THE WORLD BANK

Eco2Cities

Ecological Cities as Economic Cities

Urbanization in developing countries is a defining feature of the 21st century. Some 90 percent of global urban growth now takes place in developing countries – and between the years 2000 and 2030, developing countries are projected to triple their entire built-up urban areas. This unprecedented urban expansion poses cities, nations and the international development community with a historic challenge and opportunity. It sets forth before us a once in a lifetime opportunity to plan, develop, build and manage cities that are simultaneously more ecologically and economically sustainable. We have a short time horizon within which to impact the trajectory of urbanization in a lasting and powerful way. The decisions we make together today, can lock-in systemic benefits for the present and for future generations.

"**Eco² Cities: Ecological Cities as Economic Cities**" is a new initiative launched by the World Bank in order to respond to this challenge. Its objective is to help cities in developing countries achieve greater ecological and economic sustainability.

What do we mean by Ecological Cities?

Ecological cities enhance the well being of citizens and society through integrated urban planning and management that fully harnesses the benefits of ecological systems, and protects and nurtures these assets for future generations.

What do we mean by Economic Cities?

Economic cities create value and opportunities for citizens, businesses, and society by efficiently utilizing all tangible and intangible assets, and enabling productive, inclusive and sustainable economic activity.

So what do we mean by an Eco² City?

*As the name implies, an **Eco²** City builds on the synergy and interdependence of ecological and economic sustainability, and their fundamental ability to reinforce each other in the urban context. Innovative cities in both the developed and the developing world have demonstrated that with the appropriate strategic approach they can economically enhance their resource efficiency - realizing the same value from a much smaller and renewable resource base – while simultaneously decreasing harmful pollution and unnecessary waste. By doing so, they have improved the quality of life of their citizens, enhanced their economic competitiveness and resilience, strengthened their fiscal capacity, and created an enduring 'culture' of sustainability. At the same time, many of their interventions have also provided significant benefits to the poor. Urban sustainability of this kind is a powerful and enduring investment that will pay compounding dividends. In a fast-paced and uncertain global economy, cities that adopt such an integrated approach are more likely to survive shocks, attract businesses, manage costs and prosper.*

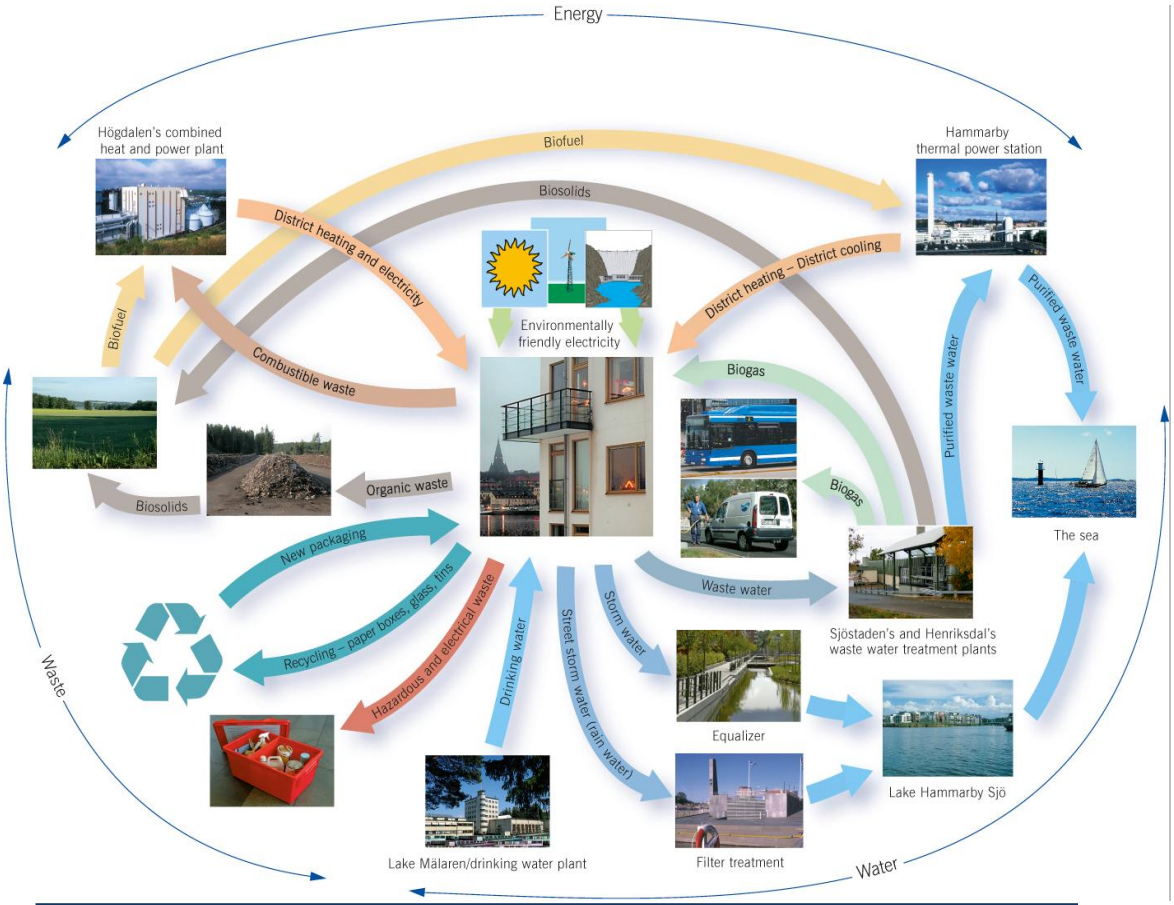
It is with the purpose of enabling cities in developing countries to realize this value, and take on a more rewarding and sustainable growth trajectory while the window of opportunity is still open to them, that the Eco² Cities Program has been developed.

Some Unique Features of Eco² Cities Program

The ***Eco² Cities Program*** has a number of unique features. First of all, it is a comprehensive support program which provides cities with an analytical and operational framework that can be applied to the particular challenges of each city. The framework also includes methods and tools that make it easier for cities to adopt the Eco² approach as part of their city planning, development and management. The ***Eco² Cities Program*** will also assist cities in developing countries access financial resources needed for strategic urban infrastructure investments.

Another important feature of ***Eco²*** is its **bottom-up approach**. A number of innovative best-practice cities around the world have demonstrated how ecological and economic progress can go hand-in-hand. The ***Eco²*** program elements build on these global best practices in a systematic manner. For example;

- **Stockholm** has demonstrated how integrated and collaborative planning and management, can transform an old inner city industrial area into an attractive and ecologically sustainable district - based on a cyclical urban metabolism. The district is seamlessly integrated into the larger urban fabric, and has provided inspiration for more initiatives in the city and catalyzed change. Some of the initial results have been a 30% reduction in non-renewable energy use and a 41% reduction in water use.



The Hammarby Model, Stockholm: An Example of Integrated Planning and Management based on a cyclical urban metabolism, that leads to substantial reductions in resource use and emissions. (http://www.hammarbysjostad.se/frameset.asp?target=inenglish/inenglish_model.asp)

The City of Stockholm, is also physically well integrated with an effective public transport system, and good spatial planning.

- **Curitiba**, has implemented innovative, imaginative and practical solutions that demonstrate resource constraints are no barrier to sustainable ecological and economic urban planning and development – and that sustainable planning is in fact an investment in the future of a city's economy and welfare. Through its innovative approaches in urban planning, city management and transport planning, Curitiba has been able to sustainably absorb a population increase from 361,000 (in 1960) to 1,797,000 (in 2007). Most well known for its innovative 'Bus Rapid Transit' system, Curitiba has found innovative solutions to practically every dimension of planning – and most importantly created an enduring 'culture' of sustainability. Consequently, Curitiba has the highest rate of public transport ridership in Brazil (45%), the lowest congestion related economic losses, and also enjoys lowest rates of urban air pollution. While preserving urban density and vibrancy, Curitiba invested in large parks as ecological assets for flood prevention and recreation. This solved the city's flooding problems at 1/5th the cost of constructing canals, greatly enhanced the attractiveness of the city for residents and tourists, provided bike routes and pedestrian pathways that linked into city's existing transportation network, and increased property values of neighborhoods close to parks. The poor have always been an integral part of the city's programs, and have benefited from community housing and small business assistance programs. Through an innovative waste collection and recycling program, the poor can exchange collected waste for transport coupons and food.

- **Yokohama**, Japan's second largest city, has demonstrated how an integrated approach to waste management, combined with stakeholder engagement, could reduce solid waste by 38.7% and during a period when population actually grew by 170,000. This significant waste

reduction allowed Yokohama to save US$1.1 billion which was otherwise required for the renewal of two incinerators, as well as US$ 6 million annual operation and maintenance costs.

- **Vancouver** has demonstrated how a set of basic land use planning principles, combined with independent thinking at the local level, can help to create a highly livable region and to combat the forces that lead to urban sprawl. As a consequence, the metropolitan area is much more compact than other metropolitan city of same population. The downtown core is home to a large population including families, has no freeway access, and is consistently ranked number one or two amongst cites worldwide in terms of livability.

So, how does the Eco² Cities Program work?

The World Bank's Eco² City program is a broad platform that will provide practical and scalable, analytical and operational support for cities in developing countries to achieve ecological and economic sustainability.

The Eco2 cities program has developed an analytical and operational framework that can be used by cities across the globe to work towards their sustainability targets.

The Eco^2 analytical and operational framework is rooted in four key principles. Cities will face challenges when trying to adopt a new approach. These challenges have been carefully anticipated in the framework, and together with the valuable ground level lessons from best practice cities they help to frame our strategic response: the key principles that will define the Eco² City Program. Each of these has been elevated to status of principle, because it is widely applicable, critical to success, and frequently ignored or under-appreciated.

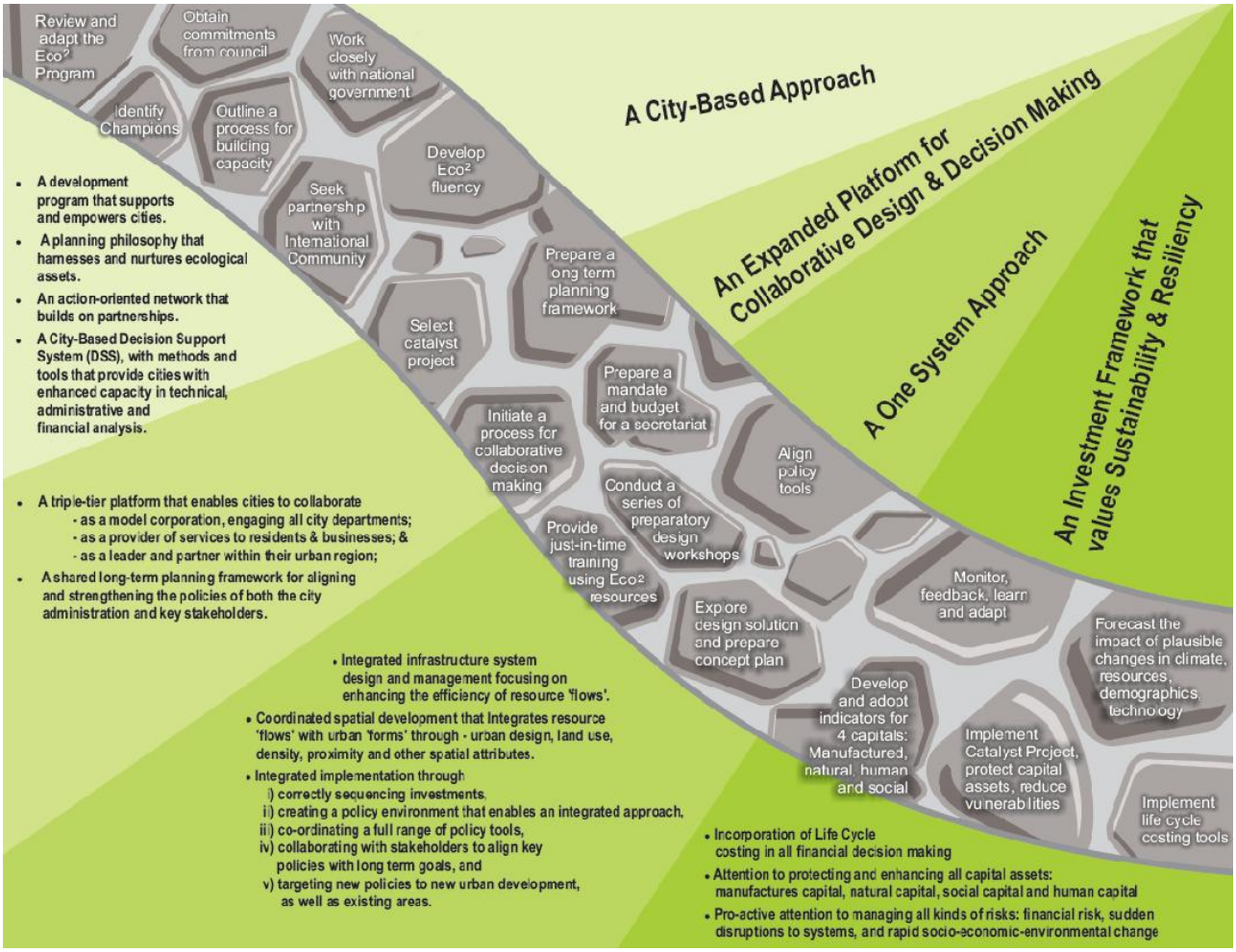
These four principles are 1) 'A City Based Approach,' which enables local governments to lead a development process that takes into account their specific circumstances, including their local ecology; 2) 'An Expanded Platform for Collaborative Design and Decision Making' that accomplishes sustained synergy by coordinating and aligning the actions of key stakeholders; 3) 'A One System Approach' that enables cities to realize the benefits of integration by planning, designing, and managing the whole urban system; and 4) 'An Investment Framework that Values Sustainability and Resiliency' by incorporating and accounting for life cycle analysis, the value of all capital assets (manufactured, natural, human, and social), and a broader scope of risk assessments in decision making.

The four principles are interrelated and mutually supportive. For example, without a strong city-based approach, it is very difficult to fully engage key stakeholders through an expanded platform for collaborative design and decision-making. And without this expanded platform, it is difficult to explore creative new approaches to the design and management of integrated systems, and to coordinate policies to implement through the one system approach. Prioritization, sequencing, and effectiveness of investments in sustainability and resiliency will be greatly enhanced by appreciating the city as 'one system' and expanding the platform of collaboration.

Through these four key principles are derived a set of core elements that further define the Eco^2 Framework. Cities are encouraged to operationalize the core elements into a series of concrete action items or 'stepping stones,' that take into account local conditions, and follow a logical sequence. Together, these stepping stones enable a city to develop its own unique Eco^2 action plan, called an Eco^2 Pathway. The Eco^2 Cities program also introduces cities to methods and tools that will lead to more effective decision-making through powerful diagnostics and scenario

planning. These methods and tools can also be used to operationalize the core elements and to implement the stepping stones.

In this context, an Eco^2 City is a city which formally accepts the four key principles, applies the Analytical and Operational Framework to its particular context, and by doing so develops and begins to implement its own Eco^2 Pathway.



Each of the four Eco^2 principles breaks down into a list of core elements (far left). These elements can be used to create the Stepping Stones that each city needs to create a unique Eco^2 Pathway.

Now let us look at each principle in some more detail:

The Four Eco^2 Principles

Principle 1: A City-Based Approach

A city-based approach is the first principle, and it carries two complementary messages. Firstly, it recognizes that cities are now at the front lines of managing change and leading an integrated approach. Not only do cities now embody the engines of economy and the homes of citizens, they also are responsible for a majority of resource and energy consumption, and harmful emissions. Only at the city level is it possible to integrate the many layers of site specific

information, and to work closely and rapidly with the many stakeholders whose input can impact the effectiveness of an Eco^2 Pathway, and who have a stake in its successful implementation. In addition, fiscal and administrative decentralization has brought important decision making and management responsibility to local governments. Cities can exercise proactive leadership, and thereby trigger a process of change.

Secondly, a city based approach serves to emphasize the importance of incorporating within any development program the unique aspects of place - especially ecological systems. In this sense, a city-based approach responds to opportunities and constraints of local ecologies. How might development fit into the topography of the area so that water is provided by gravity, and so that drainage is provided by natural systems (reducing the need for expensive infrastructure investments and related operation costs)? How might a city protect its water recharge areas and wetlands, so that water capacity and quality are sustained? How do we distribute populations and design cities so that local or regional renewable energy – windy sites, forests, solar access – is sufficient to meet basic needs? These types of questions may ultimately provide urban professionals with their most exciting design challenge: how to fit cities into the landscape in ways that respect and complement the natural capital, and ensure ecological services are available for present and future generations.

A city-based approach is thus very place specific, with a focus on enabling local leadership, local ecologies, and the broader local context. In fact, one of the first stepping stones of a city will be to review and adapt the Eco^2 framework to the local context.

Principle 2 – An Expanded Platform for Collaborative Design and Decision-making

Cities are increasingly experiencing a splintering of infrastructure responsibilities, the overlapping and intersection of jurisdictions, and an increase in private sector ownership of key assets. If cities are to lead the process of urban development, especially in the context of rapid urbanization, it is important to get ahead of this curve.

A city can lead a collaborative process on at least three tiers of an expanded platform. At the first tier, projects may be completely within the realm of control of the city administration itself, and will entail a city getting its own house in order – for example, by supporting an energy efficiency upgrade for all municipally-owned buildings, or a ride-share program for employees, or energy and transport peak load management by adjusting working hours. At the second tier, projects will involve the city in its capacity as a provider of services and include its formal planning, regulatory, and decision making powers – this can include water provision, land use planning, or transit development. At this level, greater collaboration is warranted with other stakeholders (including the private sector and consumers) who can influence, and who might be impacted by, the outcomes. The third tier of the expanded platform will entail collaboration at the scale of the entire urban area or region – this can pertain to issues like the development of new land or metropolitan management – and may necessarily involve senior governments, key private sector partners, and civil society.

A core element of the triple tier platform for collaboration is a shared long-term planning framework for aligning and strengthening the policies of both the city administration and key stakeholders, and for guiding future work on Eco^2 projects. In this way, triple tier collaboration can get everyone rowing in the same direction.

A Triple-Tier Platform

A Triple-Tier Platform requires that cities collaborate at varying levels of influence: at the inner tier collaboration occurs internally as departments pursue sustainable operations; at the middle tier collaboration among stakeholders can improve the sustainability of service delivery; at the outer tier the collaboration process engages many equal partners who have a stake in a sustainable urban region.

Principle 3 - A One-System Approach

The One System Approach is about taking full advantage of all opportunities for integration by learning to view the city and the urban environment as a complete system. Once we see the city and the urban environment as a system, it is easier to design the elements to work well together. This can mean enhancing the efficiency of resource 'flows' in an urban area through integrated infrastructure system design and management. For example, the looping and cascading of energy or water through a hierarchy of uses can satisfy many demands with the same unit of supply.

The One System Approach also includes integrating urban 'form' with urban 'flows' by coordinating spatial development (land use, urban design, and density) with the planning of infrastructure systems. For instance, new development can be directed to those locations with a surplus of water, energy, and transit. Urban form and spatial development also establish the location, concentration, distribution, and nature of demand nodes that impact the design of infrastructure system networks. By doing so, urban form establishes the physical and economic constraints and parameters for infrastructure system design, capacity thresholds, technology choices, and the economic viability of different options. This has tremendous implications for resource use efficiency.

It is a challenge, and a huge opportunity, for any city to integrate the planning of flows and forms, and operationalize initiatives. The One System Approach also focuses on how to implement projects using a more integrated implementation approach. This means sequencing investments so that the city sets the correct foundation by addressing the long-lasting, cross cutting issues first. This also means creating a policy environment that enables an integrated approach, co-ordinating a full range of policy tools, collaborating with stakeholders to align key policies, and targeting new policies to reflect the different circumstances between urbanization in new areas and improving existing urban areas.

Integration can apply to the elements within a sector, or across sectors. It can apply to implementation policies, collaboration of stakeholders and their plans, sequencing of financing mechanisms, and all of these in combination! In every case, the integration of elements tends to reveal opportunities for greater efficiency, synergy, and increased utility from a given investment, with corresponding improvements in ecological and economic performance.
By applying the One System Approach, cities, and their surrounding natural and rural areas, can strive to coalesce into a functional system that works well as a new whole.

Principle 4 – An Investment Framework that Values Sustainability and Resiliency

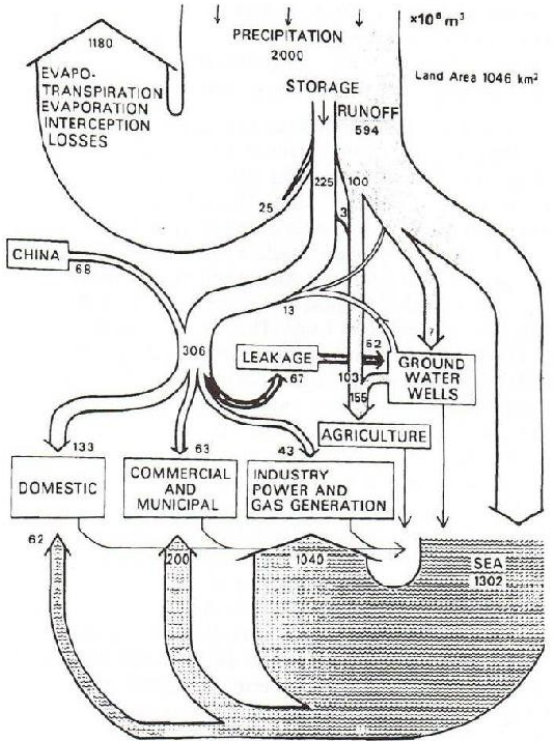
The simple concept of investing in sustainability and resiliency for cities has become extremely difficult to put into action. Policies, plans, and projects tend to be assessed on their short term financial returns, or on an economic valuation based upon narrowly structured cost benefit analysis, from the perspective of a single stakeholder or project objective. Investments are valued in monetary terms, and what cannot be monetarised is either ignored, or addressed on the side as 'externalities.' Decisions are dominated by immediate capital costs, despite the fact that often over 90 percent of lifecycle costs for typical infrastructure are expended during operational maintenance and rehabilitation.

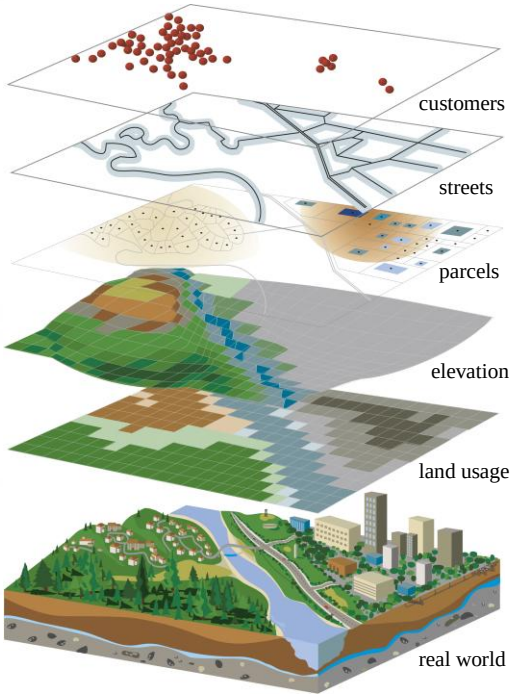
Few cities worldwide have a real knowledge of the impact of new development on their long-term fiscal condition. Lifecycle costs are often back-loaded, which means that future generations will have a massive infrastructure deficit, as they face costs for repair and replacement of infrastructure without any prior capitalization.

At the same time, ecological assets, the services they provide, and the economic and social consequences of their depletion and destruction are not accounted for in most government budgets. Since these assets are not measured, they are treated as zero value – and their services go unaccounted for. Principle 4 requires that cities adopt a new framework for making policy and investment decisions.
The framework has multiple elements. A new range of indicators and benchmarks must be adopted for assessing and rewarding performance of all stakeholders. The family of indicators must address the needs of different categories of decision-makers (e.g., strategy evaluation vs. operational). Longer time horizons are needed, and life-cycle cost-benefit analysis must be applied to understand full implications of policies and investment options. All four categories of capital assets (manufactured, natural, human, and social) and the services they provide must be appropriately valued or priced – and monitored through indicators. The combination of indicators should be viewed as a whole so that the qualitative dimensions of city life (cultural, historic, and aesthetic) cannot be ignored when assessing costs and benefits.

At the same time, investing in sustainability and resiliency will entail broadening our scope of risk assessment and management to include managing the many indirect, difficult to measure risks that nonetheless threaten the viability of an investment or even the city as a whole.

Eco^2 Methodologies: Combining Flows and Forms to Create a Trans-Disciplinary Platform



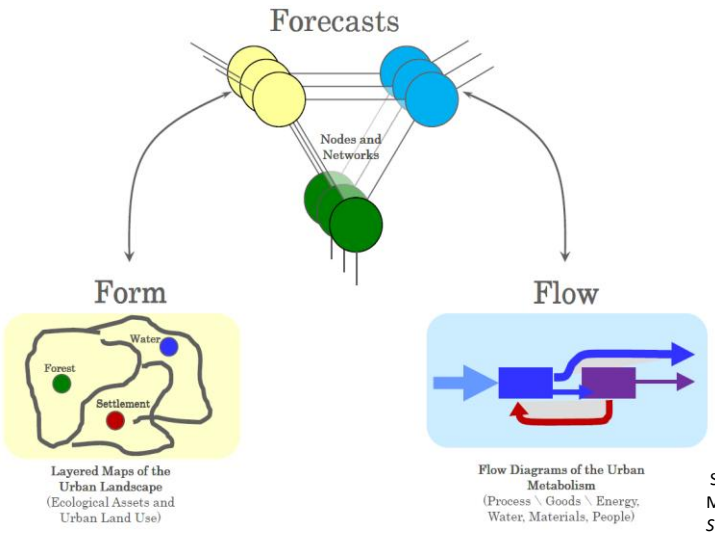


FLOWS: Materials Flow Analysis and Sankey Diagrams

This is a method for calculating and illustrating the flow of resources through any size of urban area. Inputs and outputs are determined as a resource is extracted from nature, processed by infrastructure, consumed by homes and businesses, treated by infrastructure, and finally returned for re-use, or delivered back to nature as waste. Colourful and simple diagrams are used to educate everyone on the resource flows, and how effectively they are used, all on a single page.

FORMS: Layering of Information Maps

Maps are especially useful in collaboration, since they speak so well to so many: a picture is worth a thousand words. The layers of information make it possible to immediately interrelate the different features and qualities of the landscape and also to easily quantify important spatial relationships. Layering is an old technique that has become more powerful as a result of computer technology and satellite imagery.



INTEGRATING FORMS AND FLOWS: A Tran disciplinary Platform

Because diagrams and maps can be easily understood and shared by a broad range of professionals and decision-makers, they help to bring stakeholders and experts together, facilitating a common understanding of integrated approaches to design and decision-making. Both forms and flows should be analyzed and understood for current and future scenarios. The methods in combination form a 'transdisciplinary' platform for understanding both the spatial dynamics of a city and its physical resource flows – elements that are interdependent but difficult to integrate because they involve such different skill sets and stakeholders. This transdisciplinary platform enables the One System Approach.

Source: Baccini P, Kytzia S & Oswald F 2002: Restructuring Urban Systems. In Moavenzadeh F, Hanaki K & Baccini P (Eds): *Future Cities: Dynamica and Sustainability;* Kluwer Academic Publishers, Dordrecht.

Incremental and Phased Approach Using an Eco² Catalyst Project

Clearly, taking on all the core elements simultaneously may not always be possible for all cities. Probably many cities will need to take an incremental or phased approach. Often, cities may begin by engaging in capacity building and by targeting their most critical priority through the development and implementation of an Eco² Catalyst project. Given the many innovations and transformations required, an Eco^2 Pathway may be more manageable when developed in phases or increments. A good first step would be to select an Eco^2 Catalyst project that fits into the most critical priority areas for a city, and then use this project to expand capacity. This can lead to plans for targeting a city's most urgent priority through the development and implementation of an ***Eco^2*** 'Catalyst Project'. Unlike stand-alone projects in resource efficiency, what will distinguish an ***Eco^2*** Catalyst Project is its explicit objective and ability (beyond its immediate project scope and objectives) to drive the city forward on its ***Eco^2*** Pathway by catalyzing a process of change. The Eco^2 pathway of each city will be designed in consideration of each city's needs, priorities and capacities.

Moving Forward Together

Cities are the place where hope can emerge from uncertainty, and where challenges can lead to solutions.

The Eco² Program provides a foundation for helping cities in developing countries achieve greater ecological and economic sustainability. The World Bank intends to collaborate with cities in developing countries, their national governments, the international community, global best practice cities, multilateral and bilateral development agencies, academia, the private sector and NGOs. As pilot Eco^2 Cities in developing countries develop and implement their own Eco^2 pathways, we hope to channel their support to other cities beginning their Eco^2 pathway. We are very pleased that some of the best practice cities and development agencies have shown strong interest in working together in ***the Eco^2 Cities Program. The Eco^2 Cities Program*** will continue to evolve as this larger community of expertise becomes familiar with the program and as the approach is field-tested and adapted to different locations and circumstances. Now is a particularly good time to explore how you can help to shape the ***Eco^2*** Cities Program, and how you can use the program to enhance your own plans and priorities.

Cities are places where hope can emerge from uncertainty and challenges can lead to solutions. Curitiba has overcome the chronic flooding through Green Engineering by preserving its natural areas and turning them into parks. In terms of waste management, innovative waste management programs such as the Garbage that is not Garbage Initiative (recycling) has raised environmental awareness among citizens. (Picture from IPPUC, Curitiba)

Collaboration

Valuable support was provided to the World Bank by the Australian Government's overseas aid program AusAID, which provided co-funding as well as peer review and comments to the program. In addition, the Energy Sector Management Assistance Program (ESMAP) provided financial and intellectual support, and the Swedish International Development Cooperation Agency (SIDA) contributed its knowledge to further the development of this Program.

The Book on Eco² Cities

The World Bank's publication entitled: "Eco^2: Ecological Cities as Economic Cities," has recently been issued as a three-part book. Part One of the book expands on the principles and develops them into a set of core elements. It explores how cities can use these elements to create a phased, incremental Eco^2 Pathway. Part Two of the book introduces the methods and tools that provide cities with the capacity to undertake more integrated development. Part Three includes case studies of best practice, city by city, and a review of current planning and policy options, sector by sector. Other methods, tools and case studies which could not be included in the publication, will soon be posted on World Bank Eco^2 website at www.worldbank.org/eco2, which is soon to be launched. This book will be available at the East Asia and Pacific Regional Launch on June 26, 2009 in Singapore (Website: http://www.urs2009.net/) and at Global Launch on July 1st, 2009 in Marseille, France (Website: http://www.sip.org.sg/).

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