SUSTAINABILITY IN URBAN DEVELOPMENT AN INDIAN STANDPOINT

ABSTRACT

1. Sustainable development means attaining a balance between environmental protection. present and future needs. It means equity in development and sectoral actions across space and time (1). It requires an integration of economic, social and environmental approaches towards development. Sustainable urban development refers to attaining social equity and environmental protection in urbanization while minimizing the costs of urbanization. This paper deals with the role of environment and climate change in sustainable urban development. The first section deals with urban basic services and sustainable urban development in India. The second section notes the inefficiencies in the land policy of India ……..and its implications for sustainable urban development in India. The last and third section summarizes the discussion and ends with way forward. This paper aims at discussing some of the important issues relating to sustainable urban form that would lead to sustainable urban development with possible references to India. The paper is based on available literature and secondary data. The paper is divided in two parts.

INTRODUCTION

2. UN General Assembly convened a conference on the "human environment" at Stockholm in June 1972, which came out with guiding principles on "human environment". It emphasized that man has the fundamental right to environment of quality and also that he has a responsibility towards protecting the environment for present and future generations. It also maintained that natural resources of the earth must be safeguarded for the benefit of present and future generations. About a decade later, to address the issues concerning continuing depletion of natural resources and unsustainable development, the World Commission on Environment and Development was created in1983. Popularly known as Brundtland Commission (1983) (2), it described sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs". After twenty years of Stockholm Declaration, the UN Conference on'Environment and Development' (also known as 'Earth Summit') was held at Rio-de Janeiro in 1992 that adopted an action plan, popularly known as 'Agenda 21'.

AGENDA 21.

3. The agenda 21 promised to reduce poverty, provide clean water and health care, and protect the natural resources and so on. Also to be noted that some of the Millennium

Development Goals (3) (see UNDP) have urged for ensuring environmental sustainability and reduction of the percentage of the population under extreme poverty. Similarly, explaining implications of climate change for sustainable development the Intergovernmental Panel on Climate Change notes (IPCC) (4) the importance of social and environmental equity in development. Thus all the major world conferences and initiatives taken so far on environment and development have stressed on economically viable development, socially equitable development and protection of the environment for attaining sustainable development. Sustainable urban development specifically means achieving a balance between the development of the urban areas and protection of the environment with an eye to equity in employment, shelter, basic services, social infrastructure and transportation in the urban areas. With rapid expansion of urban population around the world there has arisen a wide awareness about minimizing the environmental costs of urbanization. Concerns are raised at environmental damages and depletion of nonrenewable resources and rising levels of pollution in urban areas. In recent times cities have become places of urban environmental degradation and wasteful use of resources, which is proving to be costly to generations present and future. In order to mitigate the problem we require to minimizing the depletion of non-renewable resources and resort to environmentally sustainable economic development. But this has to be done in ways that are socially, economically and politically acceptable. While planning for sustainable development of the towns, we should also take into account the factor of climate change. According to this, ensuring environmental sustainability means taking steps, which include a) integration of the principles of sustainable development in the policies and programmes of the country, b) reversal of loss of environmental resources, c) reduction of the proportion of people without sustainable access to safe drinking water, d) improving the lives of slum dwellers. Before discussing the different aspects of sustainable urban development and city form we explain the relation of climate change with sustainable urban development and city form in the next section.

OBJECTIVE

4. The objective of the dessertation is to improve the understanding of Sustainable Development and the various concepts related to Sustainability in urban development. It also highlights the deficiency in urban basic services in India and its management for sustainable urban development.

THE STORY OF A PARADISE SQUANDERED!

5. Long, long ago on a little island (about 20 square kilometers) named Karu, people lived happily. Their island had everything they needed- food, water, shelter, magnificently spreading trees for fresh air, shade, animals, birds and ocean full of fish. Two hundred years ago, an English sailor discovered Karu and called it Pleasant Island. Another century passed before an expedition was carried out to Karu. Discovering that the island had one of the richest piles of phosphate rock on the globe, for most of next century, millions of tons of phosphate was mined and shipped to other countries. The population on the island included 7000 Karuan

natives and another 3000 imported workers. Karu has only one road around the island, but an average Karuan family has at least two vehicles. They possess all electronic gadgets for their convenience including microwave ovens, stereo equipment and multiple televisions per family. Nine out of every ten Karuans are obese and average young men weigh more than 135 kilos. This is because their native food was replaced by imported foods, subsidized by the government. Meat brought from another country more than 3200 kilometers away is cheaper in Karu than it is in that country. Karuans receive their housing, power supply, water, telephones, education and medical services free of cost or at a nominal charge. The tiny island has two hospitals, and Karuans needing specialist treatment are flown to other countries at the expense of the government.

6. Today Karuans even import fish! Due to the change in the eating habits, the health of the people on the island is being affected. The average life span of a Karuan is expected to be about 55 years. Diseases like hypertension, heart disease and diabetes are very common. Where does all this wealth come from? The Phosphate. Of course! Then what is the problem? The phosphate supply could run out before the next century. The government is now desperately searching for phosphate reserves even as the interior of the island lies ravaged by mining. They even plan to demolish the President's residence in their search. Karuans continue to tear their island apart, live and spend as if there is no tomorrow. At this rate, there may be no one on the plundered island.

What kind of development do you think is going on in the island? Is it going in the right path?

What do you think has gone wrong in the island of Karu?

LET'S EXPLORE MORE ON THIS!!!

'Development', generally, is measured in the form of economic growth that contributes to a nation's wealth. As seen in the example above, it was a narrowly defined 'income' or 'wealth and prosperity' based view of the government of Karu regarding the export of Phosphate from their island. But did this lead to the development of the people on the island?

What exactly do we understand by Development? Are there any other factors contributing to development?

7. The only parameter used to measure the development of the community was taken to be the Gross Domestic Product (GDP). It had its advantages but on the other hand, it has certain limitations also.

WHAT ARE THESE LIMITATIONS?

8. We have realized that it is not the country's wealth alone but the welfare of its people also, that is equally important. The major limitation of using GDP as an indicator of development in this case was that it did not consider the standard of living and human well being. Hence,

with the changing scenario, our concerns and commitments have also changed. It was realized that, if one wanted to prevent the rapid destruction of life systems, the development paradigm had to change. We thus moved ahead beyond the concept of development, from 'growth' to 'growth plus equity' whereby social justice, equality of opportunity and access for all the people in country's prosperity are the major concern. With this concept of development in mind, two things become very evident:

- Development involves continuous growth.
- It is concerned with human and environmental well being.

9. Sustainable Development (SD) implies economic growth together with the protection of environmental quality, each reinforcing the other. Sustainable Development, thus, is maintaining a balance between the human need to improve lifestyles and feeling of well-being on one hand, and preserving natural resources and ecosystems, on which we and future generations depend.

10. SD may also be defined as . "To improve the quality of life while living within the carrying capacity of ecosystems" IUCN (The World Consevation Union), 1991. Thus, Sustainable development does not focus solely on environmental issues. More broadly, it encompasses the three general policy areas namely economy, environment and society.

11. The Swiss 'Monitoring of Sustainable 'Development Project' MONET (BFS, BUWAL & ARE) in 2001, proposed the following definition:- 'Sustainable development means ensuring dignified living conditions with regard to human rights by creating and maintaining the widest possible range of options for freely defining life plans. The principle of fairness among and between present and future generations should be taken into account in the use of environmental, economic and social resources. Putting these needs into practice entails comprehensive protection of bio-diversity in terms of ecosystem, species and genetic diversity, all of which are the vital foundations of life.'

MONET , 2001

12. There's another definition given by the famous Robert Prescott Allen, who has founded and chaired several influential IUCN-The World Conservation Union projects and has 18 years experience evaluating and advising development strategies on four continents. Sustainability is just another way of saying "the good life" as a combination of

(a) a high level of human well-being.
(b) the high level of ecosystem well-being that supports it.

13. The main features that all the above definitions have (either explicitly or implicitly) are as follows:

- A desirable human condition: a society that people want to sustain because it meets their needs.

- A enduring ecosystem condition: an ecosystem that maintains its capacity to support human life and others.
- A balance between present and future generations; and within the present generation.

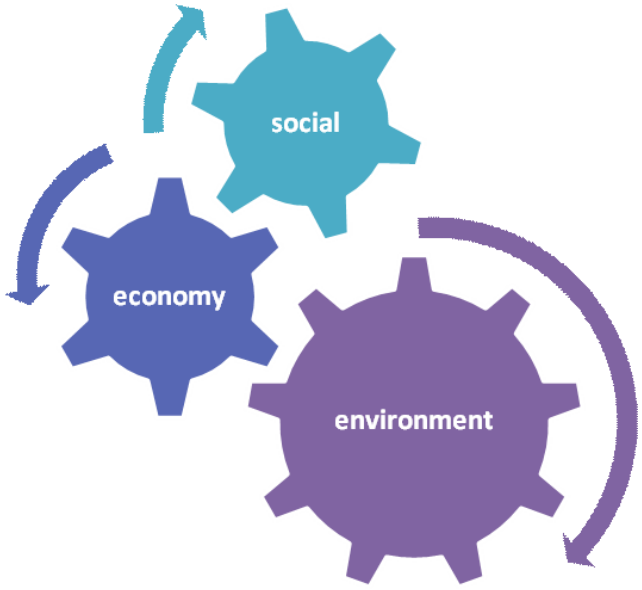
MODELS FOR SUSTAINABLE DEVELOPMENT

14. Moving towards sustainable development presents tremendous challenges. Man has all the tools necessary for achieving it. However we tend to forget that in order to survive, we need to adapt to nature and not vice-versa. We need to develop the ability to make a choice which respects the relationship between the three "Es" – economy, ecology and equality. If all the three "e's" are incorporated in the national goals of countries then it would be possible to develop a sustainable society. Models help us understanding the concepts of Sustainability better. Achieving SD thus, requires more effective, open, and productive association among the people themselves. Models help us gather, share, and analyse information; they help coordinating work; and educate and train professionals, policymakers, and the public in general.

15. The following are some of the constructive models for understanding SD.

THREE PILLAR BASIC MODEL

16. This is one of the most well-known models created using the three dimensions - Economy, Environment and Society. The diagram shows three interlocking circles with environmental (conservation), economic (growth), and social (equity) dimensions. Sustainable Development is modeled on these three pillars. This model is called 'three pillars' or 'three circles model'. It is based considering the society, but
does not explicitly take into account 'human quality of life'.

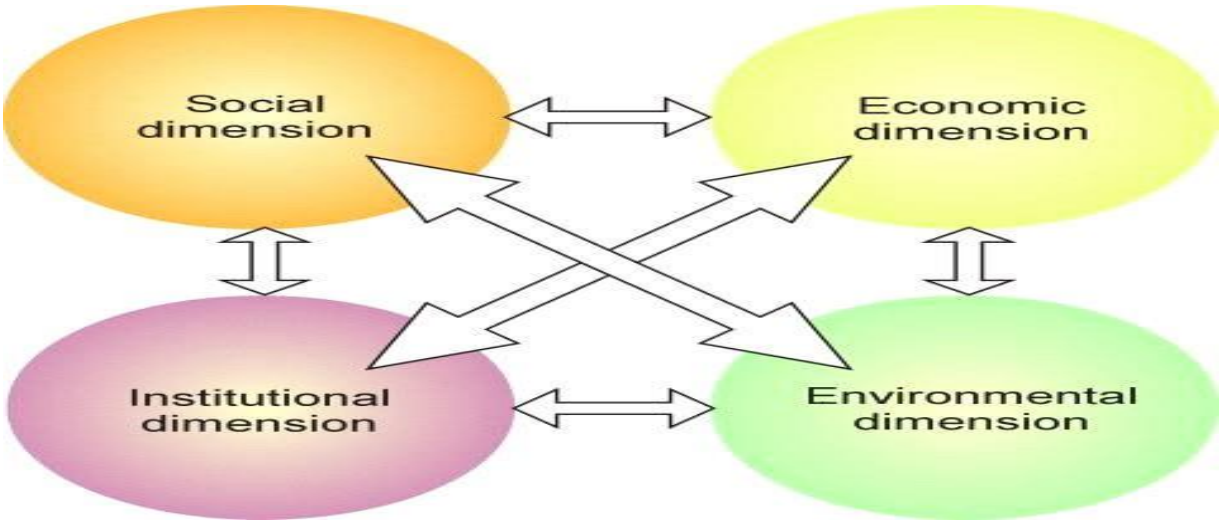


and ecosystem as one circle inside another, like the yolk of an egg. This implies that people are within the ecosystem, and that ultimately one is entirely dependent upon the other. Just as an egg is good only if both the white and yolk are good, so a society is well and sustainable only if both, people and the eco- system, are well. Social and economical development can only take place if the environment offers the necessary resources: raw materials, space for new production sites and jobs, constitutional qualities (recreation, health etc.). Ecosystem is therefore to be regarded as a super coordinated system to the other dimensions of the triangle or prism models: social, economical, and institutional. These latter can only prosper if they adapt themselves to the limits of environmental carrying capacity.Thus according to this model:

SUSTAINABLE DEVELOPMENT = HUMAN WELL-BEING + ECOSYSTEM WELL BEING

DIMENSION OF SUSTAINABILITY

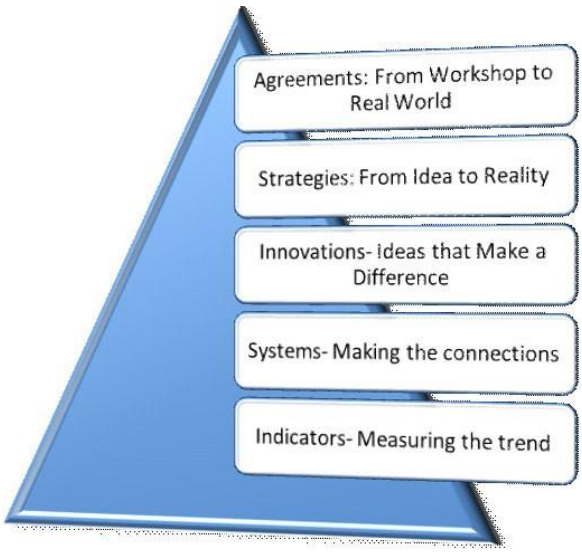
17. However an improvement to this three circles model have been made and a dimension is being incorporated along with social, economy and environment. This forth dimension is institutional dimension that is playing a crucial role in sustainable urban development, whether it is government institution or private institution or alliance of both.



THE EGG OF SUSTAINABILITY

18. The 'Egg of Sustainability' model was designed in 1994 by the International Union for the Conservation of Nature, IUCN (cf. Guijt & Moiseev 2001).

The Egg of Sustainability
IUCN's egg of sustainability (Source: IDRC 1997)



ATKISSON'S PYRAMID MODEL

19. The Atkisson Pyramid process supports and accelerates the progress from identifying the vision of sustainability, through analysis and brainstorming and agreements on a credible plan of action. The Structure of the Pyramid guides through the process of first building a firm base of understanding, searching for and collecting relevant information and ideas, and then focusing and narrowing down to what is important, effective, doable, and something that everyone can agree in. It illustrates the relationship between people

20. The Atkisson's Pyramid is a blue print for the SD process. Its five steps or levels include: This model is designed to help groups of 20-40 people move quickly up the sustainability learning curve, from basic principles and frameworks, to systems analysis, to innovative strategies for action. Along the way, groups practice cross-sectoral teamwork, make linkages, generate dozens of new ideas, and work toward an "Agreement" which is a set of actions they agree to follow through within the real world.

THE AMOEBA MODEL

21 The Amoeba Approach is a model used to visually assess a system's condition relative to an optimal condition. The model is circular with the various indicators positioned around the outside. Lines radiate from the center to the indicators, on a continuum from unsustainable (in the center) to sustainable (the outside of the circle). A circle would indicate the optimum conditions. This type of model allows simultaneous assessment of different indicators, and easy comparison between components of the system. "The Amoeba Model" is a powerful technique for accelerating the innovation process and training to be far more effective in achieving SD.

A TALE OF TWO INDIA

22. India with its 30 states and seven union territories displays great regional disparities in terms of economic growth and specialization. A two-speed, divergent India has emerged with infrastructure development a key piece of the puzzle. Under typical patterns of economic development, countries or areas tend to go through labor-intensive manufacturing cycles before they specialize. But in India, fast growth states or areas have skipped steps in the economic development models and focused where they appear to have comparative advantage, according to a 2006

23. **International Monetary Fund working paper**. That is, leading regions like Delhi, Karnataka (Bangalore), and Maharashtra (Mumbai) which embraced the IT wave with their first-tier cities, have realized faster growth and rising incomes alongside better infrastructure offerings. Conversely, slow growth or lagging regions :— Bihar, Madhya Pradesh, Rajasthan, and Uttar Pradesh—suffer with growing, less-educatedpopulations, which are expected to follow more traditional economic growth and development patterns. These areas may also be a political force for redistributing resources unless they are incentivized to reform governance, business climates, and infrastructure offerings. Recent research reports that politicians in electorally competitive states announce large numbers of infrastructure projects ahead of elections, and then don't follow through. States, particularly in lagging regions, have proved wasteful and corrupt in infrastructure spending.

24. An antidote for both fast growth states attracting most of the foreign investment—in dynamic cities such as Delhi, Mumbai, Bangalore, and Chennai—and lagging states, may be a new approach to private investment in infrastructure. As a new form of public-private partnership, global capital markets can offer a viable source of funds, promote better governance, and bring transparency to infrastructure's complexities. With India ready to further embark in public-private partnerships for infrastructure projects, getting the formulas right is imperative. This can make the difference between further regional divergences and politicization which deters reforms and development, and the opportunity for more balanced growth for those who will need it most.

HOW ENVIRONMENT AND CLIMATE CHANGE AFFECT SUSTAINABILITY IN URBAN DEVELOPMENT

25. While planning for sustainable development of the towns, we should also take into account the factor of climate change. Explaining implications of climate change for sustainable development the Intergovernmental Panel on Climate Change notes(5)"Sustainable development represents a balance between the goals of environmental protection and human economic development and between the present and future

needs. It implies equity in meeting the needs of people and integration of sectoral actions across space and time." (Cruz et al, 2007). One of the greatest challenges that the world is facing today is climate change. Climate change is the variation in the earth's global climates over time. It involves changes in the variability or average state of the atmosphere over durations ranging from decades to millions of years. These changes can be caused by dynamic process on earth, external forces including variations in sunlight intensity and more recently by human activities. Human influences can be by increase in CO2 levels due to combustion of fossil fuels, aerosols, cement manufacture etc. Other factors like ozone depletion, animal agriculture and deforestation also change climate. The effect of climate change can be found on among other things, on rising sea level that may accelerate coastal erosion, on increasing temperature, on increase in intensity of natural disaster, and very importantly on vector borne diseases. There has been an increasing trend in the annual mean temperature in India. In recent decades the east coast has been experiencing fewer rainy days while the northwest has been experiencing heavy summer monsoon. There have also been some extreme climatic events like heat wave, intense rain, floods and droughts in India. Researchers have documented the increase in frequency of hot days and multiple-day heat waves in the past century. There has been record rainfall in Mumbai, India on 26 to 27 July 2005, which led to loss of large numbers of lives. Consecutive droughts between 2000 and 2002 caused crop failures, mass starvation and affected millions of people in Orissa. Also, increased water stress poses to be a major problem for India. Accelerated glacier melt is likely to cause increase in the number and severity of glacial melt-related floods, slope destabilisation and a decrease in river flows as glaciers recede. The researchers have predicted that with the current trend in the melt of glaciers, the Ganga, Indus, Brahmaputra and other rivers could likely become seasonal rivers in the near future and affect the lives of people residing around them (Cruz et al, 2007).

26. Thus, it is likely that climate change will hamper sustainable development of India as it increases the pressures on natural resources and the environment associated with rapid urbanization, industrialisation and economic development. In order to reduce the effect of climate change, we need to include climate-proofing concepts in national development initiatives. Urban areas mostly face problems of air quality pollution, green house gases, unsustainable consumption and of inadequate sanitation and water supply. Thus translated into policy initiatives, environmental sustainability of urban form should aim at energy efficiency in transport and buildings, optimal planning solutions in terms of locations, distances and spaces, which will reduce air and noise pollution. It should also aim at sustainable management of sanitation and water supply, promote equity in provision of services and of course reduce deforestation. The recently announced National Action Plan on Climate Change by the Prime Minister in June 2008 visualises to make economic development of India energy efficient. All these concerns, questions and initiatives about sustainable environment and climate change have resulted in experiments and debates over city forms that are sustainable. Before discussing the relevant city forms it would be pertinent to discuss the sustainable management of urban basic services and the inefficiency in the land policy in India and its implications for sustainable city form and development in India, which is done in the next part. URBAN

BASIC SERVICES IN INDIA

27. **MANAGEMENT OF THE SERVICES**. Shortcomings: Sustainable city planning should aim at achieving social and environmental equity while improving the lives of the people. For that to happen we need to have a sustainable city form as well as provision and proper management of the services. Thus, in order for a city or urban area to be sustainable it needs to produce and

manage basic services like water, waste, energy, and transportation in a way that it conforms to the principles of sustainable development. In other words, the city should be able to produce and distribute the services in an economic, environment friendly and equitable way. Cities in the developing countries are deficient in the provision of basic services that pollute the environment. It is to be noted that though there are some differences between cities and between rich and poor nations, in general urban infrastructure systems are designed without much attention to environmental and social impacts. Mostly the delivery of the services like water, energy, waste, transportation, are based on non-renewable energy sources (Pinderhughes, 2008). Moreover, the inequality in the provision of these services is very high. Indian cities are characterized by high density of population, deficiency in services and air pollution. Let us see the status regarding these in India. In urban India in 2001, 69 (6) per cent of the households had safe drinking water, 61 (7) per cent of the households had their latrine facilities within their houses and only 35 per cent of the households had closed drainage facilities (Census 2001) (8). Eighty- eight per cent (88%) of the urban households had electricity and only 0.2 per cent had solar energy in 2001(Census, 2001) (9). In Delhi, the capital city of India, 77 (10) per cent of the urban households had tap as source of drinking water, 63 (11) per cent had their latrine facilities within their premises and 52 per cent of the households had closed drainage facilities (12). Delhi generated 5922 tons of solid waste per day in 2004-05 (13).Air pollution has become a major problem in Indian cities. Taking the case of Delhi, we find that there are around 54 lakh vehicles in Delhi. Around 70 per cent of the air pollution in Delhi happens to be due to vehicles (14). It has been found in a World Bank study based on 1994-95 air quality data that around 10,000 people die every year prematurely due to air pollution in Delhi alone. According to Delhi Medical Association the incidence of asthma in Delhi is ten times the national average (Centre for Science and Environment). Densities of Indian cities are very high. Management of the basic services should be done keeping in mind the deficiency in the services, the environmental impacts and the inequality in the provision of the services. Thus we have two issues here, the first one is covering the deficiencies in services and the second one involves how to provide the services in an environment friendly way. We discuss some of the options for alternative and environmental

SUSTAINABLE MANAGEMENT OF URBAN BASIC SERVICES

28. Water supply management: The effect of climate change on water supply will be negative in almost all the countries. Thus care should be taken that energy efficient alternative systems are innovated. As for efficient practices, water consumption can be limited by using raw water, recycled water for gardening and landscaping. In the state of Vermont, U.S.A., a wastewater treatment system uses a series of tanks containing plants and other organisms to naturally clean wastewater that serves 500,000 people per year (Pinderhughes, 2008). There have been other scattered evidences of use of wastewater but the example of a city doing it on large scale is rare. In India the water from Sewage Treatment Plants (STP) in factories are used for landscaping and gardening. However, in developing countries the main challenge is to provide clean drinking water to all the urban residents adopting sustainable water management practices. Rainwater harvesting has its possibilities for partially managing water supply. Conservation of old water bodies like lakes, ponds can be made for increased and sustainable water supply. It has been considered as an optional reform under Jawaharlal Nehru National Urban Renewal Mission (JNNURM) in India. In Delhi itself, one after another marshlands and water bodies are being converted in residential areas, garbage dumps,petrol pumps and so on, the latest victim being the Jahangirpuri marshland (Hindusthan Times, 2008). Marshlands recharge ground water substantially. Much is yet to be done regarding this in India. Other environmentally sustainable methods can be explored.

29. Waste management: Waste management practices should be started from the production and distribution stages of economic activities through reuse and recycling. Reuse of things like metals,

glass, paper, plastic, textiles, organic waste and water will reduce demand for energy, raw materials, fertilizers and fresh water sources (Pinderhughes, 2008). However, care should be taken that hazardous wastes do not go for recycling. Plastic should be used less.

30. In Delhi more than 5000 tons of municipal solid waste is generated everyday, which is disposed of in landfills. Too much land is being consumed for disposal and is creating danger of ground water contamination. As such the department of environment of the government of India recommended that other'best practices' in waste management should be adopted in a large scale. The practices include vermiculture, pelletisation, aerobic composting and so on. A research study by NEERI has recommended mechanical composting as the viable option for such a huge amount of waste (15). The Supreme Court of India, hearing public interest litigation on solid waste management of Delhi directed the Municipal Corporation of Delhi to improve the system.

31. Energy management: Energy management practices should be encouraged in the planning of buildings and the city form. Buildings and city forms that are energy efficient and use sustainable energies like solar and wind energies should be considered. There are fragments of evidences in India of settlements using solar power, water recycling techniques and waste management practices. But in general the environment friendly techniques are yet to be practiced in urban areas, especially in large cities where the differences would be felt. City forms should be such that it uses energy efficient transport. Coming to the financing part, it can be said that the policies should help energy efficient practices. The loans should be easily available and tax benefits provided for such practices.

32. Reduction in inequality: Management of basic services in the cities should reduce inequality in services between rich and poor. The concept of commercial viability does not hold for social services always. City form should take into account social conditions also. The ability of urban poor to pay for the full cost of water supply would remain low in India. Thus reduction in grant of the government and introduction of private sector in this sector is likely to make the situation worse. It is also well known that much of the subsidized schemes in the past have gone to the middle and high-income areas (Kundu and Thakur, 2006). Apart from deficient, non-environment friendly and unequal basic services, the other major problem in developing a sustainable city form in India is inefficient land policy of the country, which we discuss next.

INEFFICIENT LAND POLICY OF INDIA

33. Since this dessertation has reference to India, it would be pertinent to mention the inefficiencies of land policy of India in this context. This is because land is an important input for producing goods and services for urban development. Under the conventional analysis, factors of production i.e. land, labor and capital flow to make goods and services but the social and environmental consequences are not reflected in such analysis. Sustainable urban development does take account of social and environmental effects and means balance between the development of the areas and protection of the environment with an eye to equity in employment, shelter, basic services, social infrastructure and transportation in the urban areas. For this to happen, one has to ensure that land is properly used to meet these objectives. Urban India is plagued by shortage of housing facilities and scarcity of land for social overheads like roads, footpaths, parks, schools and so on. The roots of these problems can be found in the inadequate, inefficient, iniquitous land policy of the country. This is why it is important to have an effective and appropriate land policy that would promote sustainable development.

34. National Commission on Urbanization of India (NCU, 1988) recognized the need for adequate supply of land, efficiency and equity in allocation of land and promotion of flexibility in land use. Thus it mentioned that the objectives of urban land policy should be a) to achieve an optimum social use of urban land,
b) to make land available in adequate quantity to both public authorities and individuals at reasonable prices
c) to encourage cooperative community effort as well as individual builders to develop land and construct houses,
d) to prevent concentration of land in few hands,
e) to use land to finance urban development,
f) to encourage socially and economically efficient allocation of land so that land development conserves resources and land utilization is optimal,
g) to promote flexibility in land use in response to a growing city (16).

35. Also, the Eleventh Five Year Plan (2007-12) of India emphasizes, "governments at appropriate levels including local authorities have to strive to remove all possible obstacles that may hamper equitable access to land" (17). It identifies failure to adopt appropriate urban land policies and land management practices as the primary cause of inequity and poverty. Thus the Eleventh Five year Plan calls for a flexible land policy which will make conversion from one use to another, cost efficient and promote equity. It judges that urban planning tools like master planning, zoning and regulations are not enough for the requirement of land supply for rapid urbanization. The problem has also been addressed somewhat by Jawaharlal Nehru Urban Renewal Mission in India. This section discussed the role of land in sustainable urban development with particular reference to land policy of India. The next section discusses options for the right city form for sustainable urban development in India.

SUMMARY AND WAY FORWARD

36. We have dealt in this paper with some issues relating to sustainable development and sustainable urban development with special reference to India. The paper first discussed the concept and importance of sustainable development and especially that of sustainable urban development. All the major conferences on world environment have stressed on need of development of the economy with social equity and protection and conservation of the environmental resources. In recent times, cities have become places of wasteful use of nonrenewable resources and urban environmental degradation. Apart from that, Climate change is posing a challenge to the world and it has the potential to affect the economies, rich and poor both. This is likely to affect the water supply and ecosystems among other things. Climate change would affect the poor of the world more because they are morevulnerable and does not have the means to protect themselves against the vagaries of extreme climatic conditions. Manmade pollution of water, air and environment seriously affect the climates. Sustainable urban development should take account of all this and try to reduce the ill effects of climate change, depletion of nonrenewable resources and degradation of the urban environment.

37. Next the paper discusses the deficiency in urban basic services in India and its management for sustainable urban development. It also mentions the role of land in sustainable urban development and inefficiencies in the land policy of India. Urban form is important for sustainable urban development but equally important are the environmental friendly management of basic services like water-supply, sanitation and also of energy. The issue of equity in delivery of services is one important requirement of sustainable urban development, which should be kept in mind while planning for them. There are three main issues here, which are meeting the deficiencies in services, how to manage the services in an environment friendly way and the need to make them more equitable.

38. The issues can be numerous and varied for attaining sustainable urban development. But all of them should consider economic, social and environmental aspects of development. In the end it can be said that economic growth does not mean economic development. True economic development should contribute to increase in efficiency and quality of life of a community. It is to be seen that positive externalities (such as more employment) of economic growth of a city does not give rise to negative externalities like air pollution, traffic congestion and so on. It is also to be remembered that such an effort should be made at local, regional and global level. Above all the solutions should take account of the local characteristics, acceptability and indigenous practices.

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GREEN PRACTICES IN HOSPITALS

FOCUS ON SELECTED ISSUES

Enery efficiency while fossil fuel consumption in hospitals has been on a downward trend for the last 20 years, electricity consumption has been growing steadily. Electricity already accounts for around 18% of a hospital's delivered energy consumption and it represents over 50% (international average) of a hospital's energy costs. By reducing a hospital's energy consumption, it is possible to achieve the twin benefits of saving money and ensuring a less polluted environment for the local community

.GENERAL ASPECTS

- Monitor regularly energy consumption by checking the electric- ity meters at least once a month.
- Identify areas/equipments having high energy consumption.
- Implement measures such as installing energy-efficient equipments.

HEATING AND AIR-CONDITIONING

- Inspect or install a combined heat and power system
- Use solar collectors for hot water
- Use night-time temperature lowering thermostats
- Install several small boilers instead of one large boiler for load- dependent operation
- Install double glazed windows
- For air-conditioning, check specific room parameters (tempera- ture, humidity, air exchange)
- Check air flow reductions are in place in unused rooms
- Clean and change the air conditioner filters regularly.

LIGHTING

- Reduce general lighting during daytime and make sure that exterior lighting is switched on only at night
- Use energy-saving bulbs, especially in high consumption areas
- Install timers and movement detectors to reduce lighting time.

CAFETERIA & FOOD SERVICES

- Invest in high-performance cooking units and refrigerators when replacing equipment.
- Defrost refrigerators and clean the door seals monthly.

LAUNDRY SERVICES

- Use heat recovery to warm up clean incoming water.
- Avoid wasting energy from over-drying the laundry by fitting humidity sensors to dryers.
- Use direct firing of gas for tumble dryers and finishing equipment.
- Plan to use laundry equipment during periods of low consumption (off-peak hours)
- Use low temperature washing programmes.

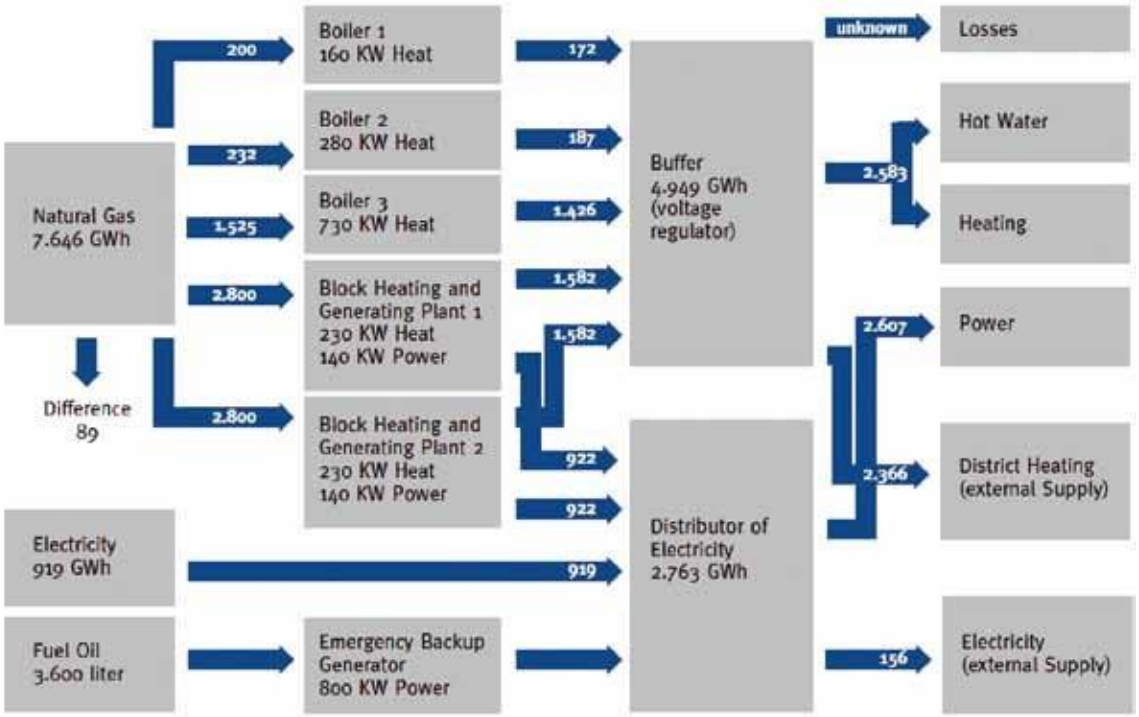

Figure 5: Typical energy flows through a hospital (Hospital Tulln, Austria, 1999) Source: Greener hospitals: improving environmental performance University Augsburg – Bristol-Myers Squibb Company

Figure 6: A solar water heater on the roof of the building of a Jordanian private Hospital

WASTE MANAGEMENT

Hospitals generate up to around 8 kg of waste per bed per day (in USA, see section 2) if not properly managed. Medical waste incineration is a leading source of dioxin, mercury and other dangerous pollutants that threaten human health and the environment. It is important to minimize the amount and toxicity of waste generated by the healthcare sector, to ensure the proper management and segregation of medical waste and to eliminate the dangerous practice of incineration by promoting and implementing alternatives, such as non-incineration treatment. Recycling and composting can also be a valuable solution for waste valorization.

GENERAL ASPECTS

- Elaborate a waste management plan to establish a framework of policies and procedures with an overgoal of zero waste
- Understand waste categories and segregation: domestic wastes (paper, glass, plastics, etc.); regulated medical waste (biohazard- ous waste, potentially infectious medical waste, biomedical waste, etc.); hazardous waste; low-level radioactive waste.
- Implement non-incineration technologies: thermal, chemical process, irradiative or biological processes
- Promote waste recycling: paper, plastics, glass, batteries, etc.
- Encourage composting wastes, such as grass, leaves, flowers, etc.

- Track the treatment and disposal costs of waste from individual sections and departments .

LABORATORIES

- Promote recycling of paper, X-ray films and solutions, packing material, etc.

PATIENT CARE

- Reprocess single-use devices, such as arthroscopic shavers, blood pressure cuffs, soft tissue ablators, scissors and staplers, etc.
- Separate bags used for the regular solid wastes and recyclables.
- Donate or resale surplus.
- Monitor waste management, and educate staff.

PHARMACY

- Regulate pharmaceutical wastes: regulate entering products (green purchasing, appropriate dose packaging, etc.) and modify management practices.

Medical Waste		**Group A**	**waste like municipal waste**	
	Medical Risk Waste	**Group B**	**waste with a risk of contamination and/or injury**	
			B1 waste with a risk of contamination	B1/1 anatomical waste
				B1/2 waste with blood and body fluid
			B2 waste with a risk of injury	
			B3 pharmaceutical waste	
			B4 cytotoxic waste	
		Group C	**infectious waste**, incl. waste from microbiological labs	
Non-Medical Waste		**Group D**	**all other kinds of hazardous wastes**	
		Group E	**radioactive waste**	
			E1 waste with t1/2 < 60 days	E2 waste with t1/2 > 60 days
		Group F	**dead animals**	
			F1 contaminated and/or infectious	F2 radioactive

Figure 7: In Switzerland, all waste that comes from healthcare activities is called medical waste. Medical wastes include: “No-Risk” waste which is comparable to household waste; and Medical risk waste / Medical hazardous waste. (Schelker, Raymond, 2010)

WATER CONSERVATION

Many parts of the world are water stressed, and the ever-increasing population intensifies the problem. Prudent use of this invaluable natural resource is essential from a resource conservation perspective. Water use is driven by the number of inpatients and outpatients, equipment used, facility size, number and types of services, facility age and maintenance requirements. Other contributors include steam sterilizers, autoclaves, medical processes, heating ventilation and air conditioning, sanitary, x-ray equipment, laundries and food services. It is recommended that all these areas be evaluated to identify activities to help reduce water consumption.

GENERAL ASPECTS

- Check the water supply system for leaks and turn off unnecessary flows
- Install automatic water volume controls that operate indepen- dently of the water pressure to control the amount of water
- Read water meters monthly in order to identify leaks
- Recycle and reduce water use wherever possible, consistent with health requirements.

CAFETERIA & FOOD SERVICES

- Wash only full loads in the dishwasher .
- Reuse the rinse water from the dishwasher as flush water in garbage disposal units.
- Upgrade equipment with water-efficient model.
- Turn off the continuous flow used to wash the drain trays of the coffee/milk/soda beverage.

GARDENING AND OUTDOOR

- Water early in the morning or in the evening.
- Consider using low-volume irrigation, such as a drip system.
- Adjust the irrigation schedule for seasonal changes.

LAUNDRY SERVICES

- Investigate a treated rinse water system to reuse rinse water for other purposes or recycle it in the wash cycle.
- Instruct cleaning crew to use water efficiently for mopping.
- Wash only full loads.

HEATING & COOLING

- Adjust boiler and cooling tower blow down rate to maintain total dissolved solids at levels recommended by manufacturers' specification.
- Return steam condensate to the boiler for reuse.
- Shut off water-cooled air conditioning units when not needed ,or replace water-cooled equipment with air-cooled systems.

LABORATORIES & PATIENT CARE

- Install automatic valves on film processing or X-ray equipment to stop water flow when equipment is not in use.
- Determine shorter hand-wash cycles.
- Reduce flow to surgical vacuum pumps to acceptable minimum level and maintain proper operation.
- Overhaul faulty steam traps on sterilizers.

BATHROOMS & RESTROOMS

- Shut-off the water supply to equipment and areas that are un- used.
- Install electronically controlled valves.
- Replace toilets with low-volume models.
- Install low-volumes showerheads Source: Guide of Best Environmental practices.

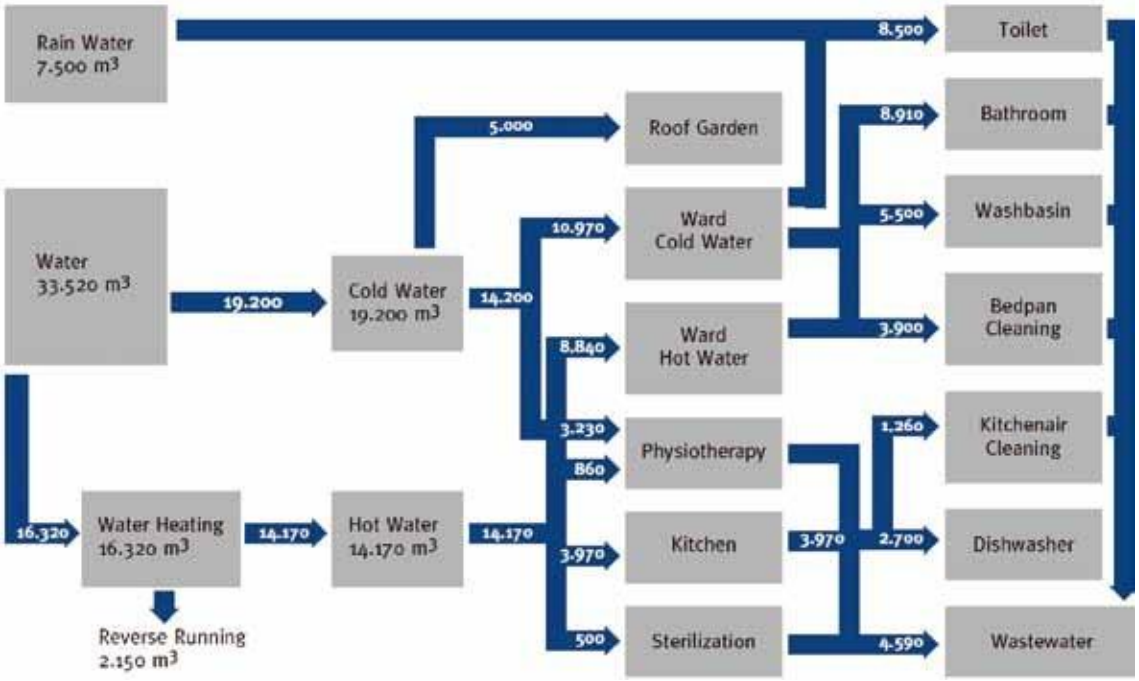

Figure 8: Water flows in a small hospital (Hospital Tulln, Austria, 1999) Source: Greener hospitals: improving environmental performance University Augs- burg – Bristol-Myers Squibb Company

GOOD HOUSEKEEPING & BEHAVIOR

Cleaning in hospitals is an important issue. For example, many nosocomial infections occur in hospitals (hospital-acquired). Thus, hospital staff and administrators often react anxiously to suggested changes in cleaning practices. Nevertheless, cleaning products are a major contributor to indoor air quality issues in closed environments. Many contain high levels of volatile organic compounds (VOCs) which can give rise to respiratory irritation, headaches and other symptoms for workers and building occupants. All disinfectants are intentionally toxic to microorganisms, and none can be accurately qualified as "green". However, best practices can assure that disinfection is highly effective without involving unnecessary exposure for workers, staff, and patients.

GENERAL ASPECTS

- Adopt a cleaning products protocol as part of your hazard management plan.
- For each product in use, determine if there is a "less-toxic" substitution that will perform the same task.
- Use the most modern equipment.
- Limit the use of disinfectants.

EQUIPMENT

- Replace dust mops and cotton cloths with microfiber.
- Purchase vacuum cleaners equipped with high-performance filters.
- Vacuum before mopping.
- Use advanced technology mop buckets to reduce the redistribution of dirt during cleaning.

CLEANING

- Clean before disinfecting.
- Use the appropriate product for target microorganisms.
- Use products at the appropriate concentration and for the proper residence time.
- Be sure to follow the instructions carefully, and comply with the recommended "dwell" time or time it takes for the biocide to effectively eliminate the targeted organisms (the dwell time is generally 10 minutes).
- Read your product's label and comply with the instructions.

DISINFECTING BEHAVIOR

- Determine where to use disinfectants by carefully dividing your facility into risk areas.
- Identify those areas that need the highest level of disinfecting and separate them from areas that can simply be thoroughly cleaned or that need to be sanitized (food service areas).
- Identify the organisms you need to eliminate, such as those in blood and vomit or general pathogens.
- Use the least toxic antimicrobials to disinfect or sanitize.

TOXIC MATERIALS

Healthcare institutions regularly use an important amount of highly toxic materials. These toxins affect patients, hospital staff, and hospital visitors. The management of these materials is an essential part of a hospital's day-to-day activities. Proper registration, handling, and training are necessary to guarantee a safe workplace and to prevent potential risks to employees, patients and the environment. Many of these toxins are defined and regulated by federal, state and local laws. Others are used daily but are hardly regulated. They include carcinogens, materials that damage the skin and organs, and materials that corrode, irritate, or release other toxins in the course of normal use, storage, transportation or disposal .Potentially toxic materials used in hospitals may include halogenated and non-halogenated organic compounds (e.g. solvents), in- organic compounds, caustic materials (acids/bases), prescription pharmaceuticals, disinfectants or other compounds that may be carcinogenic, mutagenic, or reproductive toxins. This section focuses and provides tips on four toxic materials: mercury, PVC and phthalates, flame retardants and pesticides.

GENERAL ASPECTS

- Institute a comprehensive chemical management policy .
- Establish a framework of policies and procedures to reduce and eliminate the use and improper disposal of toxic materials.
- Examine all hospital departments and functional areas for the presence and use of toxic materials.
- Evaluate and approve all potentially toxic materials before using it.
- Replace highly hazardous substances (benzene, chromosulphuric acid, mercury, chrome VI compounds, and hydrazine) with less hazardous ones whenever feasible.
- Train the staff on how to safely use potentially hazardous substances.
- Develop written procedures for receiving, handling, storage and disposal of toxic materials.

TOXIC AND CHEMICAL WASTE DISPOSAL

- Establish special disposal procedures for certain chemicals, such as solvents, halogenated solvents, acids, rinses/washes (saline solutions, buffers, formaldehyde solutions, aqueous dye solutions), alkaline, old disinfectants and cleaning agents, etc.
- Check with pharmaceutical companies for specific information on proper disposal of

expired pharmaceutical products.

Some examples: fixer and developer baths from X-ray departments; heavy-metal- based compounds containing silver, lead, copper, cadmium, chromium, mercury, or manganese; reactive/explosive substances such as acides and peroxide compounds such as hydrogen peroxide, perchloric acid, peracetic acid, and perborates; concentrates of disinfectants and cleaning agents, bleaches and detaching agents; substances from nuclear medicine/radiology (including radioactive substances and iodo organic contrast media); etc .**mercury**

- Mercury is a potent neurotoxin that can harm the brain, spinal cord, kidneys and liver. It is used throughout health care in a variety of products including thermometers, sphygmomanometers, dental amalgam, laboratory chemicals and preservatives such as thimerosal, cleaning agents, and various electronic de- vices such as fluorescent lamps and computer equipment.

- Evidence shows that BFRs bio-accumulate in people and cause adverse health effects in children. BFRs are found in many products: bedding materials, furniture cushions, lamp shades, curtains, drapery, electronic equipment, televisions (pulse oximeters, monitors, ventilators, pumps, computers, printers, fax and copy machines, etc.) and finally, in the infrastructure of the building (walls, roofing materials, floor tiles, carpeting, wiring, electrical switches, sockets, and insulation).

CLEANERS AND PESTICIDES

- Patients are particularly vulnerable to indoor air quality threats such as pesticides or chemicals, since many have compromised respiratory, neurological or immunological systems and/or in- creased chemical sensitivities.
- Many traditional cleaning products, floor strippers and disinfectants often contribute to poor indoor air quality and may contain chemicals that cause cancer, reproductive disorders, respiratory ailments (including occupational asthma), eye and skin irritation, central nervous system impairment and other human health effects. Hospitals also use a variety of methods to disinfect and sterilize surfaces and equipment. Some of the most commonly used products, however, such as glutaraldehyde and ethylene oxide, have been shown to cause serious health effects.

- Pesticides can also cause acute symptoms, including nausea, headaches, rashes and dizziness. Many are also linked to chronic diseases and conditions such as cancer, birth defects, neurological and reproductive disorders, and to the development of chemical sensitivities. The elderly, pregnant women, chemically sensitive individuals, infants and children are especially vulnerable to the toxic effects of pesticides.

GREEN PURCHASING

Health care facilities purchase thousands of different products re- quested by dozens of different departments. As shown throughout this chapter, hospitals may purchase items that are toxic to workers or patients, or have serious environmental impacts. From eliminating unnecessary packaging, to seeking substitutes for products containing mercury or other toxic substances, purchasing decisions can have a major impact in providing environmentally friendly healthcare facilities. Purchased products must be considered in their totality (life cycle). Indeed, the different stages of the life of a product (manufacturing, marketing, use and disposal) all have an impact on the environment. The purchasing of green products helps to minimize these impacts.

GENERAL ASPECTS

- There is up to 50 times more mercury in medical waste than in general municipal waste, and the amount of mercury emitted from general medical waste incinerators averages more than 60 times that from pathological incinerators.
- Ninety-nine percent of a typical hospital's mercury is contained in oesophageal dilators, sphygmomanometer services kits, and barometers.
- Total cost to replace mercury devices is modest, especially in light of the cost of spills. According to the Environmental Protection Agency of United States, mercury spill training and equipment costs around 649 USD. The Grand Rapid hospital in Michigan invested USD 6'000 for replacing all existing sphygs and oesophageal dilators containing mercury and instituting a policy banning the purchase of mercury-containing thermometers, sphygs, oesophageal dilators, and batteries.

PVC AND PHTHALATES

- PVC plastic is the most commonly used plastic in medical devices and has been used in a wide variety of other applications in the health care setting, such as disposable gloves, curtains and flooring. Unfortunately, this type of plastic creates a number of environmental health risks. The two main problems are:
- Dioxin: a known human carcinogen can be formed during an in- adequate manufacture of PVC, and during the incineration or burning of PVC products. There are however also environmental friendly PVC in the market.
- DEHP (2-ethylhexyl phthalate): a phthalate used to soften PVC plastic that can leach from PVC medical devices; it is linked to reproductive birth defects and other illnesses. Medical devices made of flexible PVC, such as bags and tubing, can leach the phthalate DEHP into patients, resulting in some of the highest exposures to this toxic chemical.
- Fortunately, medical devices that do not contain vinyl plastic or phthalates are available for use and many healthcare facilities are switching to these safer alternatives.

FLAME RETARDANTS

- In order to meet fire safety standards, chemicals that act as flame retardants are commonly added to a wide range of products such as pumps, televisions, computers, hospital beds, waiting- room chairs and hospital privacy curtains. Unfortunately many of these flame retardant chemicals do not remain fixed in the product, and slowly leak into our air, dust and water, eventually entering our food and bodies.
- Many chemicals are used as flame retardants. They are called CFRs (chlorinated flame retardants) and BFRs (brominated flame retardants). Collectively, these are called halogenated organic flame retardants. The most commonly used as brominated flame retardants are polybrominated diphenyl ethers, or PBDEs (poly- brominated diphenyl ethers).

- Evidence shows that BFRs bio-accumulate in people and cause adverse health effects in children. BFRs are found in many products: bedding materials, furniture cushions, lamp shades, curtains, drapery, electronic equipment, televisions (pulse oximeters, monitors, ventilators, pumps, computers, printers, fax and copy machines, etc.) and finally, in the infrastructure of the building (walls, roofing materials, floor tiles, carpeting, wiring, electrical switches, sockets, and insulation).

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GENERAL ASPECTS

- Buy only what is needed (avoid unnecessary supplies).
- Buy in bulk rather than individually packaged items. Buy recycled contents (office paper, paper towels, etc.)When purchasing new equipment, take their water and energy consumption into consideration.
- Educate and train the purchasing department Use standard labels and choose the right suppliers.

ADMINISTRATION

- Buy reusable ink and toner cartridges
- Purchase paper with at least 50% recycled fibers or non-whitened or chlorine-free bleached paper.
- Prefer rechargeable batteries.

CAFETERIA & FOOD SERVICES

- Choose, whenever possible, organic products.
- Choose seasonal fruits and vegetables.
- Use fresh products with little or no preservatives and food-coloring and with as little packaging as possible.
- Equip the kitchen with energy-efficient appliances.

LABORATORIES, PATIENT CARE, PHARMACY

- Check for alternative for products containing Latex, PVC/DHEP, mercury, flame retardants, etc.
- Check for less packaging and reusable tools.

LAUNDRY SERVICE

- Equip the laundry room with machines in energy class A
- Avoid using detergents containing bleach (products of chlorine), phosphate, EDTA (ethylenediaminetetraacetic acid), NTA (sodium nitriloacetate), etc.
- Prefer low temperature detergents

CLEANING & DISINFECTION

- For each product in use, check if there is a "less-toxic" substitution
- Purchase the least toxic antimicrobials to disinfect or sanitize.