for Municipality/Corporation

As discussed in earlier section, some parts of the concepts require the governmental intervention for their successful implementation. In order to motivate the local government to work towards this goal, a score system may be devised for them. The scores may be based on implementation of the systems / infrastructure such as checkpoints for checking car-pooling, creation and maintenance of proper green spaces, parks and gardens, restricting access to the areas near the electrical transmission lines, restricting / abolishing the number of antennae on the buildings, and setting up proper disposal facilities for items like the plastics and electrical & electronic wastes. The annual score can be used to fix up the grants / budget allocation from the central government for the next financial year for all heads.

4.5. Audit for Scoring

This is an important aspect in all the concept implementation proposed in this article. The people and societies who adopt the suggested life changes through awareness and motivation may be few or many. However, a certain segment would always remain who will not comply with the stipulations either due to lack of good will or for flouting their power by disregarding the stipulations. For this segment, the auditing system would assume vital importance. Through audit only they will be brought into limelight and their societal standing would be questioned by general public. The audit system would play a very important role in rewarding / imposing penalty on the urban communities for their efforts / lack of it towards the suggested life improvements.

5. Conclusions

In the present day, the urban communities of the developing countries like India face a number of serious issues, many of which might develop to a full blown crisis in near future, if not controlled right now. These include scarcity of space, lack of green parks & gardens, radiation from electrical transmission towers and cellular antennae, water scarcity, polluted air, and plastics, polythene, electrical & electronic waste disposal problems. Solution to these can happen easily with participation of the entire population in creating a sustainable and eco-friendly lifestyle for the urban communities.

Few concepts towards this goal have been discussed in the article. The requirements for large scale public participation for achieving and maintaining the goals would call for education and awareness, financial benefits as well as social recognition for compliance, some penalty in kind for non-compliance. These may be implemented through a system of regular and sincere audits wherein scores are given to individual families, residential or commercial societies and local government bodies on the basis of their efforts towards the goal against the stipulations. The concepts presented in this article may be considered by the government while formulating the guidelines and stipulations for new /

developing cities of the future.

From the basic unit of an individual, to the family, residential society, commercial society, and the local governance – all should get together and work towards the common goal of adopting sustainable and environment friendly ways of life. The participation of each unit is vital in bringing about the change in urban life. Man should act responsibly, intelligently, sensitively, judiciously and consciously to get in sync with the nature from which it had sprung and in which it dwells.

The article was generated from the experience of the author while living in Indian cities. It contains the general knowledge and information regarding the acute problem areas as well as some concepts of the author towards their solution. The general theme has been reduce, recycle and reuse for eco-friendly and sustainable lifestyle. Adoption of the scientifically correct method for disposal of the electrical and electronic wastes, as well as the plastics and polythene are the dire needs of the day. Many of these solution schemes had already been implemented in some form in the developed nations. When implemented in India, in whole or part, the concepts would improve the quality of life of the urban communities. The ideas have been developed with the Indian cities and population in mind. They could be applicable, partially or in totality, for the cities of other developing countries of the world.

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