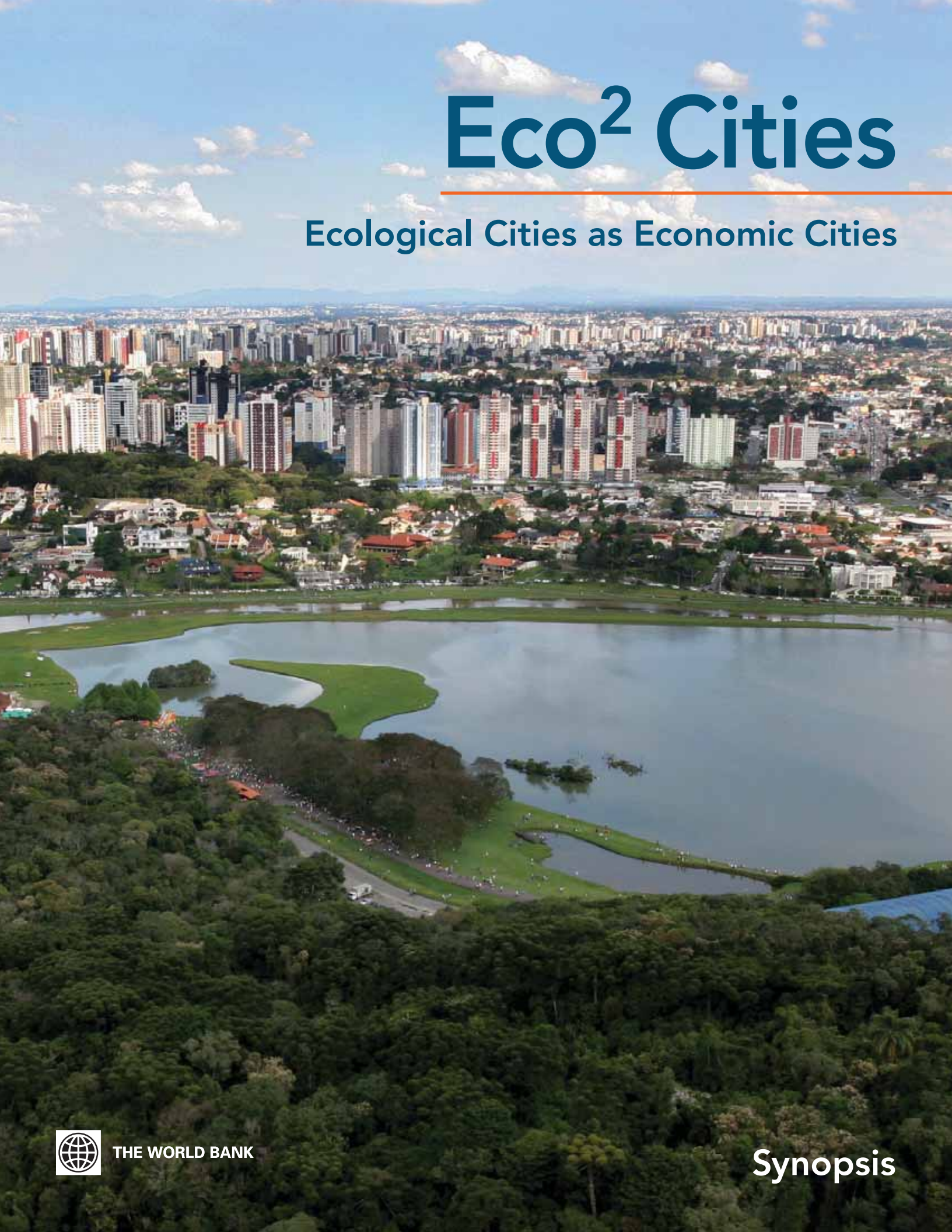
Eco^2 Cities

Ecological Cities as Economic Cities



THE WORLD BANK

Synopsis

Ecological cities as economic cities

Photo courtesy of the Institute for Research and Planning of Curitiba.

Photo courtesy of Arish Dastur

Eco^2 Cities is a new initiative launched by the World Bank, as an integral part of the World Bank Urban and Local Government Strategy, to help cities in developing countries achieve greater ecological and economic sustainability.

Urbanization in developing countries may be the single greatest change in this century. It is projected that developing countries will triple their built-up urban area between 2000 and 2030—from 200,000 square kilometers to 600,000 square kilometers. These added 400,000 square kilometers, constructed in just 30 years, equal the world's built-up urban area in 2000. One could say humans are building a whole new world at about 10 times the speed, in countries with severe resource constraints—natural, fiscal, administrative, and technical. And they are doing so in an increasingly globalized context with many new, constantly fluctuating, interlinked, and uncontrollable variables.

If we are to absorb and sustain this powerful wave of urbanization, while continuing to manage the existing built stock, we will need a paradigm shift, based on systematic learning from global best practices. Some fundamental questions: How can cities continue to harness the opportunities for economic growth and poverty reduction offered by urbanization, while also mitigating its negative impacts? How can cities do so given the speed and the scale of urbanization, given their own capacity constraints? How can ecological and economic considerations be dovetailed, so that they produce cumulative and lasting advantages for cities? How do we go from 'Eco vs. Eco' to 'Eco^2 cities'?

Achieving ecological and economic sustainability

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

What is an Eco^2 city?

As the name implies, an Eco^2 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 reducing 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.

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 Eco^2 Cities Initiative has been developed.

Some unique features of the Eco^2 Cities Initiative

The Eco^2 Cities Initiative provides cities with an analytical and operational framework that can be applied and contextualized to the particular challenges of each city. The framework also includes methods and tools that make it easier for cities to adopt the Eco^2 approach as part of their city planning, development and management. The Eco^2 Cities Initiative will also assist cities in developing countries gain access to financial resources needed for strategic urban infrastructure investments. Another important feature of Eco^2 is its bottom-up approach. Innovative best-practice cities around the world have demonstrated how ecological and economic progress can go hand-in-hand. Eco^2 elements build on these global best practices systematically.

How the Eco^2 Cities Initiative works

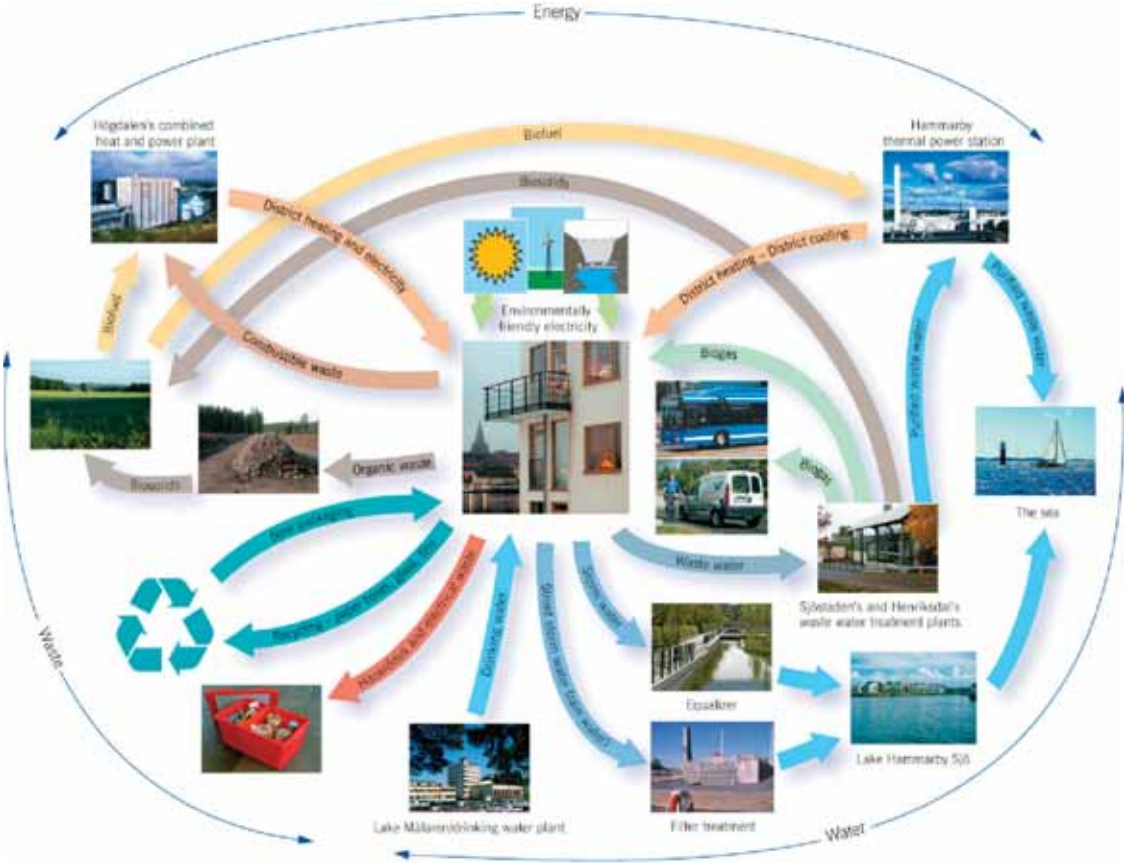
The Eco^2 Cities Initiative works through the application of an analytical and operational framework that helps cities systematically achieve positive results. As a framework, it provides a point of departure and needs to be customized to the particular context of each city.

After carefully assessing cities that have benefited tremendously from this sort of approach, and looking in detail at the major challenges that have prevented most other cities from accomplishing similar achievements, the framework has been structured around four key principles that were found to be integral to lasting success. These principles are the foundation of the Eco^2 initiative.

Each principle, is widely applicable, critical to success, and frequently ignored or underappreciated.

- ***A city based approach.*** Enables local governments to lead a development process that takes into account their specific circumstances, including their local ecology.
- ***An expanded platform for collaborative design and decision-making.*** Accomplishes sustained synergy by coordinating and aligning the actions of key stakeholders.
- ***A one system approach.*** Enables cities to realize the benefits of integration by planning, designing, and managing the whole urban system.
- ***An investment framework that values sustainability and resiliency.*** Incorporates and accounts for lifecycle analysis, the value of all capital assets (manufactured, natural,

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)

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 initiatives, 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.

Photo courtesy of the Institute for Research and Planning of Curitiba.

Yokohama, Japan's 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.

human, and social), and a broader scope of risk assessments in decision-making.

The four principles are interrelated and mutually supportive. 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.

A set of core elements have been derived through these principles. Each city may transform 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 action plan, called an Eco^2 pathway. The Eco^2 Cities Initiative 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 implement the stepping stones.

In this context, the ideal situation is when a city adopts 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 sustainability pathway. Cities may begin incrementally, by engaging in capacity building and data management and by initially targeting their most critical priority through developing and implementing and Eco^2 catalyst project. Unlike stand-alone projects in resource efficiency, a catalyst project is distinguished by an explicit objective and ability—beyond the immediate project scope and objectives—to drive the city forward on its sustainability pathway by catalyzing the process of change.

A city based approach

A city based approach, the first principle, carries two complementary messages. First, it recognizes that cities are now at the front lines for managing change and leading an integrated approach. Only at the city level is it possible to integrate the many layers of site-specific information and work closely and rapidly with the many stakeholders who can contribute to an integrated solution. In addition, fiscal and administrative decentralization has brought important decision-making and management responsibility to local governments.

Second, the approach emphasizes the importance of incorporating within any development program the unique aspects of place, especially the ecological assets. Increasingly, cities depend on their natural landscapes to provide food and recreation, capture and store water and energy, absorb wastes, and satisfy many other needs. Protecting and enhancing ecological assets—the natural capital—is a priority when directing (and constraining) urban growth. A city based approach is thus very place-specific, with a focus on enabling local leadership and local ecologies.

Depending on size, cities are the most influential institutions within the modern nation. They represent the engines of the economy and provide homes for a majority of the population. They also are responsible for a majority of resource and energy consumption and harmful emissions. Thus a city that works with its key sectors and stakeholders is especially well placed to explore Eco^2 solutions. Cities also have some critical instruments at their disposal, such as zoning, permits, approvals, taxes, and fees. And many have been further empowered through fiscal and policy decentralization. It is not surprising, therefore, that almost all the case studies of Eco^2 solutions have occurred in cities that have strong leadership and applied a city-based approach.

When a city takes leadership in setting priorities and implementing solutions, two factors appear to be critical: its level of commitment, and its capacity

to act. Decision-makers need to be convinced of the value of an Eco^2 approach and to mobilize political support within their constituency. A city's success will depend upon how effectively and creatively it uses and develops the levers within its control: these can range from its human and technical capacity and its knowledge of local realities, to its formal urban planning tools and municipal finance strategies. And to act effectively, a city may need technical, administrative, and financial support, including knowledge, skills, and tools.

A city's capacity to act will also depend on levers beyond its realm of control. Often its legislative, administrative, and fiscal powers are circumscribed by national or state level governments whose cooperation is crucial. Given the growing predominance of metropolitan areas which span the jurisdiction of more than a single city, it is often the case that coordination is required at the metropolitan level for optimal interventions within and across all sectors. Thus leadership by cities needs to occur at many levels, including the region.

The city based approach is not only political, it is fundamentally ecological. Cities are centers of resource consumption, and resource efficiency will depend greatly on how well the city is integrated into the local and regional ecologies. City planning is first about protecting and regenerating the irreplaceable natural capital, especially the natural assets and ecological services throughout the urban region in which the city is located. All cities need to be fully integrated into a viable local ecology. The integration of cities into local ecologies can happen at all scales, from food gardens and nature-scaping to planning containment boundaries that effectively separate urban areas from natural areas.

The ecological elements can provide multiple services to the local economy, by mixing and intersecting within the city, and stretching throughout the city as a natural blue/green web. Ecologies and open green spaces serve as a kind of green infrastructure. They might pollinate crops and orchards on behalf of the agri-food systems, or recharge aquifers on behalf of the water supply system, or channel wind toward open hilltops, or create water basins on behalf of the local energy utility. Green infrastructure can also enhance the larger ecological systems.

The city based approach is bottom-up

The bottom-up actions at the local level generate creative self-reliant solutions, while the top-down supports at the senior government level enable cities to implement local solutions.

An expanded platform for collaborative design and decision-making

Cities are dynamic. They emerge from the overlapping actions of many different groups of stakeholders—public sector, the private sector, civil society groups and citizens—each influencing over how elements of the city are designed and managed. Although none has the mandate or capacity to address the performance of the city as a system, they all stand to benefit when the elements are well integrated.

Cities are experiencing a splintering of infrastructure responsibilities, the overlapping and intersection of jurisdictions, and an increase in private sector ownership of key assets. An additional constraint is the election cycle, which can limit the capacity of cities—on their own—to execute policies over the long term. The election cycles for local governments often make sustainable decision-making difficult, since the change in leadership frequently means a loss in continuity. 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, an energy efficiency upgrade for all municipally owned buildings, or a ride-share program for employees, or energy and transport peak load management through the adjustment of working hours.

At the second tier, projects will engage 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 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. When collaborating at the scale of the entire urban area, the city itself may lack the authority to coordinate actions of many stakeholders. Senior governments, utilities, landowners, and private sector groups all have their own plans and agendas. At this level, it is often an appropriate process to develop an overarching planning framework, including a growth management strategy, to set the context for all other plans in the urban area by all other stakeholders. At each of these scales, very different levels of collaboration are necessary, and different working groups are required, all participating in a city-led collaborative process.

As a city embarks on its Eco^2 pathway, many different projects could occur over a single year in which different players from the private sector, public sector, civil sector and other sectors may wish to participate, or may have valuable information or assistance to offer at various levels. For this reason, it is important for a city to initiate a process where participants develop a shared long-term planning framework to guide all projects and efforts, and which creates the opportunity and vehicle for groups to align their policies and programs around a common set of long term goals and strategies. The framework can also set the context for specific projects. In many cases a primary collaborative working group can generate subgroups that meet as needed and that can also benefit from professional facilitation, research, and other support.

The planning framework can be a powerful platform for collaborative design and decision-making and can enable the city to steer the efforts of all stakeholders toward a commonly agreed upon vision. Because Eco^2 focuses on integrated design solutions, as well as integrated implementation policies, projects may expand to include multiple stakeholders and require a highly diverse pool of expertise.

Once the formal collaborative process is in place, it also offers the opportunity for much more intensive participation on particular projects among stakeholders in design and implementation. For example, an integrated approach to neighborhood revitalization can often benefit from iterative design

workshops that engage a variety of experts from different groups in creative design exercises. Regular participation in such creative design workshops is much easier to arrange and approve if the groups that need to be involved are already participating in a formal collaborative process at the most senior level.

The same is true when it comes to implementing the preferred design solutions. An expanded platform for collaboration at different scales creates a mechanism that can be used repeatedly to bring stakeholders together, and to expedite the intensive, and interdisciplinary process of design and implementation of Eco^2 projects.

The expanded platform for collaboration, in combination with a long-term planning framework, is likely to increase the commitment of local governments to its longer term policies. It is much more difficult for a new council or mayor to reverse decisions if many other stakeholders have participated in the decisions and are cooperating through their own policy instruments. In Curitiba, for example, the creation of a separate planning institute—the IPPUC—provided a particularly strong basis for ongoing collaboration in long-term planning. This approach has since been followed in many other countries in Latin America.

By extending the platform for decision-making to include planning institutes, and by encouraging alignment among all stakeholders, the governance of a city becomes less vulnerable to the inevitable disruptions created by elections, political incidents, and the manipulation of policy by special interest groups at election time. An expanded platform for collaboration compensates for the inherent short-termism of the democratic process.

The city's collaborative working group at three tiers: corporate, municipal, and regional

Moving from the inner tier to the outer tier increases the number of stakeholders and the complexity and scope of the potential benefits.

A one system approach

A one system approach enables cities to plan, design, and manage the whole urban system by integrating and optimizing its key subsystems. In so doing, it provides the opportunity for cities to realize the many benefits of synergy.

A one system approach has many dimensions, but is not complicated. The idea of systems thinking is to reduce complexity by understanding how the parts fit into the whole. The challenging part is overcoming the institutional structures and inherited attitudes that prevent city leaders, investors, designers, users, suppliers, and managers from working as a team. Adopting the one system approach in all projects is a good way to bring the team together.

The one system approach takes full advantage of all the opportunities for integration within a sector or across sectors. Integration can be applied to policies, stakeholders and plans, sequencing of financing mechanisms, and all of these in combination. In each case, the integration opportunities tend to provide greater efficiency and utility for a given investment, and improve ecological and economic performance. By applying the one system approach to every project, entire cities, and their surrounding natural and rural areas, can coalesce into a functional system that works well as a new whole.

In exploring the possibilities for a one system approach, cities first analyze its urban forms and consider spatial planning, land use, density, connectivity, proximity, and other attributes of urban form. Next, cities address the enhancement of the efficiency of resource flows in an urban area through integrated infrastructure system design and management. The approach applies to most urban infrastructure sectors—such as transport, energy, water, and waste management—and may be applicable within each sector and across sectors.

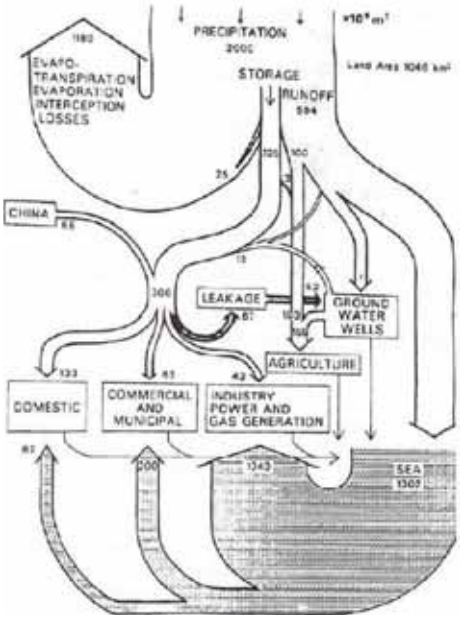
Then, cities need to look at the possibilities for applying a one system approach to integrate urban form and urban flows. For this, cities need to examine how much overall system efficiency depends on integrating and coordinating these attributes with infrastructure systems. There is a fundamental relationship between a city's infrastructure systems and its urban form. Urban form and spatial development establish the location, concentration, distribution, and nature of the demand nodes for the design of infrastructure system networks. Urban form establishes the physical and economic constraints and parameters for infrastructure system designs, their capacity thresholds, and technology choices, and the economic viabilities of the various options. These have tremendous implications for resource use efficiency. At the same time, infrastructure system investments (transportation, water, energy, and so on) typically enable and induce particular spatial patterns on the basis of the market response to the investments.

The benefits of integration are especially attractive because the efficiency gains tend to be substantial, and because the opportunities tend otherwise to be missed.

Integration is a powerful concept for cities. So where does the concept come from, and where might it take us in the long run? Integration is used here as it relates to the application of systems theory: seeing the full scope of elements that make up the city, how these different elements are connected, and how changes in one element can affect the others. This systems perspective is a way of seeing the world that has emerged from studying ecological systems. It can help us design and manage cities so that they can become very efficient and very adaptive—just like natural ecologies.

Ecological systems are characterized by multifunctional elements and the looping and cascading of resources through interlinked and nested subsystems, which greatly enhance productive utility. They also demonstrate powerful strategies for managing change, such as succession and evolution, self-organization, and adaptive management. All these strategies are part of integrated one system approach. They improve the efficiency of the system as a whole—maximizing assets and information quality over time. And they help the system adapt to change at least cost and to recover quickly and fully from shocks. Many innovative cities grasp the potential of these opportunities for system-wide sustainability and resilience.

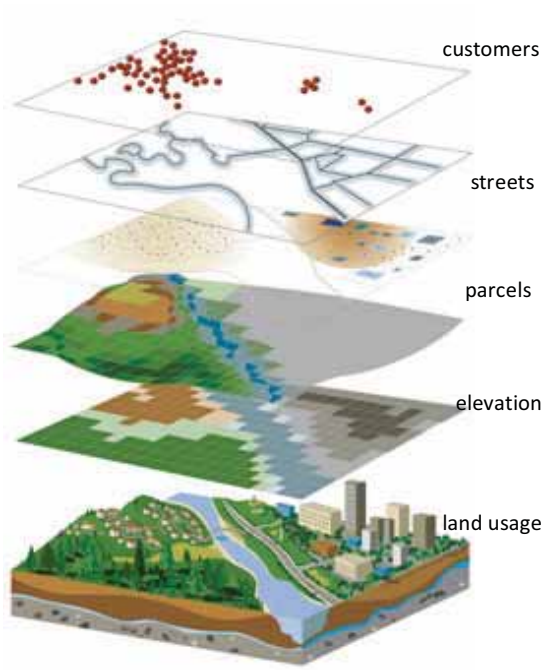
Combining Flows and Forms to Create a Transdisciplinary Platform



This flow diagram summarizes all the water flow through Hong Kong (China) and is one of the first illustrations of an urban metabolism.
Source: Boyden, Millar, and Newcombe (1981).

Flows: Material flow analysis and Sankey diagrams:

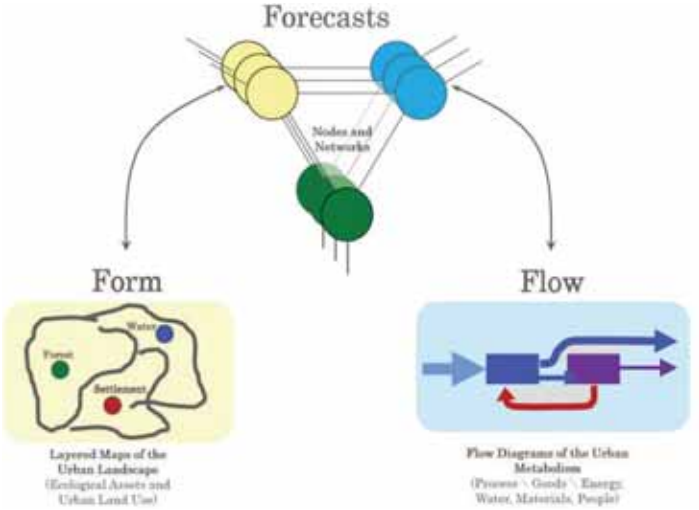
Material flow analysis and Sankey diagrams are a method for calculating and illustrating the flow of resources through an urban area of any size. Inputs and outputs are determined as resources are extracted from nature, processed by infrastructure, consumed by homes and businesses, treated by infrastructure, and finally returned for reuse or delivered back to nature as waste. Colorful, but simple diagrams are used to educate everyone on the resource flows and the effectiveness of their use, all on a single page.



Source: Copyright © ESRI, used by permission, http://www.esri.com/.

Forms: Layering information on maps

Maps are especially useful in collaboration because they speak so well to so many. (A picture is worth a thousand words.) The layers of information make it possible immediately to interrelate the various features and qualities of the landscape and also easily to 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 transdisciplinary platform:

Because diagrams and maps may 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. Forms and flows should be analyzed and understood for current and future scenarios. In combination, the methods represent a transdisciplinary platform for understanding the spatial dynamics of a city and its physical resource flows, elements that are interdependent, but difficult to integrate because they involve such different skills and stakeholders.

A platform is needed to integrate the design concepts for urban form with the corresponding resource flows.
Source: Redrawn and adapted from Baccini and Oswald (1998).

An investment framework that values sustainability and resiliency

Despite rising interest in sustainability in many locations, and demonstrated capacity for urban design solutions, cities today are having difficulty investing in systems that are long term and ecological. Although many exceptions exist, time horizons for investments generally appear to be shrinking. Perhaps the fast-paced and deregulated global economy makes it especially difficult for corporations and political leaders to take a long view. Whatever the explanation, the simple concept of investing in sustainability and resiliency has become extremely difficult for cities to put into action. Policies, plans, and projects are assessed for their abilities to provide short-term financial returns, and economic valuations are based on narrowly structured cost-benefit analyses from the perspectives of single stakeholders.

To achieve ecological and economic sustainability, decision-making needs to be clearly guided by a holistic perspective. This entails a new accounting and assessment framework that allows every city to adopt a lifecycle perspective and make investments that are fair to all stakeholders, effective at preserving all assets (manufactures, natural, human and social), and good for long-term fiscal health. This entails adopting a new range of indicators and benchmarks for assessing and rewarding the performance of all stakeholders.

Longer time horizons and lifecycle analysis of the implications of policies and investment options and strategies among multiple stakeholders will need to be carried out to reflect a truer, more inclusive, and more complete picture. All capital assets (manufactured, natural, human and social) and the services they provide should 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, historical, and aesthetic) cannot be ignored when assessing costs and benefits. The basis and implications of policy decisions, regulatory actions, and legislation need to be assessed in the broader context of Eco^2.

Investments are valued in monetary terms, and what cannot be monetized is either ignored or addressed on the side as an externality. Decisions are dominated by immediate capital costs, despite the fact that over 90 percent of lifecycle costs for typical infrastructure are often for operational maintenance and rehabilitation. Most cities worldwide have no real knowledge of the long-term impacts of new development on fiscal health. Lifecycle costs are back-loaded, which means that future generations will have huge costs for repair and replacement of infrastructure. In many developed country cities, that future has already arrived by creating a massive infrastructure deficit that can be addressed only through subsidies or more debt financing.

Nor are ecological assets, the services they provide, and the economic consequences of their depletion and destruction accounted for in most government budgets. Since these resources are not measured, they are treated as zero value assets—and their services go unaccounted for. For instance, green areas in a city are usually thought of as simply providing some sort of soft aesthetic value.

But green areas are ecological assets that provide valuable services and economic benefits in several ways.

- They provide natural drainage (results in avoided infrastructure capital and maintenance costs, and reduces seasonal losses related to flooding).
- They can reduce the average temperature in cities (this reduces peak load demand on electricity, which can result in avoided capital costs for installed power as well as related operation and maintenance cost).
- They absorb carbon dioxide and release oxygen, are natural air cleaners, and support overall citizen health.
- They can be integrated into the public transport system as a network of bike paths and pedestrian walkways to enhance utility.
- They have generally been shown to increase physical and mental well-being, while creating a sense of community and reducing crime.

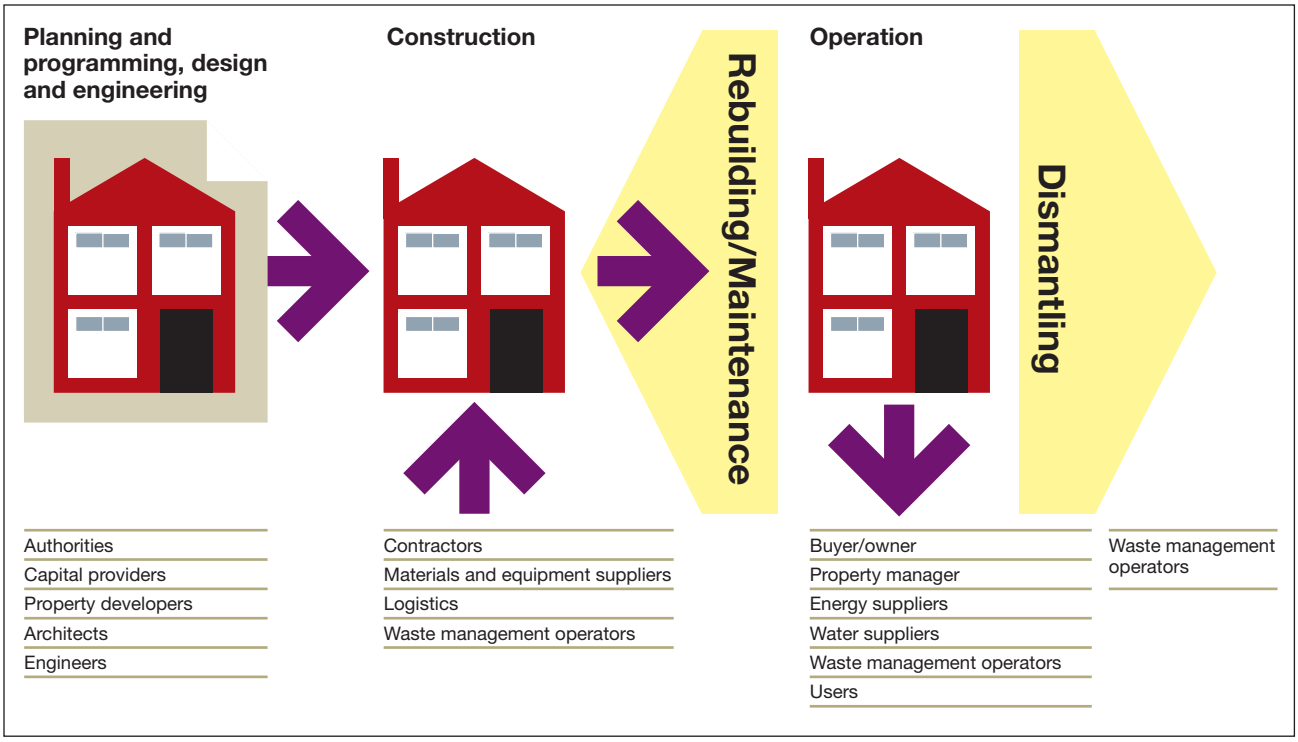
If all of these services were truly valued, and understood in the long term, many cities might make decisions the way Curitiba does.

Investing in sustainability and resiliency will entail broadening the scope of risk assessment and management to include managing the many indirect, difficult-to-measure risks that threaten the viability

of an investment or even the city as a whole. Cities today face multiple hazards largely outside financial calculations, such disruptions to systems, epidemics, natural disasters, and socio-economic changes. By proactively adopting the concepts of resilience and adaptive capacity, cities will be better positioned to absorb and respond to shocks and protect their investments.

Introducing new methodologies and a broader scope of accounting in many countries will clearly be difficult and complex. But while the actual use of complex methodologies will take time to be established, at least the principle behind such methods should be clearly understood and considered by decision-makers. Curitiba did not do a detailed accounting and valuation exercise before following its development agenda. But by appreciating the broader and longer term perspective, it managed to focus on critical interventions that continue to pay lasting and compounded benefits.

The life cycle costs of a building go way beyond construction



Source: Brick 2008.

Moving from principles to core elements and to a unique Eco² pathway

The four principles define the scope of each city's unique Eco² pathway, with every aspect of the pathway following directly from one or more of the principles and the connections to principles reinforced in all aspects of the pathway. Since they lie at the core of the program, if things become complicated or confused, we can always 'fall back' on our principles. The analytical and operational framework emerges from the principles. For starters, we derive a set of core elements from each principle.

The core elements operationalize the principles,

PRINCIPLES	CORE ELEMENTS
A city based approach	• A development program that supports cities in making good decisions and implementing these decisions using all levers of city influence and control • A planning philosophy that recognizes the fundamental role played by local ecological assets in the health and wealth of cities and their surrounding rural communities • An action-oriented network that provides city leaders with the full support of national governments, the international development community (including the World Bank), and global best practice cities • A decision support system with methods and tools that adapt to varying levels of knowledge and skill and provide cities with the technical, administrative, and financial capacity to develop an Eco² pathway
An expanded platform for collaborative design and decision-making	• A three-tier platform that enables a city to collaborate (1) as a model corporation, engaging all city departments; (2) as a provider of services, engaging residents, businesses, and contractors; and (3) as a leader and partner within the urban region, engaging senior government officials, utilities, rural settlements, private sector stakeholders, nongovernmental organizations, and academia • A shared long-term planning framework for aligning and strengthening the policies of the city administration and key stakeholders and for guiding future work on Eco² projects
A one system approach	• Integrated infrastructure system design and management focusing on enhancing the efficiency of resource flows in an urban area • Coordinated spatial development that integrates urban forms with urban flows, combining land use, urban design, urban density, and other spatial attributes with infrastructure scenarios • Integrated implementation by (1) correctly sequencing investments, (2) creating a policy environment that enables an integrated approach, (3) coordinating a full range of policy tools, (4) collaborating with stakeholders to align key policies with long-term goals, (5) targeting new policies to reflect the differing circumstances involved in urbanization in new areas and in improving existing urban areas
An investment framework that values sustainability and resiliency	• Incorporation of life-cycle costing in all financial decision making • Equal attention to protecting and enhancing all capital assets: manufactured capital, natural capital, social capital, and human capital • Proactive attention to managing all kinds of risk: financial risk, sudden disruptions to systems, and rapid socioeconomic environmental change

providing specific information on new concepts and on the roles and responsibilities of Eco^2 cities and their partners. Each core element is an arena of activity and learning. Each city will translate the core elements into a series of action items, or stepping stones, that adapt the elements to local conditions in a logical, step-by-step sequence. Together, the stepping stones for a city constitute a unique Eco^2 pathway. The pathway should include all the essential actions needed to take leadership, collaborate, design Eco^2 projects, and invest in the preferred solutions.

All cities want to benefit from good urban and spatial planning. It is up to city leaders to determine whether the Eco^2 program is the kind of pathway they are seeking.

STEPPING STONES (ACTIONS TO BE TAKEN)

- Review the Eco^2 initiative and adapt the Eco^2 principles to the local context, especially current issues of concern and the local political constraints
- Identify champion(s) and the specific groups or individuals who are vital to success
- Obtain commitments from city councils and influential groups and people
- Work closely with national governments and, where possible, dovetail the Eco^2 elements so they clearly fit within national priorities
- Seek a partnership with the international development community (including the World Bank), best practice cities, and Eco^2 initiative partners
- Outline a process for building capacity and enhance the skills and knowledge of local professional staff
- Develop fluency of concepts among local decision makers using case studies from this book and other supporting materials

- Initiate a process for collaborative decision making and integrated design to develop the Eco^2 approach as a corporation, as a provider of services, and as a leader within the larger urban area
- Prepare a mandate and budget for a secretariat that can support collaborative committees through background research on cross-cutting issues and the facilitation of regular meetings, communications products, and event planning
- Prepare a long-term planning framework, in collaboration with others, and seek consensus on common goals and indicators of performance, an overarching growth management strategy, and an adaptive management approach
- Select a catalyst project suitable for demonstrating the Eco^2 principles, aligned with the goals and strategies identified in the long-term planning framework

- Provide just-in-time training and capacity building, arrange for multiple opportunities for local professionals to become comfortable with the one-system approach, and make the best use of technical support so it may be truly transformative and valuable
- Conduct a series of integrated design workshops to create important opportunities for planners, designers, and engineers to come together and use new methods and information; a series of short workshops can clarify goals and set targets; the long-term planning framework can guide, design, and stimulate creative solutions
- Explore design solutions and prepare a concept plan for review; an integrated design process should be used to generate alternative proposals on ways to design, construct, and manage the project; an intensive, multiday urban systems design charrette can facilitate the integrated design process; the integrated design process should culminate in a recommended concept plan for implementation, including any policy reforms
- Align a full set of policy tools to ensure successful implementation, in collaboration with stakeholders, to sequence and enable a one-system approach and to coordinate actions across sectors; a strategic action plan can be prepared to clarify who is responsible for what tasks and to show how policies interact

- Use a lifecycle costing method or tool to understand the lifecycle costs and cash flows
- Develop and adopt indicators for assessing the four types of capital and for benchmarking performance
- Forecast the impacts of plausible changes in climate, markets, resource availability, demographics, and technology by hosting a forecast workshop
- Implement a catalyst project in ways that protect and enhance capital assets and reduce vulnerabilities; the best way to learn the accounting methods is in practice in a catalyst project; a base case scenario may be developed as a benchmark for comparing alternative approaches
- Monitor feedback results, learn, and adapt to improve performance

Applying Eco² nationally and locally

So how exactly does the Eco² process unfold and adapt in a specific country and city contexts, and what is the sequence of steps? Each country has unique political, socio-economic and institutional system and each country faces different resource and capacity constraint. One-size-fits-all solutions will not work in applying Eco², which should adjust to the specific conditions and needs of each country at both national and local levels. For this reason, the following steps will be taken.

Diagnostic

The first step is diagnostic and prospective. The objective is for national government and interested local governments to assess national and local parameters in their country and cities. This will provide an initial sense of the opportunities and constraints likely to be faced in the adapting and implementing the Eco² approach. Once this is done, the Eco² framework and methods can be contextualized and detailed to best suit the country's needs.

Program and project design

At the national level, a country might develop its own Eco² program, and at the city level an interested city might develop its specific Eco² pathway. At this stage, regional or country workshops may be used to identify issues, engage key stakeholders, and build the momentum for the initiative.

The next step is for the process to unfold in two complementary streams of action—a national agenda and a city agenda, which strongly reinforce each other and build on appropriate ongoing initiatives in the country and city. On a case by case basis, each stage—as well as some of the actions prescribed within a stage—may be supported by different types of financing from the World Bank Group.

The agenda of a national program might include:

- Legislative and policy reforms.
- Institutional reforms.
- Systematic capacity building for institutions and individuals.
- Integrated data management systems.
- Structured national funding schemes (these can provide the context for cities to develop their own pathways).
- Strategic regional-scale infrastructure.

These initiatives could be supported by a range of World Bank financial instruments, as well as by analytical and advisory services.

The agenda of a city's Eco² pathway might include:

- Setting a structured agenda for capacity building.
- Designating an independent urban planning authority with significant responsibilities.
- Adopting accounting and budgeting processes that capture and reflect the value of all capital assets (natural, human, social and manufactured).
- Initiating a collaborative long-term planning framework with key stakeholders.
- Adopting urban design and integrated infrastructure strategies for a one system approach.
- Designing and implementing specific catalyst projects, such as waterfront redevelopment, the bundling and bidding out of energy efficiency contracts in government facilities, bus rapid transit system, or integrated low income housing schemes.
- Many other stepping stones identified in the table on pages 12–13.

A multi-city initiative might be supported through a national funding scheme.

While it is preferable that national and local agenda be developed together, each country may have its own strategy and flexibility on how to develop its own Eco² program. In some cases, the country needs to start with selected pilot cities, before launching the national program.

World Bank Group support

The World Bank Group, together with other development partners, can assist national governments and local governments through technical assistance, capacity building, and investment and policy lending. In addition, when it is justified the World Bank can also provide access to funding for climate change.

Technical assistance might include (but is not limited to):

- Assessing the overarching enabling environment for a country—the political economy, as well as systemic and institutional issues; key legislative and policy bottlenecks, as well as regulatory and incentive frameworks; technical, institutional, administrative and financial capacity constraints; the decentralization agenda; the history of sustainability related policy and legislation at the national and local level.
- Conducting the necessary and overall baseline diagnostics and analysis of a city from the perspective of overall, cross-sectoral, and long-term urban sustainability.
- Through collaborative visioning workshops and integrated design processes, developing a few alternate scenarios and plans (including investment and financial plans) guided by the Eco^2 framework and applicable methods and tools (such as material flow analysis, GIS, and lifecycle analysis).
- Facilitating a collaborative process of scenario and plan evaluation using appropriate methods and criteria (clear sustainability indicators and criteria need to be developed for each city; evaluation needs to factor the life-cycle and inter-system costs and benefits).
- Assessing private sector and market incubation opportunities related to new technologies and their role in strategic local economic development.
- Preparing and developing catalyst projects.

Capacity building might include (but is not limited to):

- Putting in place a strategic approach to capacity building and partnerships with a view to enhance integrated and sustainable urban development that benefits the city as a whole—based on where administrative, technical, and financial capacities, as well as official mandates are located in the institutional environment of (and often beyond) a city.
- Introducing reform measures and institutional and policy changes—as well as creating a platform for collaborative planning and decision-making. The process may benefit from partnerships with leading local universities and academic institutions.
- Creating an independent planning institute for cities—with long-term planning objectives.
- Providing the technical requirements and staff training for the use of relevant methods and tools. These methods of interest may be broadly classified as: operational and process methods that can strengthen collaborative decision-making and cross-sector synergies in a city; analytical methods ranging from diagnostics, simulation, design, and scenario-generation; accounting and benchmarking methods that can help clarify, define, and measure what it means to truly invest in sustainability and resilience.
- Structuring partnerships between global best practice cities and forward-looking cities with a strong commitment to developing and implementing its own Eco^2 program.

Catalyst projects to be supported by the World Bank Group could include (but are not limited to) investments and interventions in demand-side management:

- Resource and energy efficiency initiatives.
- Peak load management.
- City management systems.
- Land use planning as infrastructure demand management.
- Investing in cyclic urban metabolism (satisfying many more units and types of demand in succession, through the looping, cascading and regenerative use of a single unit of a particular resource).

They could also include (but are not limited to) investments in infrastructure supply systems:

- Multimodal transport infrastructure (such as bus rapid transit and bicycle lanes) coordinated with urban design, land use, and spatial planning.

- Waterfront redevelopment and renewal.
- Renewable energy.
- Water and wastewater systems.
- Solid waste management.
- Environment improvement in slums.
- Integrated low-income housing schemes.

What is important from an Eco^2 cities perspective is that the number and diversity of financing instruments for such programs are increasing and that it is possible to combine such instruments to fit the different dimensions or phases of a project. By integrating, sequencing, and linking these financial instruments, World Bank support could foster an integrated approach to the implementation of a city's financing needs for sustainability.

Please keep in mind that some of the most remarkable innovations and approaches were implemented without the luxury of these complex external financial resources. The true test of the Eco^2 cities initiative will not be its ability to link cities to finance, but to facilitate a process for cities to adapt and apply the four Eco^2 principles to unlock their full potential. The World Bank Group is ready to provide the support that the country and cities will need to make their own transition.

For further information

Eco^2 Cities Web Site: www.worldbank.org/eco2

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THANK YOU FOR YOUR ORDER

The World Bank's new Eco^2 Cities Initiative is strongly grounded in the realities and challenges faced by cities in developing countries. Over the last 30 years, Curitiba's sustained experiences have taught us that cost and affordability are not major barriers to achieving ecologically and economically sustainable urban development. Curitiba presents a creative and inspiring approach that can be adapted to the circumstances of almost any city. We are proud and honored that the World Bank has chosen to reflect on these lessons. Like many other cities across the world, Curitiba continues to work toward the social, cultural and economic inclusion of new generations of citizens who are in search of employment, education, a healthy living environment and a place they can proudly call their home. Today, as cities in developing countries face the pivotal and urgent challenge of urban sustainability, it is very encouraging to us that the World Bank has strongly and assertively moved forward with the launching of the Eco^2 Cities Initiative. In the years to come, we look forward to working with this program. The World Bank now stands out as a committed partner of the city—a partner with the ability and mandate to drive meaningful and lasting change.

Beto Richa, Mayor of Curitiba, Brazil

Urbanization in developing countries is a defining feature of the 21st century. Around 90 percent of global urban growth now takes place in developing countries, and between the years 2000 and 2030, the entire built-up urban area in developing countries is projected to triple. Global urban expansion poses a fundamental challenge and opportunity for cities, nations and the international development community. 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 affect the trajectory of urbanization in a lasting and powerful way. The decisions we make together today, can lock-in systemic benefits for current and future generations. The Eco^2 Cities Initiative appears at a critical historic juncture in relation to this challenge and opportunity.

From the foreword by **Kathy Sierra,** Vice President, Sustainable Development, The World Bank and **James W. Adams,** Vice President, East Asia and Pacific Region, The World Bank.