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Environmental Assessments in an Ecosystems Approach to Urban Development

Arne Dalfelt [1]

[1] Norwegian Institute for Urban and Regional Research (NIBR) , E-mail: arne.dalfelt@nibr.no

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What is an ecosystems approach?

An ecosystem approach is defined as “a comprehensive and holistic approach to understanding and anticipating ecological change, assessing the full range of consequences, and developing appropriate responses. It recognizes the interconnections among component parts, and also recognizes that humans are an integral part of this and that human social and economic systems constantly interact with other physical and biological parts of the system.”

An ecosystems approach to urban development and growth should be seen not only in terms of the immediate urban boundaries, but also in terms of the resources necessary to sustain the urban population. Urban growth problems can be grouped under two broad contradictive classes, those associated with poverty and those associated with economic growth and affluence.

An ecosystems approach to urban development implies that urban centers must be managed within environmentally sustainable resource constraints and limits, and the ecosystem approach to management should involve all relevant sectors of society. Most of the urban and semi-urban development plans in developing countries attempt to be wholly sufficient within the municipal boundaries or immediate area, but in fact, in most urban centres, the level of resource use (food, water, energy, materials supply) and waste generation (solid waste, wastewater, pollutants) are not compatible with the ecological resource sustainability of the immediate surrounding region. The ecological footprint of urban centres illustrates that high-density human settlements no longer have boundaries that coincide with land needed for daily activities, thus modern cities cannot achieve sustainability on their own. For example, according to the Earth Council's report, "Ecological Footprints of Nations" Japanese lifestyles generate a demand for 6.25

hectare per capita (for resources such as energy, arable land, pasture, forest, built-up area, etc.). However, the supply has been only 1.88 hectares per capita. This leaves an 'ecological deficit' of 4.37 hectare per person that has to be met from outside the country. For the greater Tokyo region alone which have almost 30 million inhabitants, this ecological deficit is equal to 120,000,000 hectare or 3.07 times the total land area of Japan.

For urban planning purposes, this problem has to be “reduced” to manageable levels where focus is directed to sub-optimization of issues like the management of upstream watersheds supporting the cities, reduction of air pollution from neighbouring urban industrial areas, downstream river clean up etc.

The Urban Environment

Cities, towns and urban areas fulfil a number of functions for their inhabitants and people that use them. These functions include employment, housing, social interaction, access to goods and services, cultural activities, and recreation. To fulfil this role the urban areas have a variety of static elements like buildings, infrastructure, parks and green areas, transport systems, water, energy, abandoned land, waste, and air. Each of these elements and issues has an environmental function and impact that contribute to the overall environmental character of the urban area. Policy decisions affecting the management of each element is made by different administrative departments at different administrative levels, often in isolation from each other, and the environmental implications of these policy decisions are often not adequately considered. Reducing negative environmental impacts at the same time as securing a vibrant economy and a healthy, equitable society is key to sustainable development. Although this is commonly accepted, many municipalities do not give sufficient high priority to improving the environmental performance and quality of their towns.

Vast urban sections and areas are occupied and settled illegally by slum dwellers, with no secure tenure or land rights, and these dwellers are therefore often subject to exploitation by an illegal property market controlled by local politicians or officials working in collaboration with local property dealers. Insecure land occupation rights and tenure, and the constant threat of having their shelters demolished by urban authorities create a negative incentive for permanent housing and environmental improvement. Although local private financial resources and interest may to some extent be available

in such areas for urban upgrading, corrupt property policies and political power games may almost permanently hinder the empowerment of the slum dwellers and the emergence of secure tenure, and consequently also hinder environmentally sound urban development.

Common urban environmental problems

The urban environment consists of three dimensions: the natural environment, the built environment, and the socio-economic environment. It is the intersection and overlay of these three dimensions that constitutes an "urban environment". Taking any one dimension at the exclusion of the other two, poses the inevitable danger of missing the forest for the trees – the interdependency of the three dimensions have to be fully understood in the development of coherent and sustainable policies and programmes for the urban environment.

Significant proportions of population increases in the developing countries have been and will be absorbed by urban areas. Indeed, urban development in much of the developing world is to a significant extent characterized by an uncontrolled influx of poor peasants from the rural areas to slum areas in major cities. Urban settlements in the developing countries are, at present, growing five times as fast as those in the developed countries. Most of the resulting slums are breeding grounds for diseases, crime and sustained poverty. Systemic environmental problems ranging from poor health due to lack of access to clean water supply and sanitation, ground water depletion and contamination, to vehicular related local air pollution and climate change can be traced to patterns of activities and growth of cities. Cities in the developing countries are already faced by enormous backlogs in shelter, infrastructure, services, and suffers from increasingly overcrowded transportation systems, insufficient water supply, deteriorating sanitation and environmental pollution, thus exacerbating poverty and human misery.

Growing cities are expanding into fragile ecosystems, and cities sometimes deplete nearby areas of water and firewood, rendering them less capable of supporting rural populations and thus adding to the pressures for urban migration.

Urban planners need to deal with the ecological footprint of the urban residents. Various examples may illustrate the immediate ecological footprint and ecosystem dimensions

of city planning and management: (i) clean water supply sources are becoming scarce near many cities and have to be secured from increasingly distant places, (ii) waste from the cities are unhealthily dumped in sites situated in or close to cities' administrative boundaries, (iii) food and firewood have to be supplied from further and further away and transported over longer distances, (iv) several cities are regularly subjected to great economic and social losses caused by floods or droughts as a result of poor land management, (v) groundwater depletion is a common problem in urban slums, (vi) downstream of the cities, polluted waters and waste are causing problems further and further away.

As the congestion and environmental problems grow in the inner city centres, wealthier citizens move to the sub-urban fringe areas contributing to urban sprawl while the city centres slowly dies.

Local urban development policies

Towns and cities will increasingly be the locations where human activities and their associated ecological impacts can be best met with policy and planning responses (UNU/IAS). To reduce the pressures on local environmental resources, at the same time as providing for residents needs, the municipal authorities and governments urgently need to apply practical and decentralized urban environmental management policies and strategies through demonstration projects, capacity building, partnership development, and knowledge sharing.

Conventional urban management and planning approaches have limitations:

- Insufficient recognition that proper regional ecosystem functioning and maintenance is vitally important for people, health, economy, recreation, and overall environmental quality
- Present urban management practices are too site-specific and local based and does not sufficiently take into consideration the inter-linkage between the city and the rest of the region and the country
- Too often single focused sectoral emphasis on either the urban services or on the infrastructural aspects
- Too little understanding and emphasis of the fact that the major issues for good urban development lies outside the city boundaries

- Inappropriate assignment of costs and benefits, due to market distortion and failure, perverse incentives and lack of consideration of values of public goods and open access resources supporting the urban centres.
- Common lack of coordination between different urban sectors.

These limitations are often recognized by urban authorities, but at the same time, tools needed to improve upon the situation are not known or unavailable. Capacity building, improved communication, and institutional coordination are therefore important factors needed and necessary for positive change.

In the absence of environmental policy reform, strong urban institutions, and enlightened political leadership, single focused economic growth and population increase in developing countries are likely to increase the deterioration of the urban environment, both physical and social. A clear urban environmental policy framework should therefore be delineated, based on the sustainable capacities of natural ecosystems at national, regional and local levels, as well as on human-environment interactions. It should take into account the stresses and effects occurring within the urban arena. A system of prioritization has to be put in place, which incorporates concerns for human life, health, productivity and depletion of resource stocks, capacity and resilience of the environment, and the inclusion of systematic accounting measures.

Operationalizing environmental policies, therefore, requires the integration of many interrelated economic, environmental, social and cultural factors.

Table: Resources, Processes and Effects of Urban Ecosystems

Resources	**Processes**	**Effects**
• Human resources • Sunlight • Land • Water • Wildlife • Minerals • Electricity • Fuels • Finance • Intermediary products • Recyclable materials	• Manufacture • Transportation • Construction • Migration • Population growth • Residence/Living • Community services • Government (Education, Health etc.) • Civil society	• *Negative effects* - Pollution - air, water, noise; Waste generation, garbage, sewage; Congestion, overcrowding, transport distance; Vegetation clearing, extermination • *Positive effects* Products, Value-addition, Increased knowledgebase/ education, Access to better services, health

Consolidating the ideas and issues together is the ecosystem approach. An urban ecosystem brings together the resources, processes and products into a coherent system that exchanges and makes use of by-products and/or energy - aiming towards the reduction in the use of virgin materials as resource inputs; reduction in pollution; increased energy efficiency leading to reduced energy use in the system as a whole; reduction in the volume of waste products requiring disposal (with the added benefit of preventing disposal-related pollution); maintenance of green space and biodiversity; and increase in the amount and types of process outputs that have market value.

A city must have adequate infrastructure and flexibility to support the needs of its population, and the needs of the ecosystem as a whole. As in the case of the global system as a whole, cities must not use resources faster than they can be replenished or substituted for, nor generate pollution faster than it can be assimilated. One of the guiding principles for the future will be to reform urban systems so that they mimic the metabolism of nature. Rather than devouring water, food, energy, and processed goods, and then belching out the remains as pollutants, the city could align its consumption with realistic needs, produce more of its own food and energy, and put much more of its waste to use.

Mainstreaming environment

Looking at cities as sustainable ecosystems draws its inspiration from the cyclical ecosystems of nature itself. It is sensitive to global impacts of local consumption and production patterns, and takes an interdisciplinary and interlinked approach in developing its activities, outputs and partners.

Developing cities as sustainable ecosystems requires a radical increase in efficiency and productivity of the resources it uses, and the goods and services it produces. This entails changes in both production, design, and technology, and an increase in the utility value of energy, minerals, water, and other natural resources. Closed-loop systems need to return every output harmlessly back to the ecosystem, or become an input to another process. This requires consumption and production systems that are modeled after the cyclical ecosystems of nature itself.

Municipal authorities are increasingly seeking to mainstream the principles of an ecosystem approach to urban development in order to secure a sustainable input of

needed natural resources, and to mainstream environmental issues in local development policies and address linkages between poverty and environment.

An integrated ecosystem approach to urban development will incorporate a geographically broader holistic planning model. The approach will focus on processes with continuous public representation and participation. Applying the approach will normally entail the following:

- Development and practical testing of site specific models and guidelines for an ecosystem approach to urban development.
- The preparation of a city ecosystem management plan and action programme.
- Conducting a policy dialogue (workshop) with key stakeholders and the target population to raise awareness of the positive issues of an ecosystem approach to urban development.
- Building capacity of local actors, - municipal authorities, town councils, city planners and bureaucrats, and consultants on the ecosystem approach to urban development
- Installing a long term monitoring, research, and organizational training program with regular reporting procedures.

Model development

The structure of an ecosystem approach model with guidelines will define a framework for a geographically inclusive urban ecosystem plan, covering the ecological footprint of the urban population. It will look at constraints and obstacles of applying the ecosystem principles in the urban context. The model will also deal with local economic productivity, social equity and inclusiveness, environmental viability and sustainability questions, and institutional coherence and intercommunication. The ecosystem model framework should enable the analysis of (i) the urban ecosystem services, (ii) the urban ecosystem resilience, (iii) the urban ecosystem processes, (iv) the urban ecosystem boundaries, (v) the multiple equilibrium requirements, (vi) the variable spatial scales, (vii) the variable time scales, and (viii) the resident human populations. As urban ecosystems are complex and dynamic, they contain elements of uncertainty and therefore, the

ecosystem management model needs to be process oriented and adaptive. It will also need continuous communication with target communities.

A set of planning guidelines may be developed as a result of developing the model. Such guidelines will explain and direct the ecosystem approach to urban planning and assist in the analysis, planning and implementation of such approaches for towns and cities.

Environmental impacts assessment

The ecosystem model framework will enable the analysis of a varied set of dynamic elements and their interactions, but the effects of the model on the urban situation, on the society and on the upstream and downstream natural resources need to be evaluated for their environmental and social impacts. A regional strategic environmental assessment (SEA) carried out as an integral part of an ecosystems approach will facilitate the integration of environmental issues into decision-making processes at the strategic level, assisting urban planners and authorities to formulate policies and programs for sustainable urban development. It will also support data needed to develop sound environmental policies for urban development. Strategic environmental assessment methodology has been developed to contribute towards the systematic integration of environmental protection objectives and measures in strategic decision-making. Given due consideration to the overall context of an urban plan, such approach will contribute to the promotion of sustainable development.

The working definition of SEA is that it is a process which uses various tools and techniques to establish a decision-making framework in which you have the ability to understand what strategic choices to pursue and what the trade-offs will be. This approach to SEA is particularly useful and relevant for municipalities and sub-regions whose economies are dependent on the goods and services provided by natural resources. The sub-region supporting the urban center with water, energy (fuel), agricultural products, waste disposal, sewerage disposal, transport, air quality etc. will benefit from the production of a regional strategic environmental assessment (SEA), and this will subsequently simplify the elaboration of more project specific environmental assessments as the needs arises.

The inherent limitations of project-level environmental impact assessment provide the main reason for the development, testing and implementation of strategic environmental assessments. Internationally SEA practices are growing steadily, however, a universally accepted concept of SEA and its application is still developing.
The widespread benefits of strategic environmental assessments include its application at the local and sub-regional level and its integration into the highest levels of decision-making for policy, plans and programmes. Research, training and the sharing of information and experiences is vitally important for the development and consolidation of strategic environmental assessments if they are to function as a useful tool in developing an ecosystems approach to urban planning.

Content of an urban ecosystem management plan

On the basis of the model, and the results of the SEA, an urban ecosystem management plan may be developed and should include among others the following steps:

- Preparation of a regional assessment (upstream and downstream of the urban center), identifying the urban population's widest ecological footprint.
- Preparation of a city ecosystem profile which includes an analysis of the urban ecosystem structure and functioning. This may include the following points: (i) the city, its governance structure and characteristics, and its functions within the hierarchy of the region and the country, (ii) the urbanization processes and population movement trends of the city and neighbouring region, (iii) the main human alterations of the major urban ecosystems, (iv) urban infrastructure, land use and services, (v) the urban environmental conditions and stresses: air quality, water supply and water quality, water use and wastewater treatment, energy production, consumption, and pollution, materials use and solid waste disposal and contamination, natural resources, green space and consumption of land, natural and industrial risks and hazards.
- Identification of the priority issues through stakeholders' consultation.
- Formulation of an adaptive process oriented urban ecosystem management action plan for the priority issues, including mitigation measures identified in the environmental and social assessment.
- Institutionalization of the ecosystem approach into the municipal system by proposing an organizational framework to enhance the local governance and

planning, the managerial and monitoring capacity. This should accommodate for a holistic planning approach cross-cutting sectoral responsibilities and management arrangements

- Policy dialogue workshop to raise awareness amongst stakeholders on ecosystem approach to urban development.
- Capacity building of urban workers and staff

Capacity building on ecosystem approach to urban development

In most cases it will be necessary to provide professional training to municipal staff, and to provide advice on management issues related to an ecosystem approach to urban development to local actors in the selected towns. Preferably this training should be practical and "hands on" to the extent possible. It would increase training efficiency if the teaching becomes semi-permanently attached to the preparation of urban ecosystems management long plan. Such on-the-job training could be given as modules in parallel with project implementation monitoring. This training should among other issues focus on the following modules:

- urbanization and ecosystems in the region,
- the people and their activities,
- city management and governance,
- urban ecosystems and environmental demands,
- environmental and social assessments,
- pollution and human health,
- waste originating in urban populations,
- ecosystem approach to urban development: basic concepts –
- interdependence - understanding the interactions,
- integrated urban planning and management,
- maintenance of the integrity and the health of the ecosystem,
- conservation of water,
- conservation of energy,
- ecosystems and natural features;
- urban infrastructure and services;
- monitoring progress,
- fiscal policies supportive of sustainable goals,

- dynamism, process oriented and adaptive planning,
- the need for public involvement.

Long term monitoring, research, and organizational training program.

An ecosystems approach model and plan will need to have a long term monitoring and advisory program attached. Such monitoring providing regular reporting to the program coordinators and municipal authorities will enhance local research capacities, and provide organizational training opportunities. Having the monitoring, research and training program in parallel with the program will secure timely corrections and necessary plan-changes to the programs, as well as input data to future research.

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