

An environmental disaster and public menace in Sri Lanka

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Global trends and developments in urban planning and development

Eco-efficiency is an important parameter used widely in infrastructure development. It is a management philosophy that seeks to develop synergy between economy and environment thereby reducing the use of resources such as land, water, energy and raw materials and generation of waste and pollution. It will thus maximize return on investment and promote green growth and green economy. Stated differently, eco-efficiency aims at maximizing environmental sustainability, competitiveness and quality of life. This concept is being vigorously pursued in many cities of Europe, North America and Asia, especially Japan, Singapore and Malaysia, to establish eco-efficient and socially inclusive infrastructure with a view to building clean, green, healthy and smart cities.

People rarely think of forests, wetlands, groves, grasslands, water ways, ponds, coral reefs, and other natural ecosystems as forms of infrastructure. But, they are. Forests, for instance, prevent silt and pollutants from entering streams that provide freshwater to downstream cities and enterprises, and act as a natural water filtration system. Thus they are a form of "green infrastructure" that can serve the same purpose as "grey infrastructure"—the human-engineered solution that often involves concrete, bitumen and steel.

Green infrastructure has been successfully used to improve the habitability and environmental sustainability of

environmental health, quality of life and sustainability by combining and protecting hydrological and ecological functions and the values of urban landscape. That will enhance the evaporative cooling effect from a matrix of green corridors, street trees, green or living roofs and walls and water bodies. It will also improve hydrological performance through high evaporation, high infiltration and low surface runoff. All of these benefits are of prime importance.

Urban planning and development in Sri Lanka

While many countries in the world are responding to change by building livable, competitive and sustainable green cities based on eco-efficient and socially inclusive infrastructure, we seem to be clinging on to grey infrastructure. A look at the infrastructure landscape including new constructions in many towns in our country will show that it predominantly constitutes grey infrastructure built of concrete, mortar, bitumen and steel along with impervious paving of gardens, paths and premises devoid of open areas and green spaces. Such infrastructure, in the name of "development" and urbanization, is progressively eating into the remaining limited green spaces of towns, adding to environmental issues and climate change. The highly contagious fashion and passion to pave indiscriminately roadsides, footpaths, jogging tracks, gardens, premises of offices and business establishments has taken grip of our

temperature over concrete paved areas was about 3-5°C higher than that over grass cover. Besides, such impervious cover seal off the soil preventing infiltration of rainwater and recharge of groundwater aquifers and increasing run-off to overstretch drains and sewers and thereby contribute to flash floods.

For this reason, prior permission from the relevant authorities is mandatory in some countries for paving land with impermeable material. For instance, in the UK prior permission from the relevant authority is necessary even in private property if the area to be paved exceeds 5 m².

(<https://www.paving.org/index.php/planning-permission-for-paving-a-garden/>). Why do we not adopt such practices as appropriate to curtail the menacing growth of paved areas which contribute to flash floods, poor recharge of groundwater aquifers and rise in ambient tem-

perature? Sri Lanka, being an island nation, the recharge of groundwater aquifers is of prime importance, particularly in coastal areas, to minimize the intrusion of salt water. This matter should receive utmost attention in the light of rising sea level and lowering water table owing to unplanned, ad hoc and uncoordinated infrastructure development including impervious paving, over-extraction of groundwater, unsustainable land use practices etc. As evident from Fig. 1, saltwater intrusion occurs naturally to some degree in most coastal aquifers, owing to the hydraulic connection between groundwater and seawater. Since saline water has a higher mineral content than freshwater, it is denser and has a higher hydraulic head (liquid pressure exerted by a water column). As a result, saltwater can push inland beneath the freshwater. This process has been held in check because of the greater height of fresh water columns than the sea water column. However, with the rise of sea level and the drop of the water table due to the said reasons, the equilibrium will be lost; consequently more sea water will diffuse into fresh water causing contamination of groundwater aquifers there by posing a serious threat to drinking water.

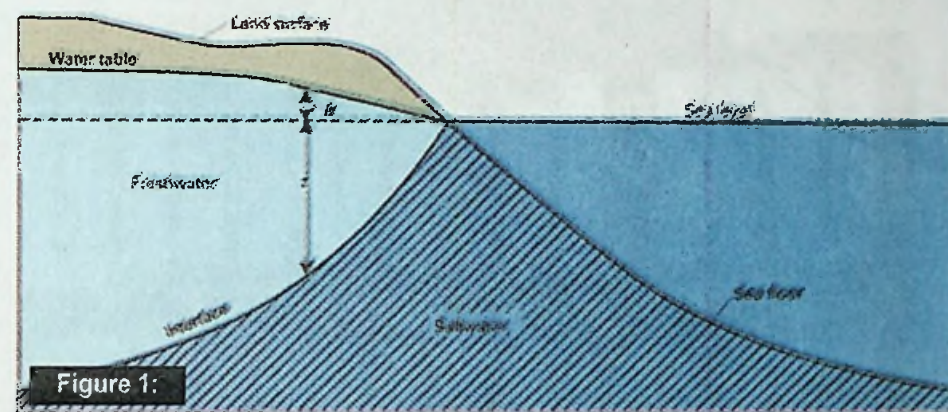


Figure 1:

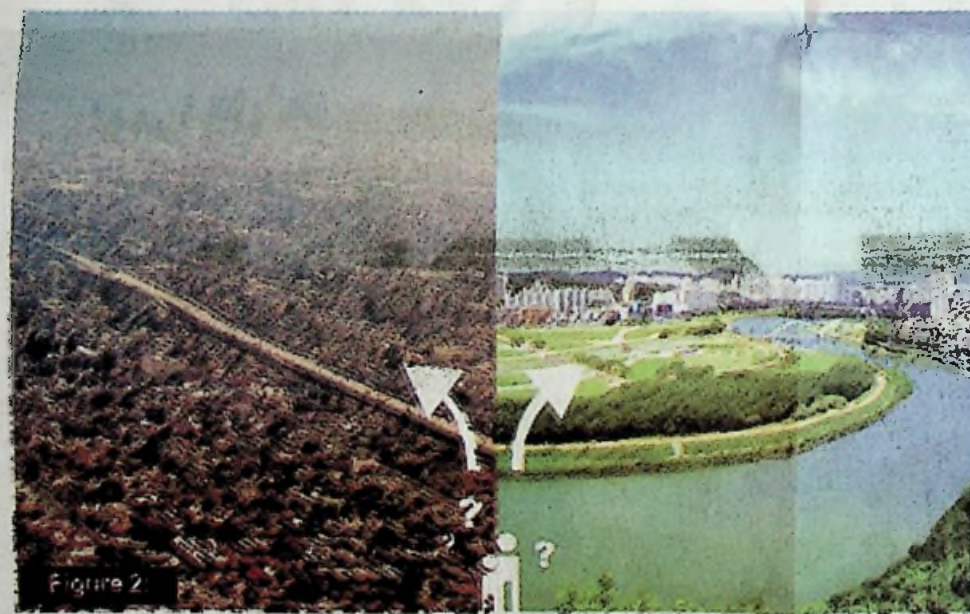
Figure 1. Sea water intrusion in coastal aquifers (https://en.wikipedia.org/wiki/Salt_water_intrusion)

Therefore the subject of intrusion of sea water and its implications has assumed paramount importance, particularly in the island nations. Dr. Gregory De Costa, Senior Lecturer, Department of Civil Engineering at Unitech, New Zealand has done extensive research on this subject highlighting the consequences of intrusion of sea water on fresh water supplies in coastal areas where nearly half of the world population lives (<http://www.unitec.ac.nz/about-us/rising-sea-levels-gregory-de-costa>).

Translating scientific knowledge to design principles in Sri Lanka There is growing awareness in cities throughout the world that green and blue infrastructure can offer a wide range of ecosystem services to support

The quotation "Politics is too serious a matter to be left to the politicians" is attributed to Charles de Gaulle. Likewise, coastal zone management is too serious a matter to be left to a few institutions because about half of the population and half of the GDP of the country come from the coastal areas since economic activities such as manufacturing, trade, tourism, banking, insurance, fisheries, port and shipping are concentrated in this region. Besides, this region is very important from environmental, social and cultural points of view as well.

Therefore a holistic approach is necessary for coastal zone management including infrastructure development in this area because of its far-reaching implications for groundwater recharge and sea water intrusion affecting the supply of drinking water among other things. Mega projects already underway and proposed projects will make an unprecedentedly heavy demand on fresh water resources, and the success of the projects is highly contingent upon availability of quality fresh water in adequate quantity. This is a formidable challenge that has received scant attention. There is little time to waste and delay could prove to be disastrous. Therefore all relevant institutions such as the Coast Conservation Department, Central Environment Authority, Urban Development Authority, National Water Supply and Drainage Board, and local government institutions as well as the academia should join forces and work in concert to plan, design and build infrastructure with the right blend of grey, green and blue for environmental sustainability, habitability and quality of life, leaving no room for unplanned and uncoordinated physical growth for protecting and fostering the precious groundwater aquifers in the country.



many cities in the world. Restoration of mangroves rather than building dikes to protect shorelines from storm damage in Ho Chi Minh city, Vietnam, upstream landscape conservation and restoration as an alternative to conventional water treatment technologies in Bogota, Columbia, and conserving and fostering mangroves, dunes and coral reefs in the Andaman Islands instead of building a sea wall are to name but a few.

Another noteworthy feature of green infrastructure is that it is often cheaper than grey infrastructure. For instance, New York City evaluated two schemes to manage its storm water flow, one a green infrastructure comprising stream buffer restoration, green roofs, bioswales and landscape elements designed to remove silt and pollution from surface runoff, and the other a grey infrastructure comprising tunnels and storm drains. Adopting the former helped to cut cost by more than USD 1.5 billion, but with comparable outcome.

Another emerging concept regarding infrastructure in urban areas is Blue Green Cities. Here water resources and green space are integrated for improved

country.

Figure 2: Business-as-usual vs. eco-efficient and inclusive urban development

Recently I painfully observed how a long and wide stretch of green space on the coast of Weligama was replaced with impervious pavers, an environmental disaster. Impervious concrete and asphalt areas are rampant in the infrastructure landscape of our country. For instance, the Kotuwegoda Beach Park is practically the only resort for leisure, relaxation, recreation and social interaction at Matara; however, over 35% of its area is covered by impervious concrete and asphalt particularly for purpose of parking buses as well as heavy vehicles. A survey by Dr. Chaminda Kumara and his team of the University of Ruhuna revealed that the visitors to the park disliked the concrete and asphalt covered areas as they were inhospitable, particularly during the day and desired more green space in the park. Studies by Dr. Sumanda Kodikara and his team of the same University found that, at noon, the ambient temper-

Figure 2:

Cities, which occupy only 3% of the Earth's land surface, accommodate half the human population, use 75% of the resources, and account for 70% of the CO₂ emissions, contributing to an enormous carbon footprint (<https://www.cepal.org/en/.../37700-are-we-building-competitive-and-liveable-cities>). Migration from rural to urban areas and urbanization occur unabated adding to the ecological footprint, exerting unmanageable pressure on the planet. Therefore it is a formidable challenge to provide essential services and amenities to a rapidly expanding urban population and maintain habitability and competitiveness of local cities in a globalized environment while minimizing the ecological footprint. City infrastructure has a profound effect on environmental health, habitability and competitiveness of cities. Because of the long lifespan and heavy capital outlay involved, it is of utmost importance to correctly and smartly plan, design and build infrastructure, taking into account environmental sustainability, competitiveness and quality of life.

Cities and towns as a major source of environmental pollution and ecological footprint

Against this backdrop, it seems fitting that a "blue-green budget" was recently presented for 2018. Under the circumstances, it is apposite to look at new concepts, strategies and emerging trends in infrastructure development in other countries to promote green cities and green growth, striking a balance between economic development and environment.

The Ministry of Environment, which is under none other than the President Maithripala Sirisena, has a laudable vision – that is to create a healthy and pleasant environment sustaining nature for the well-being of the people and the economy. This ministry has a host of institutions and programmes including the Forest Department, Central Environment Authority, Coast Conservation and Coastal Resource Management Department, Climate Change Secretariat, Blue-Green Era and Sri Lanka Carbon Fund which have a mandate to preserve and protect the environment and mitigate climate change, and around a dozen of environmental policies are in force to this end (<http://www.environment.gov.lk/policies.htm>). In addition, about ten environment-related UN International Days are observed in the country, including the World Environment Day and World Water Day with newspaper supplements and messages from the powers that be. On top of it, millions of saplings have been planted, although with an extremely low success rate, over the past several years to mark the birthdays of political leaders of the ruling party. The environmental situation in the country is, however, deteriorating day by day, with environmental issues assuming alarming proportions. Burgeoning population, migration from rural to urban areas, unscientific and irrational urbanization, uncoordinated and ad hoc industrial growth and poor waste management along with poor implementation of environmental policies have, among others, contributed to the above situation.

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