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Sustainable infrastructure and eco-efficiency: Challenges for Latin America and the Caribbean

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DIMENSIONS TO BE CONSIDERED

A. REGIONAL OUTLOOK: FACTS, TRENDS AND CHALLENGES

B. REGIONAL INFRASTRUCTURE

C. SUSTAINABLE URBAN-TERRITORIAL MANAGEMENT: NEED OF INTEGRAL APPROACH TO CREATE A LINK BETWEEN ECO-EFFICIENCY AND INFRASTRUCTURE

D. PROJECTS IN THE SUSTAINABLE DEVELOPMENT AND HUMAN SETTLEMENTS DIVISION OF THE ECLAC (CEPAL, in Spanish)

A. REGIONAL OUTLOOK: FACTS, TRENDS AND CHALLENGES

- **High level of urbanization and persistence of urban growth**
- **"*Urbanization of poverty*"**
- **Financing in sustainable development**
- **Growing importance of urban economy within the context of the macro-economics of the countries**
- **More autonomy and financing resources from the state and other governmental levels (decentralization of management)**
- **Reforms and urban-territorial change**

- Low quantity and quality of infrastructure – higher costs – less productivity. Higher inventories in companies (30% of the GDP). Financial cost, higher immobilized capital in the region than in developed and emerging countries
- Creation of programs to face climate change: Mitigation and adaptation
- Projects and planning
- Urbanization, territorial development and regional integration

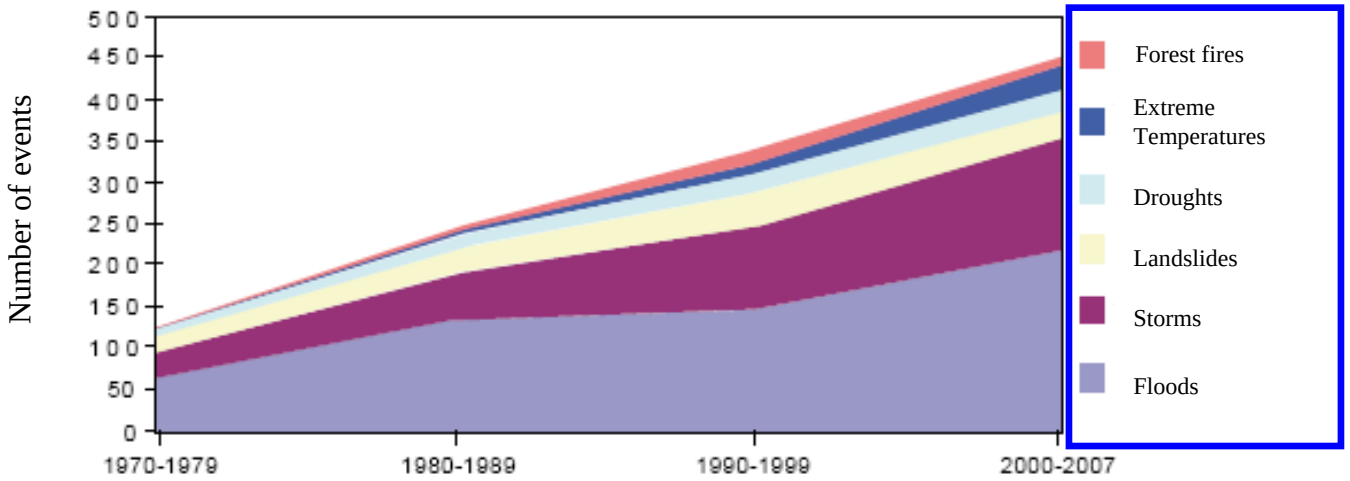
CHALLENGES OF SUSTAINABLE DEVELOPMENT IN LATIN AMERICA

1. Effects of climate change observed in Latin America and the Caribbean

Sector/Area			
Agriculture, silviculture and ecosystems	**Hydric resources**	**Human health**	**Human settlements, industry and infrastructure**
Increase of extreme weather phenomena in the last 40 years in the whole region, for instance, ENOS (1982 -1983 and 1997-1998) episodes and the arrival of hurricane Catarina in Brazil (2004), an event never seen before in the region			
Temperature increase (South America and the Caribbean)	Decrease of rainfalls (South of Chile, Southeast of Argentina and South of Perú)	Increase of diseases such as dengue and malaria (several regions)	Economic loss due to extreme weather phenomena (80 billion dollars in 1970-2007)
Modifications in the productivity of the soil (greater output of the soybean crop in South America, lower in the case of maize crop in México and Central America)	Increase of rainfalls (South of Brazil, Paraguay, Uruguay, Northeast of Argentina, Northeast of Perú and Ecuador)	Increase of morbidity and mortality indexes (Bolivia)	Greater vulnerability of human settlements affected by extreme weather phenomena (Bolivia, Perú, México)
Increase of the degradation process due to changes in the use of the soil (all countries)	Increase of the sea level (2-3 mm in Argentina in recent years)		Migration of people who live in vulnerable regions, from the rural areas towards the urban ones (México and Central America)
Increase of the desertification process (deforestation in Central America)	Decrease of the glacial mass balance (Bolivia, Perú, Ecuador and Colombia)		
Reduction of the forest layer (in the Amazon region, it decreased 17.2 million ha. in the 1970-2007 period)			
Increase in the number of species in danger in México and Perú (4%), Ecuador (up to 10%), Colombia (11%), and Brazil (3%)			

Source: Economic Commission for Latin America and the Caribbean (ECLAC or CEPAL, in Spanish) on the basis of Intergovernmental Group of Experts on Climate Change (IPCC) *Climate Change 2007: Impacts, Adaptation and Vulnerability. Contribution Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, Cambridge University Press, 2007 and United Nations Program for the Environment (PNUMA, in Spanish), GEO, *Latin America and the Caribbean: Perspectives on Environment*, 2003, México DF, 2003.

LATIN AMERICA AND THE CARIBBEAN: FREQUENCY OF HYDROMETEOROLOGICAL PHENOMENA, 1970-2007



Source: Economic Commission for Latin America and the Caribbean (ECLAC) on the basis of "EM-DAT: Emergency Events Database" (online database) http://www.em-dat.net

LATIN AMERICA AND THE CARIBBEAN: ACCUMULATED LOSS IN RELATION TO HYDROMETEOROLOGICAL PHENOMENA, 1970-2008

Type of phenomenon	Loss (in million dollars)
Storm	42 374
Floods	26 358
droughts	8 698
Landslides	2 006
Extreme temperatures	1 179
Forest fire	817
Total	81 435

Source: Economic Commission for Latin America and the Caribbean (ECLAC) on the basis of "EM-DAT": Emergency Events Database" (online database) http://www.em-dat.net.
Note: Numbers calculated based on the economic damage caused by the hydrometeorological events occurred in Antigua and Bermuda, Argentina, Bahamas, Barbados, Belize, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominica, Ecuador, El Salvador, Grenada, Guatemala, Guiana, Haiti, Honduras, Jamaica, México, Nicaragua, Panamá, Paraguay, Perú, Bolivarian Republic of Venezuela, Saint Knitts and Nevis, Saint Vincent and the Grenadines, Santa Lucía, Suriname, Trinidad and Tobago and Uruguay.

2) Impacts and vulnerabilities

Impacts	Sectoral vulnerabilities	Adaptation strategy
Temperature a) Warming over the average b) South of America: warming similar to average	Water a) Increase of people with water deficit. Up to 77 million by 2020. b) Loss of water supply sources due to glaciers melting c) Decrease of water quality due to floods and droughts	Improvement of climate observation and follow-up equipment in order to enhance the quality of the early alert and the warning systems related to natural disasters.
Precipitation, snow and ice a) Decrease in Central America and Southern Andes b) Precipitation in winter in Tierra del Fuego c) Precipitation in summer in South America (Southeast) d) Reduction and disappearance of Andean glaciers	Alimentary security a) Reduction of crops. By 2050, 50% of the farming lands subject to desertification and salinization.	The adaptation capacity is limited by high child mortality, low schooling, high levels of inequity, both in the entrance as well as in the access to drinkable water and health.
Extreme events a) Avalanches and floods b) Droughts and dry periods in the Northeast of Brazil c) Heat waves with effects on mega-cities due to the “heat islands” effect d) Increase and intensity of hurricanes in the Caribbean basin	Health a) Risks due to increase and intensity of hurricanes b) Temperature increase affects illnesses vectors	Cities responsible for around 80% of the GI [greenhouse gases] emissions. Key factors in the problem solution process: reduction of emissions creates comparative advantages as regards localization, reduction of GI requires development of new industries, services and technologies that add value to the local economy. Energetic diversified matrix-continuous and safe energy capacity: clean energy=new businesses.

Impacts	Sectoral vulnerabilities	Adaptation strategy
	Land ecosystems a) Significant loss of habitat and species in tropical area of Latin America, including tropical forests	Adaptation and projects: a) Saving in the use of energy b) Renewable energy c) Sustainable urban infrastructure d) Public transportation e) Discouraging related to the use of cars f) Zoning, management of the use of soil and building codes. g) Management of solid wastes h) Marketing of products and services with low environmental impact i) Inventories and follow-ups of greenhouse effect gasses
	Coastal zones a) Impacts in coastal edge areas (La Plata estuary)	
	Built ecosystems: a) Natural disasters (22 of the 30 major natural ones, between 1990 and 2004, mostly affected urban areas). b) Health: Increase of the intensity of transmission of illnesses vectors and critical episodes related to the atmospheric pollution	

Source: UNFCCC (2007) "*Climate change: impacts, vulnerabilities and adaptation in developing countries*".
Translated by the Sustainable Development and Human Settlements Division of the ECLAC (CEPAL, in Spanish).

3) Notes

- **The region is an important carbon sink: it is estimated that it has between 18% and 26% of the total global carbon of the wooded ecosystems. However, due to the inappropriate historical management of these natural resources, they have been subjected to constant degradation.**

- **The region presents zones with high hydrological stress levels, which result from the concentration of population in territories where water is not abundant, and where there is expansion of the agriculture, demographic growth, urbanization, industrial growth and less availability of subterranean water due to the waterproofing of the catchment areas due to urban infrastructure and deforestation.**

(1) Vulnerability is the "capacity to manage climate risks without undergoing loss of the well-being state, potentially irreversible in the long term". It reveals the plowing of development in a given zone or region, that is to say, the ephemeral capacity that poor people will have to face disasters resulting from climate variations. (PNUD, 2007).

- **According to the historical information available, the effects of the climate change in Latin America and the Caribbean have been significant. Projections indicate that in 2020 they would be mild but that they will increase after 2050 and even could be greater with an increase of only 1,5º to 2ºC of the current temperature.**

- **Forecasters predict that the most significant increase in temperature and rainfalls would take place in the Amazon region, during the dry season as well as in the wet one. In the Caribbean, a marked variation in rainfall levels would take place, in intervals ranging from a reduction of 14,2% to an increase of 13,7% in the next 20 years.**

- **Despite the fact that the available information lacks some uncertainty, some measures can be taken to prevent the effects of climate change being greater in the future.**

4) Urban-territorial responses to the challenges of climate change, in the region

- Saving in the use of energy (housing and building)
- Energy of renewable resources
- Infrastructure design (roads and segregated roads)
- Public transportation and mobility (integrated transportation)
- Incentives to reduce the use of private vehicles
- Planning of the use of soil, zoning and building codes
- Diversification of programs and actions for solid wastes
- Acquisition programs based on “green” rating
- Follow-up and cadastre of greenhouse gases

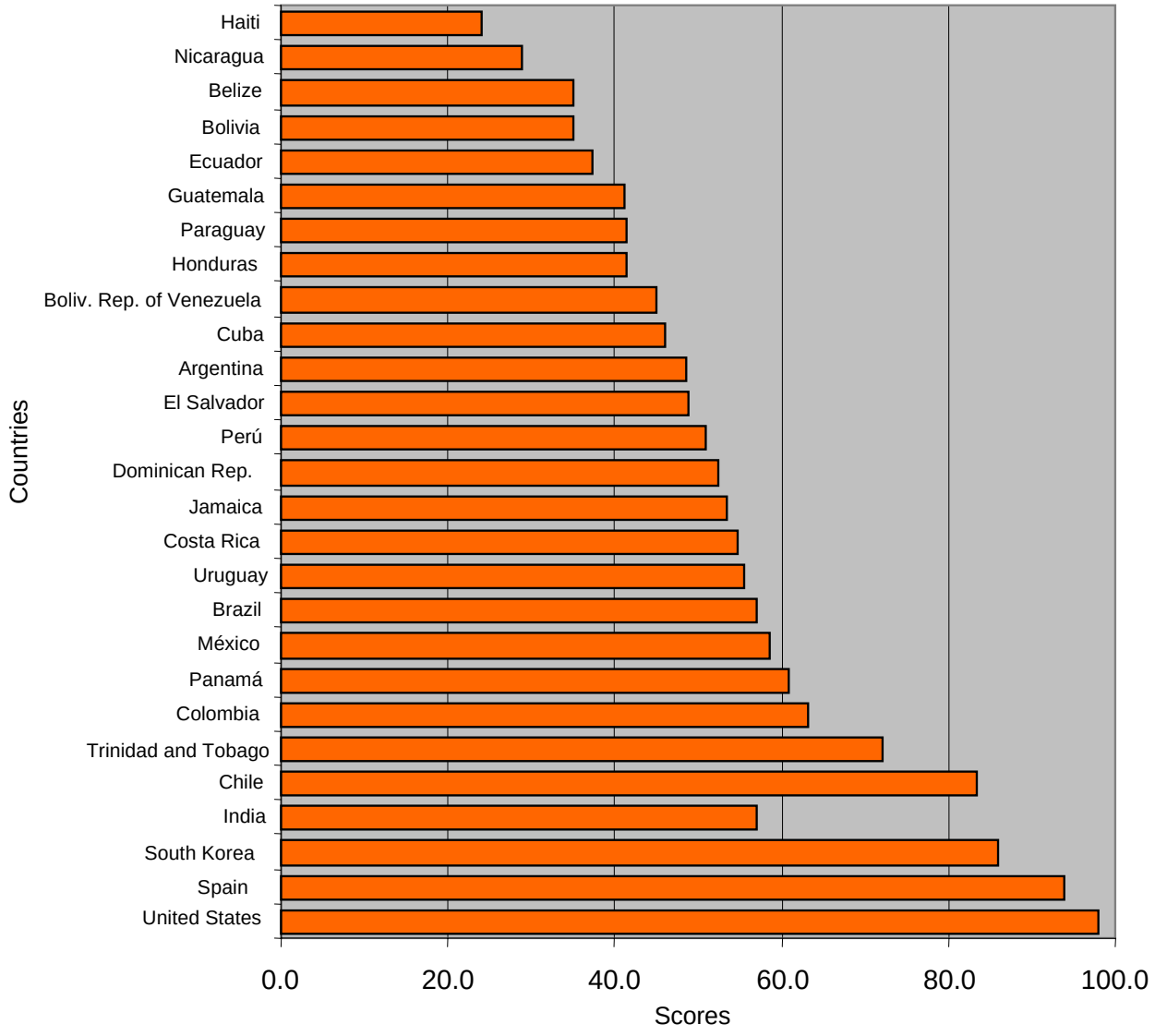
B. REGIONAL INFRASTRUCTURE

The general assessment on infrastructure for the integration in the countries of Latin America and the Caribbean was carried out by *"Global Infrastructure Leadership Forum"*

The following topics were taken into consideration:

- 4 types of basic infrastructure: electricity, transportation, telecommunications and water. Selection of key sectors for the improvement of the habitability related to *"development–equity–access"* and to the productive dynamics in the urban areas and the macro-regions.
- 2 criteria: amount of the investment and quality in the execution (time and budget)

Ranking of competitiveness of infrastructure in countries inside and outside Latin America and the Caribbean, up to 2007



Source: Sustainable Development and Human Settlements Division (2007) with data from *América Economía*, January of 2007 on the basis of data in: http://www.cg-la.com/

COMMENTS

- There are still problems regarding access to basic infrastructure; it expresses the behaviors observed in the Metas de Desarrollo del Milenio ("MDO" or Millennium Development Objectives, in English) and the permanence of Unattended Basic Needs (NBI, in Spanish)

- The production of infrastructure is increasingly less competitive. Low investment and bad execution (time and financing)

CHALLENGES

- **OECD (OCDE, in Spanish): "Infrastructures are in the *"center" of the economic, social and environmental development*";**

- **World Bank: infrastructure is a key element for the current urbanization processes and for the integration mechanism among urban sectors and several territories: "specially integrating" infrastructure (World Development Report - 2009).**

- **Infrastructure is the *integrating factor* of sustainable development in its economic, social and environmental aspects. Infrastructure is an economic activity by itself.**

- **It is a key element to carry out the MDG 1, 7 and 8**

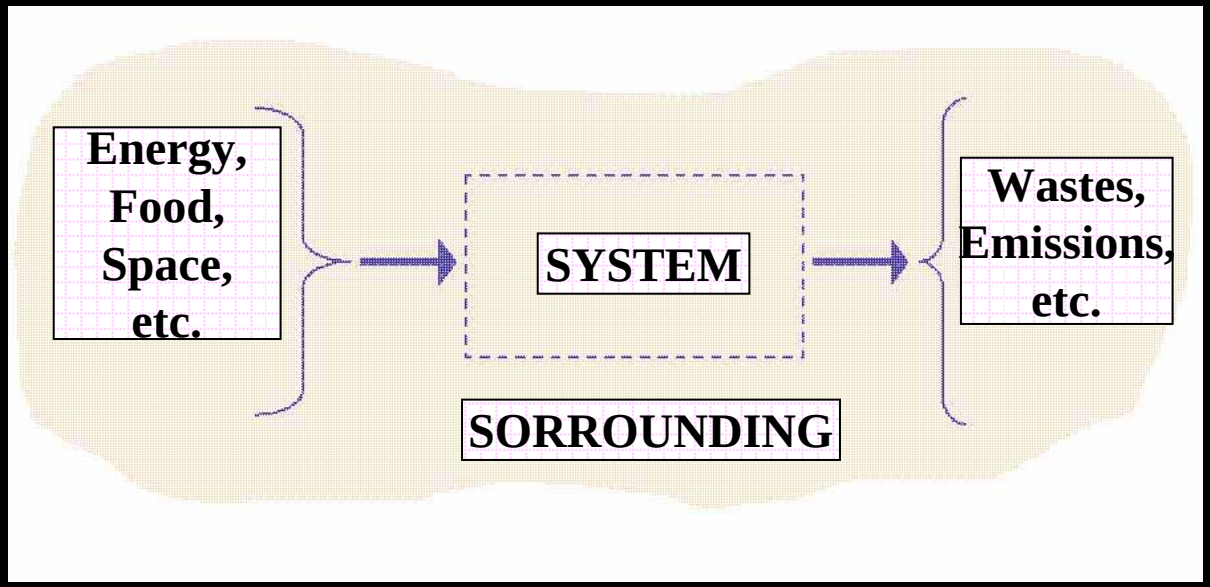
- **There is a *double challenge* regarding infrastructure production: more infrastructure to solve the deficits of the economic and social development, compatible with the mitigation and adaptation conditions as well as the climate change.**

C) SUSTAINABLE URBAN-TERRITORIAL MANAGEMENT. NEED OF INTEGRAL APPROACH TO CREATE A LINK BETWEEN ECO-EFFICIENCY AND INFRASTRUCTURE FOR INTEGRATION

- **Need to have a systemic approach and territorial, non-sectoral base (*top down approach and network)***
- **It should integrate multidimensional perspectives, comparative and simultaneous analysis (topics – cities - regions)**
- **It should develop a way to understand reciprocal interactions and the responses among urban processes and global climate change, at regional as well as local scales (territorial)**
- **It should identify responses and consequences (degrees, intensity, scales, different places and population groups) of political options to face the mentioned reciprocal interactions (programmatic CDMs)**

- **Systemic consideration of the relation between the urban system and the surroundings. The city is an open system that must keep growth according to the limits of the metabolic rhythm imposed by the support systems (the surroundings are the source of resources and energy as well as sinkholes) ("*Delinking*")**

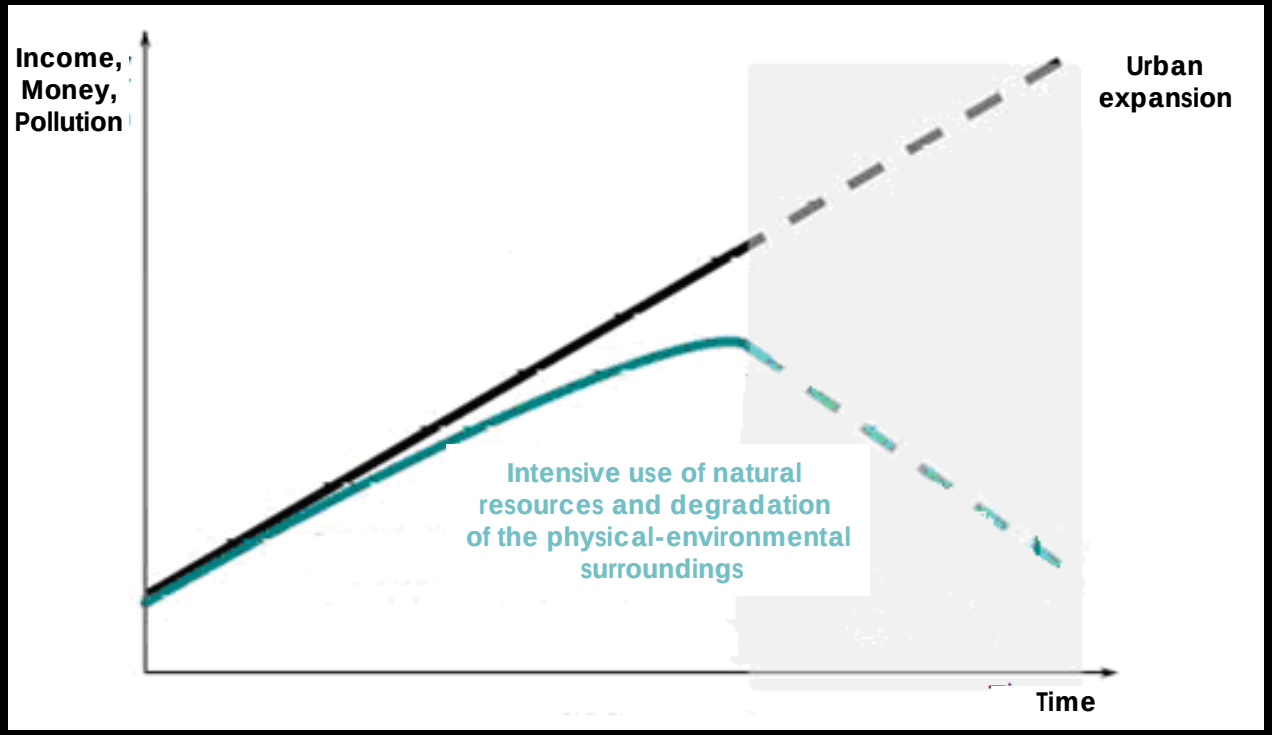
RELATION OF THE URBAN SYSTEM WITH THE SURROUNDINGS



Source: Jordán and Livert (2008)

- **It should promote a production eco-efficient approach in the city that allows to design and execute new infrastructure projects that at least keep balance in the intensive use of resources.**

RELATION BETWEEN URBAN EXPANSION AND ENVIRONMENTAL DETERIORATION



Source: Jordán and Livert (2008)

1. Management and urban-territorial planning guidelines in countries in Latin America and the Caribbean

- Guidelines with a three-element base:

Institutions-Infrastructure-Interventions

...considering the urban-territorial development phases

- In countries where rural population is predominant, the governments should keep very well designed land policies together with policies that offer basic services for everyone (Costa Rica). The challenge regarding policy is essentially aimed at an only dimension: to build **density**.

- It has been suggested that in **places with a rapid urbanization process**, the governments should consider (apart from policies that accompany the urbanization process where it naturally arises) an infrastructure that integrates and allows to share, in a more widely way, the benefits of a growing economic density. The challenge regarding policy is essentially aimed at two simultaneous dimensions: to promote **density and solve problems related to distance resulting from jams.**

- In places with **very much urbanization** (e.g. Bogotá), apart from institutions and infrastructure, it is probable that focused interventions are needed to solve problems in poor neighborhoods and slum dwellings. The challenge regarding policy here is three-dimensional: **density, distance** and the need of eliminating **divisions** in the interior of the cities (urban segregation)

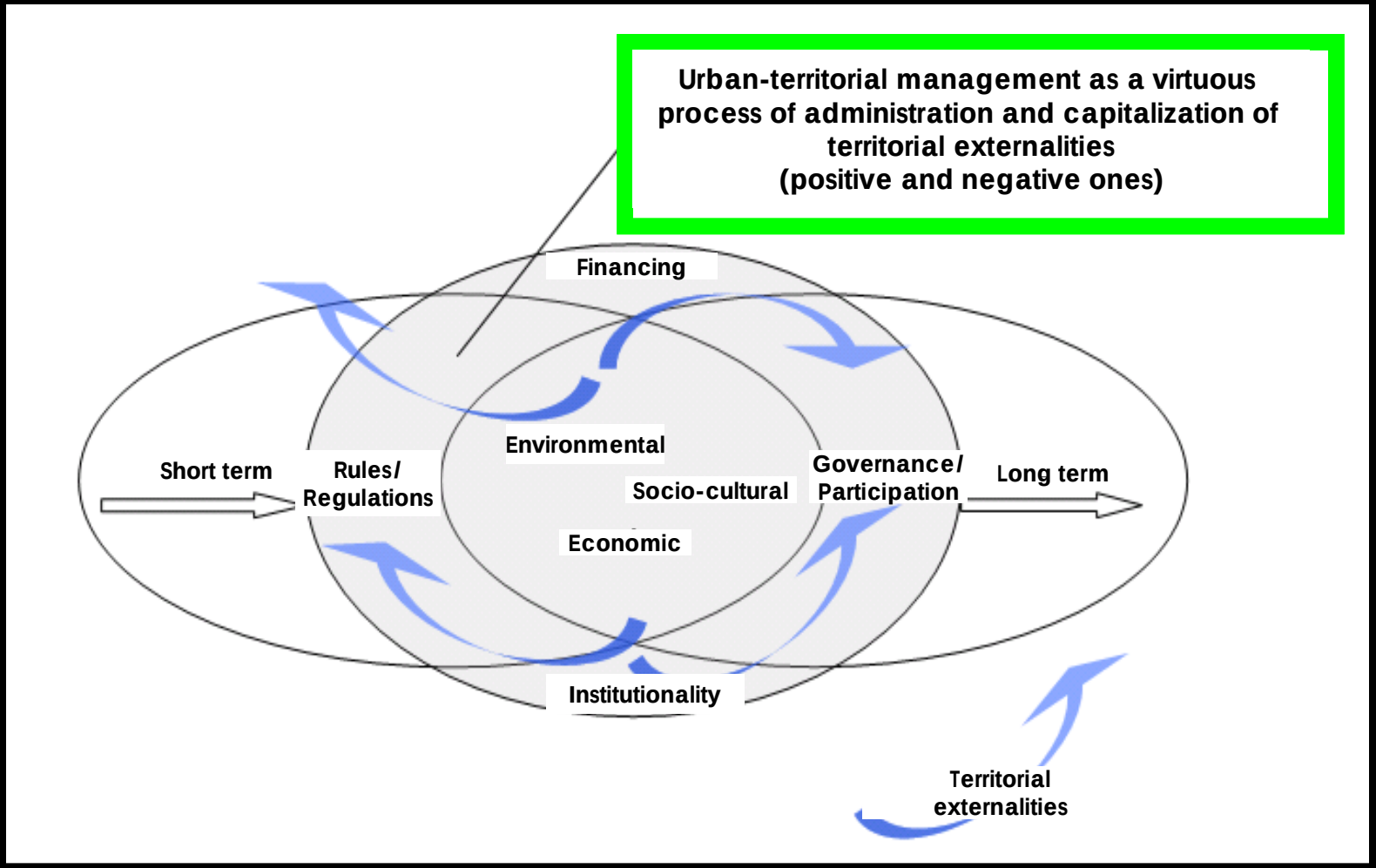
In the different phases, infrastructure is considered a mechanism for the integration at the urban-territorial level

2. Matters to be considered in the sustainable urban-territorial management

Within the context of Latin America and the Caribbean, there is a series of characteristic notes regarding the sustainable urban management. They are as follows:

- Interventions that articulate different types of resources (human, financial, organizational, political and natural ones);
- With orientation to the simultaneous achievement of: habitability and functionality;
- Also considering the conditions of productivity and urban-territorial competitiveness;
- Through the reactivation of the economic dynamics in order to fulfill physical and intangible needs.

3. Implementation of infrastructure works executed with eco-efficiency criteria that allow to reduce the negative externalities



Which are these negative externalities?

Territorial externalities

	Interaction between economic and physical-environmental dimension	Interaction between the economic and social dimension	Interaction between social and physical-environmental dimension
Positive externalities	•Economy of scale in the use of energy: -Public lighting, -Transportation, -Domestic efficiency. •Environmental values such as required goods or localization factors for advanced activities.	•Accessibility to: -Specialized services for housing, -Diversified work markets -Education institutions -Culture centers -Qualified sanitary services. •Easy social interaction	•Concentration of historical-cultural and environmental external factors •Accessibility to public environmental goods
Negative externalities	•Shortage of natural resources and biomasses. •Decreasing yields in private transportation. •Jams, air pollution, acoustic pollution. •Pollution of aquiferous layers.	•Forced suburbanization due to high central rents. •Social conflicts in the work market •New poverty forms •Domestic conflicts and neighborhood violence	•Wearing out of monu-mental historical heritage. •Loss of the cultural heritage •Social conflicts due to the access to natural resources •Social segregation and absence of law and/or order

Source: Adapted from R. Camagni, Capello and Nijkamp, 1996.

Which are the causes of these externalities?

Asymmetry of the externality, because of the type of externality as well as because of its intensity

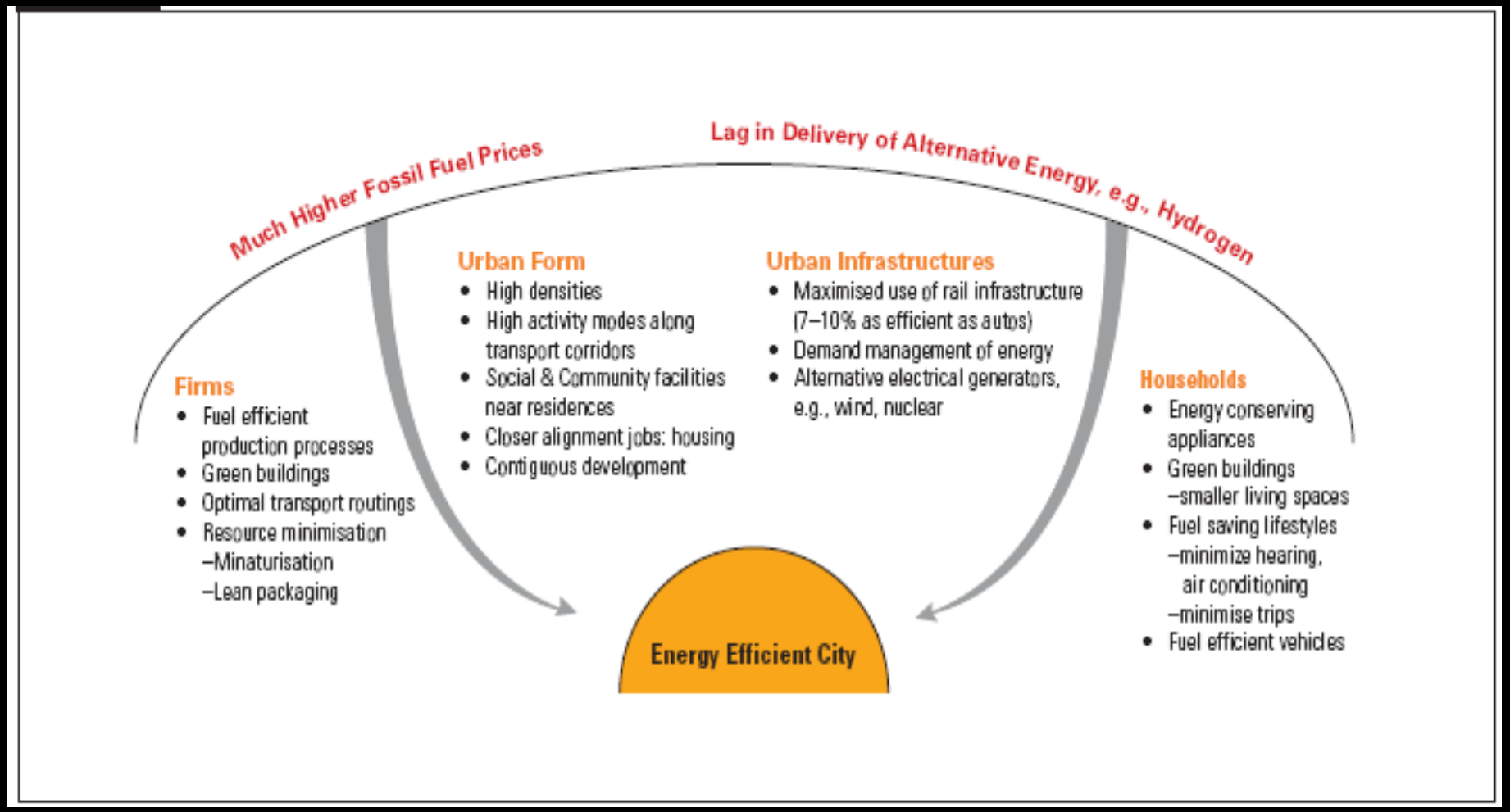
Main characteristics of the diffuse city and the compact city

Characteristics	Diffuse city	Compact city
Functional distribution	In the diffuse-city model, the space is zoned and the different functions of the city are divided. This determines a growth in extension that greatly Exceeds the population growth of the area.	In the compact-city model, city functions are mixed. This drastically reduces the distance that must be traveled in order to keep them articulated.
Transportation	As a consequence of the division of urban functions, communication among them is established based on a road network considerably dense that often favors the private transport. mode.	The proximity among functions allows less private transportation infrastructure dependence, favoring less energetically expensive modes.
Diversity	Despite the fact that the diffuse city manages to create global diversity, it is not localized. In fact, due to the functional segregation, each urban zone is homogeneous, which makes the encounter possibility difficult.	In the compact city, due to the mixture of different urban functions, a greater number of contacts per area unit is possible. The diversity in the urban areas will be relatively higher than in the diffuse city, where these are preferably homogeneous.
Energy consumption	The existence of a network-connected city, with low density, extended in the territory and where the private car is privileged has, consequently, a high energetic and material consumption.	The compact configuration, due to the reasons mentioned, implies an energetic consumption much lower than the diffuse city does: less soil consumption due to greater density, less energy consumption as regards transportation, less material consumption, etc.

Source: Jordán and Livert (2008) on the bases of Naredo (1997)

4. Infrastructure and an energy-efficient city

URBAN DYNAMICS ACCORDING TO THE ENERGY EFFICIENCY OBJECTIVE



Source: Cities Alliance (2006)

5. Typology of assets, public services and associated infrastructure

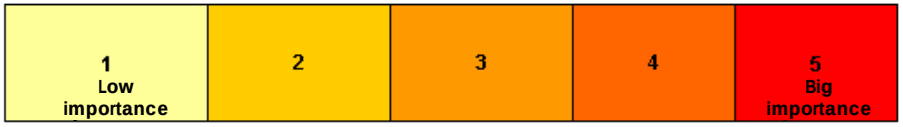
Convenience of considering diversity of infrastructures within a specific territorial context to guarantee processes and projects that simultaneously gather eco-efficiency and integrality

Public and social goods and services	Related infrastructure
Education	• Schools, high schools, universities, kindergartens, etc.
Health	• Health centers, hospitals, clinics and nursing inst., dispensaries
Defense	• Barracks, warehouses, garages, etc
Security	• Fire stations, police stations, equipment, etc
Justice	• Courts, jails
Culture	• Museums, theatres, cinemas, etc.
Telecommunications	• Lines, satellites, stations, cables, etc.
Electricity	• Power stations, transformers, lines, etc.
Water	• Dams, pumping stations, canalizat., treatment plants, etc.
Sanitation	• Sewer systems, treatment centers, etc.
Lightning	• Light posts, high tension pylons, etc.
Free time	• Parks, green areas, zoos, stadiums, gyms, pools, etc.
Post	• Post offices, distribution centers, vehicles, etc.
Religion	• Worship places, temples, cementeries, etc.
Research	• Laboratories, offices, etc.
Air transportation	• Airports, radars, control towers, etc.
Land transportation (roads)	• Roads, highways, bridges and tunnels, etc.
Railway transportation	• Rails, stations, signposts, machinery, trains, etc.
River transportation	• Canals, locks, etc.
Sea transportation	• Ports, lighthouses, etc.
Urban transportation	• Subway, modal stations, streets, avenues, information systems, signposting, traffic lights, etc.

Source: From Prud'Homme, Rèmy (2001) "Ensayo de la tipología de los partenariados público-privados", in Ministry of Public Works, Transportation and Housing of the Republic of France (2001) "Financiamiento de infraestructuras y servicios colectivos: recurrir al partenariado público-privado". Ponts et Chausseès.

Public and social goods and services	Related infrastructure	Degree of importance of the infrastructure	Degree of complexity of the required technology	Degree of importance of the place size for its production, consumption or supply
Education	• Schools, high schools, universities, kindergartens, etc.	2	4	1-4
Health	• Health centers, hospitals, clinics and nursing institutions, dispensaries.	2	5	4
Defense	• Barracks, warehouses, garages, etc.	2	3-5	1
Security	• Fire stations, police stations, equipment, etc	1	3	2-5
Justice	• Courts, jails	1	4	4
Culture	• Museums, theatres, cinemas, etc.	2	3	4
Telecommunications	• Lines, satellites, stations, cables, etc.	5	5	2-5
Electricity	• Power stations, transformers, lines, etc.	5	4	2-5
Water	• Dams, pumping stations, canaliz., treatment plants, etc.	5	4	5
Sanitation	• Sewer systems, treatment centers, etc.	5	4	5
Lightning	• Light posts, high tension pylons, etc.	5	2	5
Free time	• Parks, green areas, zoos, stadiums, gyms, pools, etc.	4	2	5
Post	• Post offices, distribution centers, vehicles, etc.	1	2	3-5
Religion	• Worship places, temples, cementeries, etc.	2	4	2-5
Research	• Laboratories, offices, etc.	2	5	5
Air transportation	• Airports, radars, control towers, etc.	2	5	4
Land transportation (roads)	• Roads, highways, bridges and tunnels, etc.	5	3	4
Railway transportation	• Rails, stations, signposts, machinery, trains, etc.	4	4	3
River transportation	• Canals, locks, etc.	2	2	3
Sea transportation	• Ports, lighthouses, etc.	3	3	4
Urban transportation	• Subway, modal stations, streets, avenues, inf. systems, signposting, traffic lights, etc.	4	4	5

References:
Importance of the variable



6. Need of achieving simultaneously two objectives related to policy: habitability and functionality

Habitability:

It refers to the quality of life in the cities and regions and the fulfillment of material and immaterial needs that the cities and regions offer. It comprises those aspects that contribute to the increase and *"evaluation"* of human capital as well as social and natural capital of the urban communities. In this regard, sustainable urban management is aimed at the minimization of negative externalities that condition the urban media.

Functionality:

It comprises levels of social, environmental and economic productivity and profitability ("returns") of human and financial resources that guarantee agglomeration economies, as well as internal economies and economies of scale and growing *"evaluation"* of physical assets (equipment, infrastructure) as well as human assets for the sustainable development (work). "Capture" of positive externalities in the metropolitan urban areas.

7. Involvement related to “transfer”

A way of approaching different urban-territorial problems (atmospheric pollution, vulnerability, climate change, energy, among others) from a perspective related to the design of policies and management. It implies:

To solve problems, shift from a sectoral and unilateral approach to an integral and multidimensional one with territorial substrate

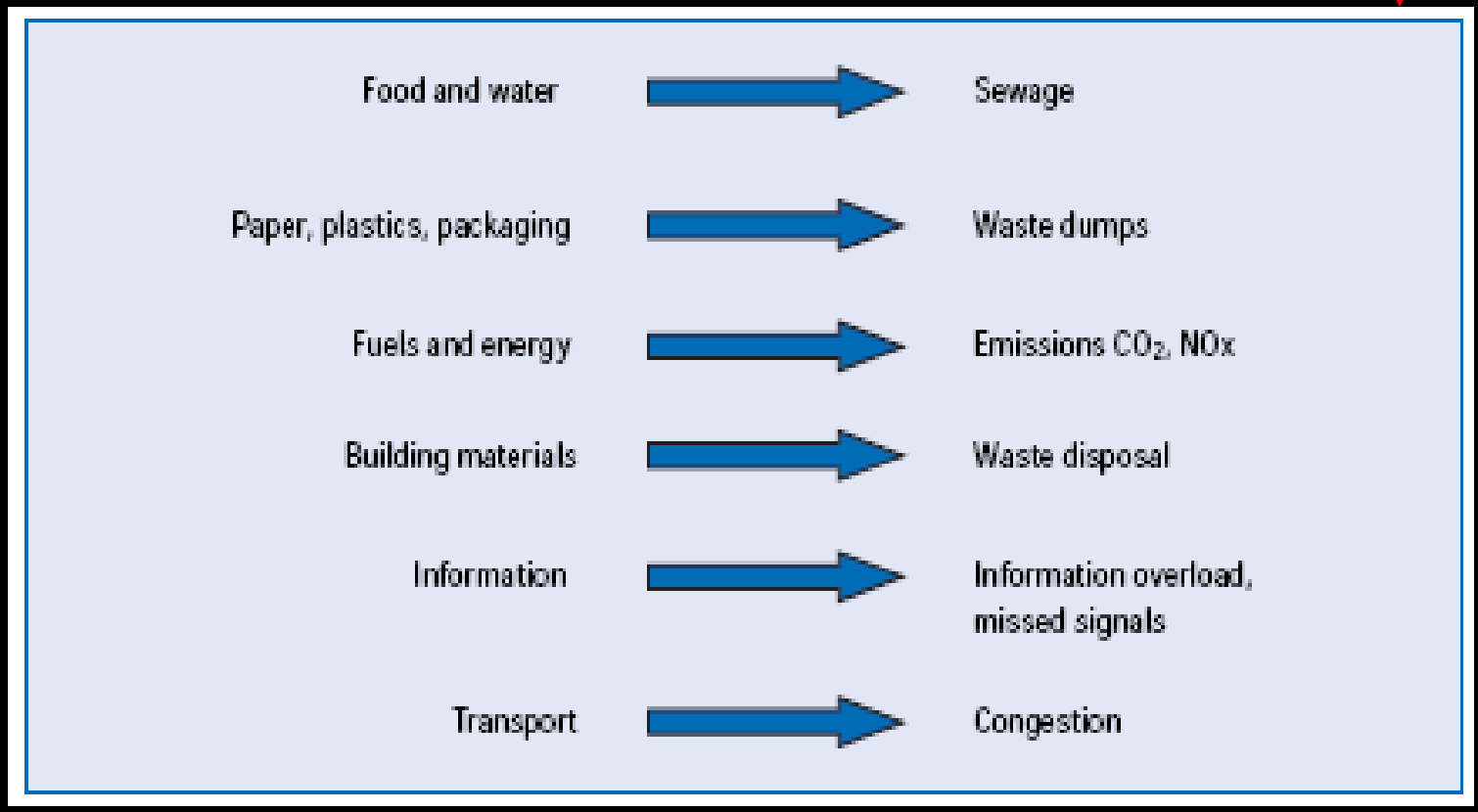
On the basis of:

- Dynamics of economies of scale in the urban-territorial interventions
- Evaluation and identification of positive and negative territorial externalities
- Identification and evaluation of economic, social and environmental impacts
- Mobility of resources and institutions with territorial basis

It supposes transit from…

"L*ineal*" effects of the infrastructure for integration

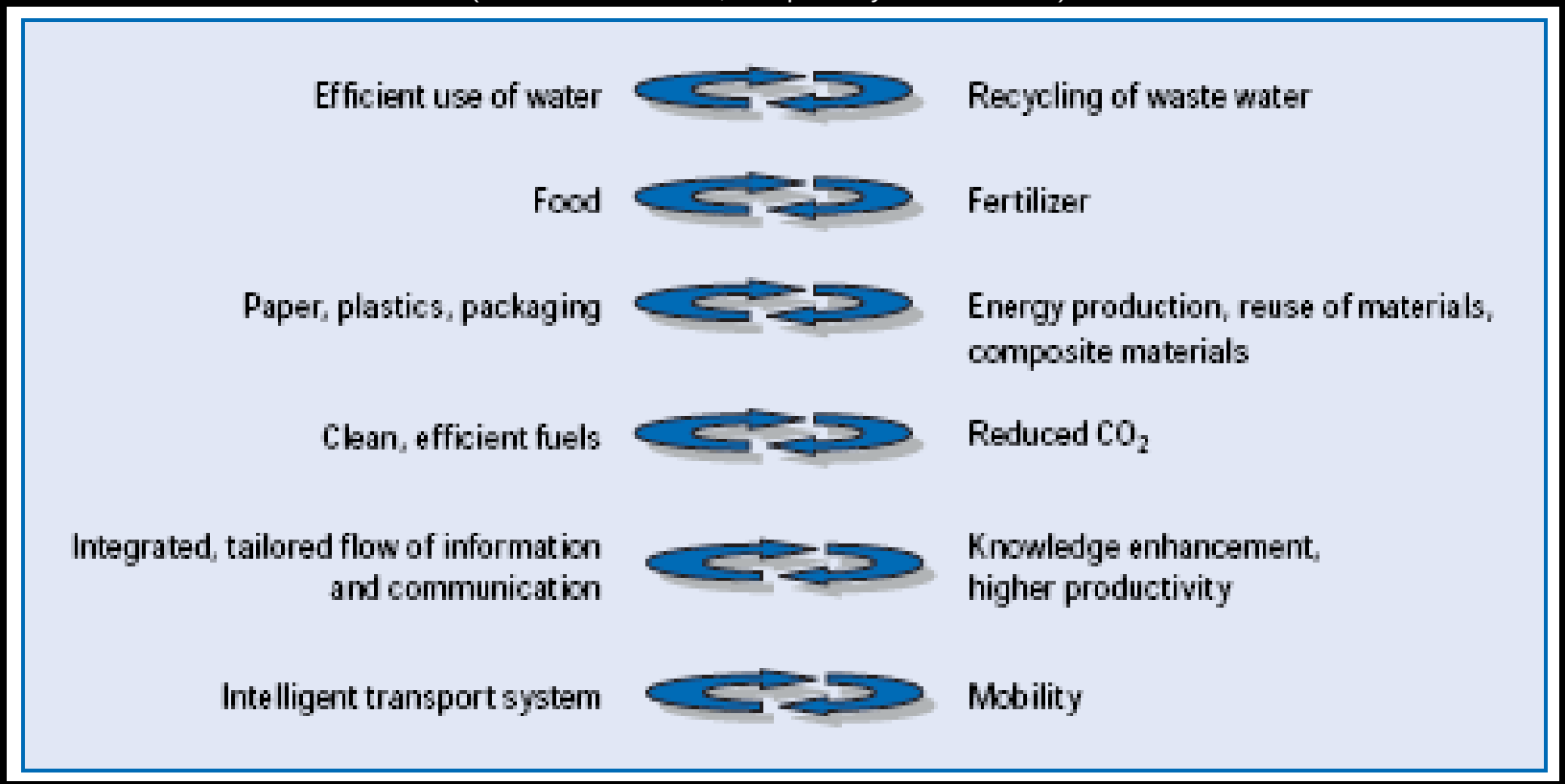
(Source: OECD 2006, adapted by Girardet 1992)



To the scheme that supposes a …

“Sustainable circle” of the infrastructure for integration

(Source: OECD 2006, adapted by Girardet 1992)



Briefly… the enhancement of certain **PRINCIPLES**:

Principle 1: Equity and social cohesion

- From the point of view of public policy, it is legitimate and convenient to create opportunities (more and better infrastructures for integration) in relation to differences for further personal development. It is worth mentioning that the exercise of the liberty to follow life convictions according to individual values requires the creation of conditions that habilitate them (A. Sen)

Principle 2: Public assets and externalities

- The urban-territorial externalities imply loss of the population's welfare due to damage (or benefit) imposed without a retribution. Its internalization or its compensation requires evaluations for the design of political measures (taxes, norms, emission rights, compensatory payments, among others). This is a principle to be considered for the design and execution of the infrastructure for the integration, which objective is to improve the quality of life in the territories.

Principle 3: Sustainability and territory

- The relation between sustainability and territory is based on many factors, among which the following are highlighted: efficient use of energy, efficient output of water and materials, prevention/minimization of emissions and wastes in the economic system, the relation water-energy-transportation-infrastructure-housing and the need of carrying out projects at the least economic cost and with the most mobilization of resources.

8) INSTRUMENTS

URBAN MANAGEMENT INSTRUMENTS THAT CONTRIBUTE TO THE ECONOMIC-PRODUCTIVE PROMOTION	
Instrument	**Description/Objectives/Implications**
✓ **Territorial / property progressive tax**	Consists of the use of a tax in order to inhibit the speculative use of the urban soil, without tax purpose. Sub-used or unoccupied lands located in urbanization and priority occupation areas must be properly occupied. This mechanism avoids real estate speculation, promotes the building activity and provides density to urban areas as a consequence of the use of vacant land. Sometimes, it has been related to the "*Real Estate Consortium*" instrument.
✓ **Real estate consortium or consortium urbanization**	To promote the use of areas with no infrastructure, by means of a private public instrument, over which there is urbanization pressure due to their urban nature. Thus, real estate speculation is avoided and it is favored the occupation of big unoccupied areas within the urban sector, that do not have complete infrastructure. It opens up urban development alternatives to owners that have the land but not the money to divide it or build in it.
✓ **Basic utilization ratio**	It implies the equal right to build for everyone. Onerous concession of the right to build beyond the basic utilization ratio (created soil), it is a right that public administration sells to those interested. It presupposes the division between the property right and the building right. Building reserved areas are established, which are differentiated by city zones and uses. Its purpose is to create resources in order to invest in urban infrastructure, houses of social interest and urban equipment.
✓ **Interconnected urban operations through consortium**	Cooperation between the public sector and the private initiative, through which certain areas of the city are promoted. The public sector designs the project, coordinates the infrastructure implementation and the occupation forms. The private initiative provides resources to carry out the works. A perimeter reserve area is established, which shall be sold to the private initiative with whose money the public works shall be financed. They are carried out through consortium because they also participate the public sector, the inhabitants, the owners, the permanent users, the private investors, with the purpose of achieving a certain area, structural urban transformations, social improvements and environmental valorization. Orientation towards achieving renewal, preservation, restoration actions, among others, could be included.

URBAN MANAGEMENT INSTRUMENTS THAT CONTRIBUTE TO THE ECONOMIC-PRODUCTIVE PROMOTION	
Instrument	**Description/Objectives/Implications**
✓ **Urban re-qualification program**	They are oriented towards recovery and reuse of industrial areas not being used and of big obsolete public equipment (markets, slaughterhouses, jails, regiments). These programs introduce financial economic programming in the promotion of urban policies. They have been used as regulators among negotiations between the public sector and the private initiative, helping to promote the transparency of the practices.
✓ **Transfer of building right**	It authorizes the owner of a public or private urban property to exercise, in another location, the right to build that is established in the urban legislation. It is kept on the basis of the social function of the property, for instance in the Brazilian Federal Constitution from 1988, and it contributes with the purposes of preservation whenever the property shall be considered of historic, environmental, landscape, social or cultural interest as well as for the location of urban and community equipment. It is a compensation instrument and not a collection one, but it can be used to collect benefits that could afterwards be oriented towards lower socioeconomic layers.
✓ **Urban societies**	It makes it possible to carry out city-planning tasks and building in zones of urban growth such as the cities´ historical centers, wherever the municipality and/or the firm shall have land available. The urban transformation created and its later sale in the real estate market creates benefits that make it possible to keep the administrative structure of these societies, to pay the soil transformation costs, to rehabilitate buildings and to carry out the planned expropriations in the historical centers.
✓ **Urban development funds**	It is oriented towards financing projects that lead to the improvement of the habitat and of the life conditions of low income sectors. It is a financial mechanism the usually has a mixed and multiple fund destined to projects of social urbanization, of basic equipment, of neighbor improvement and of regularization of urban soil. As part of the funds arise from the collection of extraordinary urban rents originated in areas of greater valorization, they create the redistributive transfer of theses rents towards the depressed sectors of the city.

URBAN MANAGEMENT INSTRUMENTS THAT CONTRIBUTE TO THE ECONOMIC-PRODUCTIVE PROMOTION	
Instrument	**Description/Objectives/Implications**
✓ **Principle of *"Socialization of the Building Right"***	Its purpose is to recover for the community, the value that is equivalent to the building rights that it has given to a land, through the different regulations. It arises from the idea that the value of a land is basically defined by the uses that the community has set to it. Thus, the property of the use of the soil is divided from the building right in order to give this a value that must be returned to the community. In Italy, the amounts collected through this principle have made it possible that a special account redirects them to the performance of different works such as provision of equipment, improvement of buildings in the historical center, among others.
✓ **Contribution through improvements**	Its purpose is to recover part or all of the public investment used in benefit works for the community. The surplus recovery form arises from the concept of payment or contribution with the performance of a work financed with public resources according to the benefit that it provides to the owners of the property affected. In Latin America, experiences have been identified where mayors in the public sector have cancelled the payment obligation, thus creating distrust in the community towards continuing to contribute with the financing of public works and taking away credibility to the instrument.
✓ **Green areas law**	Rule that makes it possible to establish a procedure of valuation and rights collection for services requested by the community in green areas. It consists of valuing the tree specie and public gardens in such a way that any public or private project that shall affect their integrity or conservation state shall have to cancel a municipal right for the damage or loss caused. Thus, it does not encourage the interest for the extraction of trees and the destruction of gardens by services firms, as these practices increase their projects costs.
✓ **Monetization of the urban standards**	Principle through which municipal governments must carry out, with the resources from the contributions that arise from the building permissions, the services required by the existing cities, whereas private entities must directly pay for and carry out the public services related to the new expansions. This monetization proposes to solve the equity and efficiency problems of the urban planning.

Financing instruments for the development of infrastructure for the integration under eco-efficiency criteria

- **Market instrument: commercial banks, insurance companies, among others.**
- **Public instruments: subsidies, taxes, incentives, development banks.**
- **International cooperation: Multilateral banking, Offices for the Support of Development (Oficinas de Asistencia al Desarrollo or OAD, in Spanish), Bilateral Agencies.**
- **Instruments for the financing of projects: Clean Development Mechanisms (Mecanismos de Desarrollo Limpio) (CDM-MDL)**

9) SCOPE

- To explore potential positive synergies among the urban and environmental macro-economic policy
- To evidence the link among local and national decisions through the urban mobility pattern. The effects of said pattern highly depend on imports
- To anticipate the levels of externalities in a scenario or baseline in a growing economy, where population is very much urbanized and concentrated in only one city
- Local and global pollution (climate change). To study scenarios with changes in the baseline. Co-benefits between local and global pollution and trade balance

More specifically:

- The identification, the economic assessment, and the study of the political and financial feasibility of the economic instruments to achieve a lower level of air emissions, taking into consideration the case of private transportation

D. PROJECTS IN THE SUSTAINABLE DEVELOPMENT AND HUMAN SETTLEMENTS DIVISION

1. ECLAC (CEPAL, in Spanish)-ESCAP *"Eco-efficiency and development of sustainable urban infrastructure in Latin America and Asia"*

2. *"Externalities of urban infrastructure projects: measurement, evaluation, internalization and options on politics in Latin America and the Caribbean"*

1. ECLAC (CEPAL, in Spanish)-ESCAP Project

"Eco-efficiency and development of sustainable urban infrastructure in Latin America and Asia"

Objective of the project

The project is aimed at the elimination of barriers for the acceptance of the approach and its materialization in the management and planning of infrastructure.

The purpose is to contribute to the management capacity of decision-makers, planners and policymakers with the objective of promoting the development of sustainable infrastructure, highlighting urban planning, eco-efficiency, prevention of disasters, social inclusion and financing of opportunities in this matter through carbon global market share.

Barriers

- **Action level: generally of ministerial nature for which ECLAC (CEPAL, in Spanish) and ESCAP must manage sensitization and accompaniment processes for the governments in relation to the convenience of the approach and the scopes of the results**
- **Political decisions: The risk of this type of decisions is the short-term vision**
- **Relevant information statistical data: which contribute to the understanding of the current levels of eco-efficiency of the existing infrastructure**
- **Wrong perception of the cost of the approach: “green growth” and “eco-efficiency” are perceived as too expensive**
- **Isolated character and lack of coordination among governmental institutions: it is against the integral and transverse approach**

Some questions that could be answered with the project

- Which are the priority challenges regarding de development of infrastructure?
- How significant is the contribution of infrastructure to the reduction of emissions as well as to other objectives (ecological trace, MDG, among others) and how can it be proved and spread to create compromise in decision-makers as well as in policymakers?
- Which is the scope regarding types of infrastructure to be taken into consideration?
- How is it possible to contribute to the understanding and outreach of the concept: “sustainable urban infrastructure system”?
- Which are the limitations and challenges of the current patterns of the development of infrastructure and which patterns and models currently available are more sustainable?
- How can the concepts of eco-efficiency be applied to the assessment of infrastructure and planning patterns? How can their impacts be measured?

Strategies-Plans for region cities for the promotion and development of urban infrastructure based on the principles of eco-efficiency

- **Hypothesis: the sustainable urban infrastructure as "a system to facilitate transportation, energy and water services, supporting economic and social development in an integrated, eco-efficient and socially inclusive way" (Ness, 2009)**

- **The objective of the Strategies-Plans is to serve as a guide for:**

  - **High-level decision-makers, at municipal or regional government levels, as well as public officials (people who create policies and projects) of areas related to planning and management of urban and territorial development, housing, public services, among others;**

  - **Officials that must negotiate with companies in the private sector for the rendering, construction, operation and transfer of infrastructures and collective services or officials that seek co-financing options for the rendering of this type of goods and services with eco-efficient criteria.**

- **The Strategies-Plans are integral; nevertheless, they have two parts or sections called: "Dimensions", which are strongly related:**

1. **<u>Dimension related to the diagnosis for the analysis and assessment of opportunities</u>: as a baseline, regarding the development of sustainable urban infrastructure through the identification of weaknesses, strengths and opportunities in the city-region.**

2. **<u>"Pro-positive" dimension</u>: it implies the identification of strategic lines, objectives, project portfolio/s with the corresponding feasibility elements. It also proposes opportunities for the inclusion of the criteria related to eco-efficiency in the current scheme of infrastructure and urban collective services for the city-region taking into consideration an economic dynamics, as well as dynamics regarding business and services, financing, institutions, relations with the community, regulations, etc.**

Diagnosis-analysis dimension of Strategies-Plans	•Which is the status of the art of the current infrastructure and urban collective services scheme, in the city or region, in the sense of the incorporation of the eco-efficiency criteria in the policies carried out in the established city or region (plans, programs and projects)? (particularly analyzing the degree of consideration or inclusion of the eco-efficiency criteria in said initiatives) •What are the greatest challenges for the development of infrastructure taking into account city urbanization? (motorization and jams?, efficient use and renewable energy?, water shortage?, resilience to natural disasters and climate change?). How could a more suitable and sustainable infrastructure for these challenges be achieved? •Which is the scope or the approach that infrastructure currently has? Are they only considered the transportation ways, waterways, etc. Or are they preferably considered as “transportation systems”, “energy system” etc.? Is infrastructure “a system for making the service distribution system easier” more than the delivery of a final product? •How can eco-efficiency concepts be applied to the evaluation of models and the infrastructure planning and how can the impact be measured? •Which is the potential for the private investment via public-private partnership and how could they provide a social, economic and environmental profitability including the consideration for the demands from the poorest sectors? •How can CDM –MDL, in Spanish (including programmatic CDM) and other innovative financial mechanisms be extended in order to create more infrastructure and energy investment? •What are the criteria for good practices and which are the examples, especially as regards planning and methodology approaches? •What are the existing successful financial policies and strategies? (i.e., jam taxes, vehicles installment, etc.) •What hypothesis or force ideas arise from the analytic diagnosis? What barriers or obstacles can be identified from an economic, businesses and services, financial, institutional, community relations, normative, among others, point of view?

Propositional dimension of Strategies-Plans	•Which action strategic lines and purposes are optimum, feasible and convenient to be established according to these hypotheses and diagnosis? What is feasible and convenient to do? Why? •Through which potential project and program portfolio? (How?) •Which methodology or approach is behind these projects and programs? •Is there a prevision or prospective analysis of impacts and externalities of each of the projects? •Which instruments or tools are complementary with the projects in order to guarantee the eco-efficiency principles? •With which financing program? •With which institutional structure – or governance? •With which support regulation or protective structure? •With which participation mechanisms? •With which outreach, information and training mechanisms? •In which time for each element?

Source: ECLAC (2009)

2. Project: "*Externalities of urban infrastructure projects: measurement, evaluation, internalization and options related to policies in Latin America and the Caribbean*"

Objective of the project

To quantify the impacts of the main mega-projects related to urban, habitational and infrastructure development in many countries in Latin America and the Caribbean and propose options with schemes of internalization of the externalities of each project.

This will be an added value for the decision-making process because it will increase the *qualitative* efficiency of the management capacity of governmental actors. This is due to the fact that it will be possible to create a priority system and a stricter "calibration" of the challenges that must be faced with scarce resources.

Approach of the project

- From the economics point of view, urban policies are currently posed through sectoral strategies and, at the tactical level, investment projects are the ones that shape the final effects that said policies will have on the welfare of the city inhabitants.

- That is why it is important to identify which are the urban and environmental benefits and costs of executing big projects in the city.

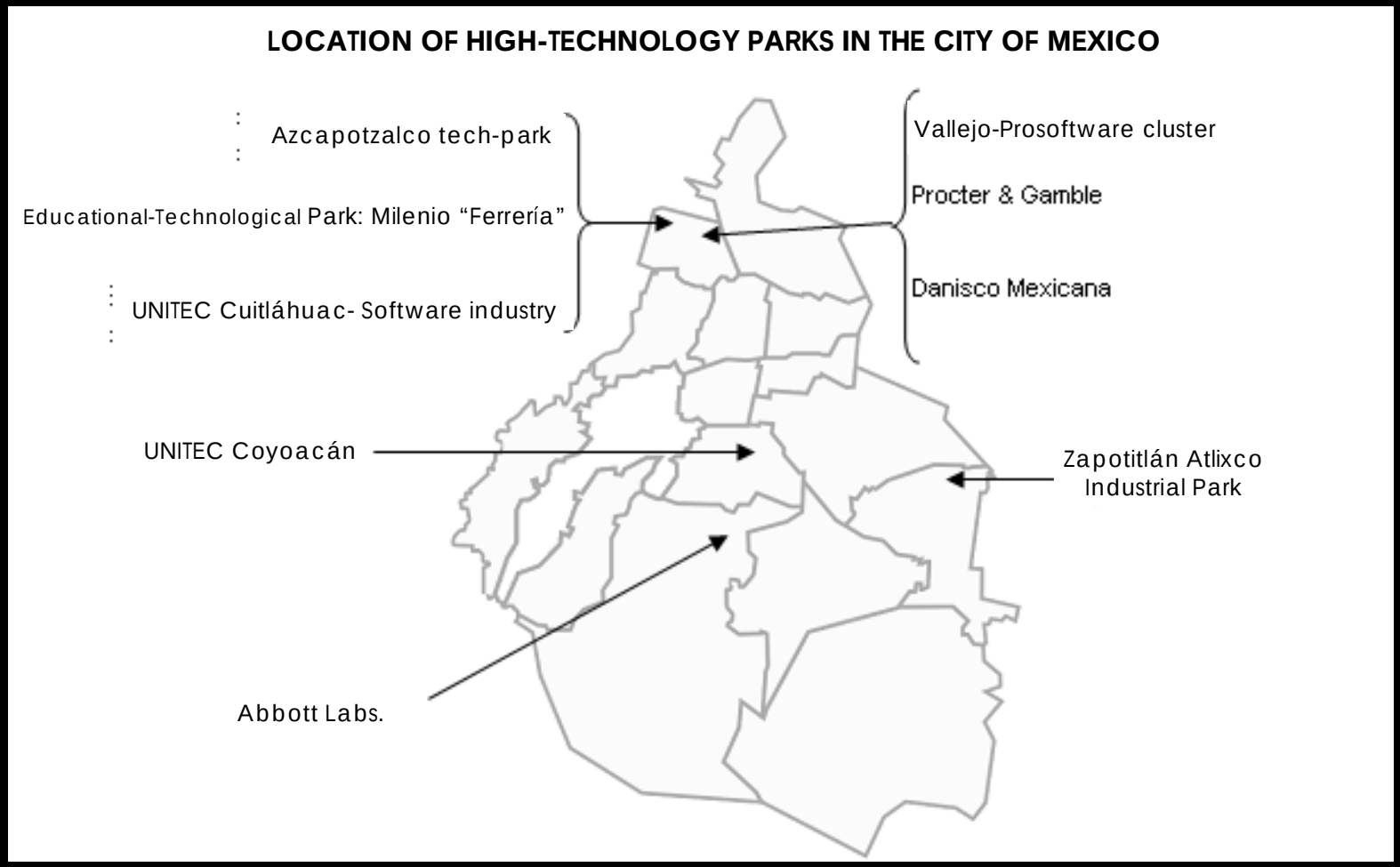
- The starting point is the conviction of systemically observing the externalities with respect to the interaction and integration of the sub-systems that compose the city system (social, physical, economic and environmental system) and the dynamic interactions that take place in the system (externalities, feedback, increasing outputs and synergies) and essentially in the urban negative externalities.

Questions that the project should answer

- Which would be the way in which negative and positive externalities are generated of the main investments in urban mega-projects (urban, habitational and/or infrastructure development)?
- How do the analysis of the private and social outputs, the economic incentives and the atmospheric impacts integrate to this diagnosis?
- Which would be the most appropriate measurements and assessments?
- Which would be the results of an initial assessment of the instruments and policies of urban management implemented by the governments in Latin America and the Caribbean?

CASE STUDIES

HIGH-TECHNOLOGY PARKS (CITY OF MEXICO, FEDERAL DISTRICT) (2001-2006)



Source: Jordán and Livert (2008)

IDENTIFICATION OF EXTERNALITIES BEFORE THE ESTABLISHMENT AND DEVELOPMENT OF THE HIGH-TECHNOLOGY PARKS IN THE CITY OF MEXICO, FEDERAL DISTRICT

Negative externalities, *ex-ante*, (or without PAT) (up to year 2000)					
Productive	**Labor**	**Social**	**Real Estate**	**Environmental**	**Fiscal**
-Non-use or sub-use of properties with existing or potential urban Infrastructure and productive capacity. -Defective circuits without PAT: weakening of productive and reciprocal Interurban products and services supply chains in city regions and zones and Productive Relocation outside the city.	-Waste of human capital of the city and of the best Professional profiles in the country. -Economic informal trend and social escape for surviving in a precarious and Inefficient environment of sub-employment and informal self-employment.	-Social insecurity resulting from the property abandoning and the sub-use of urban zones that become territories less visited by citizenship, with little lighting and less surveillance by Governmental authorities.	-Real estate waste of several optional uses of abandoned properties: use as PAT; habitational use because of the unsatisfied demand for houses in areas with high population indexes; use as equipment and urban emergency services locations (fire stations, clinics, machinery for public works, etc.). -Loss of real estate economic values both of abandoned properties and of surrounding urban zones.	-Degradation of the urban landscape. Conversion of Abandoned properties in informal waste disposal places. -Increase of harmful fauna and possible infection centers.	-Properties whose owners do not pay taxes to the city government because of being abandoned or properties owned by the city whose government does not make use of that fiscal patrimony. -Properties socially expensive for the public treasury because it has to spend money in its Precarious maintenance with no useful means whatsoever.

Source: Jordán and Livert (2008)

IDENTIFICATION OF EXTERNALITIES AFTER THE ESTABLISHMENT AND DEVELOPMENT OF THE HIGH-TECHNOLOGY PARKS IN THE CITY OF MEXICO, FEDERAL DISTRICT

Positive externalities, *ex-post,* (or with PAT) (2001-2206 period)					
Productive	**Labor**	**Social**	**Real Estate**	**Environmental**	**Fiscal**
-Productive reuse of abandoned or sub-used property and industrial areas. -Production of goods, services, income and productive chains at punctual, zonal and metropolitan scales. -Economic re-specialization of the city in high technology changes and of significant added value that induce a better Global Competitiveness of the city.	Use of human capital and improvement of productivity in manufactures, commerce and non-financial private services of the city. -Economic gradual formalization and greater work options of better quality. -More than 22 thousand jobs created during 2001-2006 directly attributable to PAT.	-Less social insecurity resulting from the productive recovery of properties and the reuse of urban zones that are again visited by citizenship and assisted with public services from Governmental authorities.	-Real estate recycling by means of the PAT impulse. -Real estate revaluation of the properties where PAT are, as well as those of Surrounding properties. -Once the decision of the real estate use of said properties as PAT has been taken, other public policies are re-ordered, such as housing, urban equipment and public services, etc.	-Improvement of urban landscape. -Use of recovered properties as PAT as examples to be followed regarding saving and efficient use of energy and water and good management of urban solid wastes for other neighboring activities. -Favorable Environmental Correlation between PAT and air quality improvement.	-Properties whose new owners (PAT) pay taxes to the city government after five years of fiscal exemption. -“Fiscal investment” more than “fiscal subsidy” due to the fact that fiscal exemptions to promote PAT are recovered in two years or less after the five of “fiscal grace”.

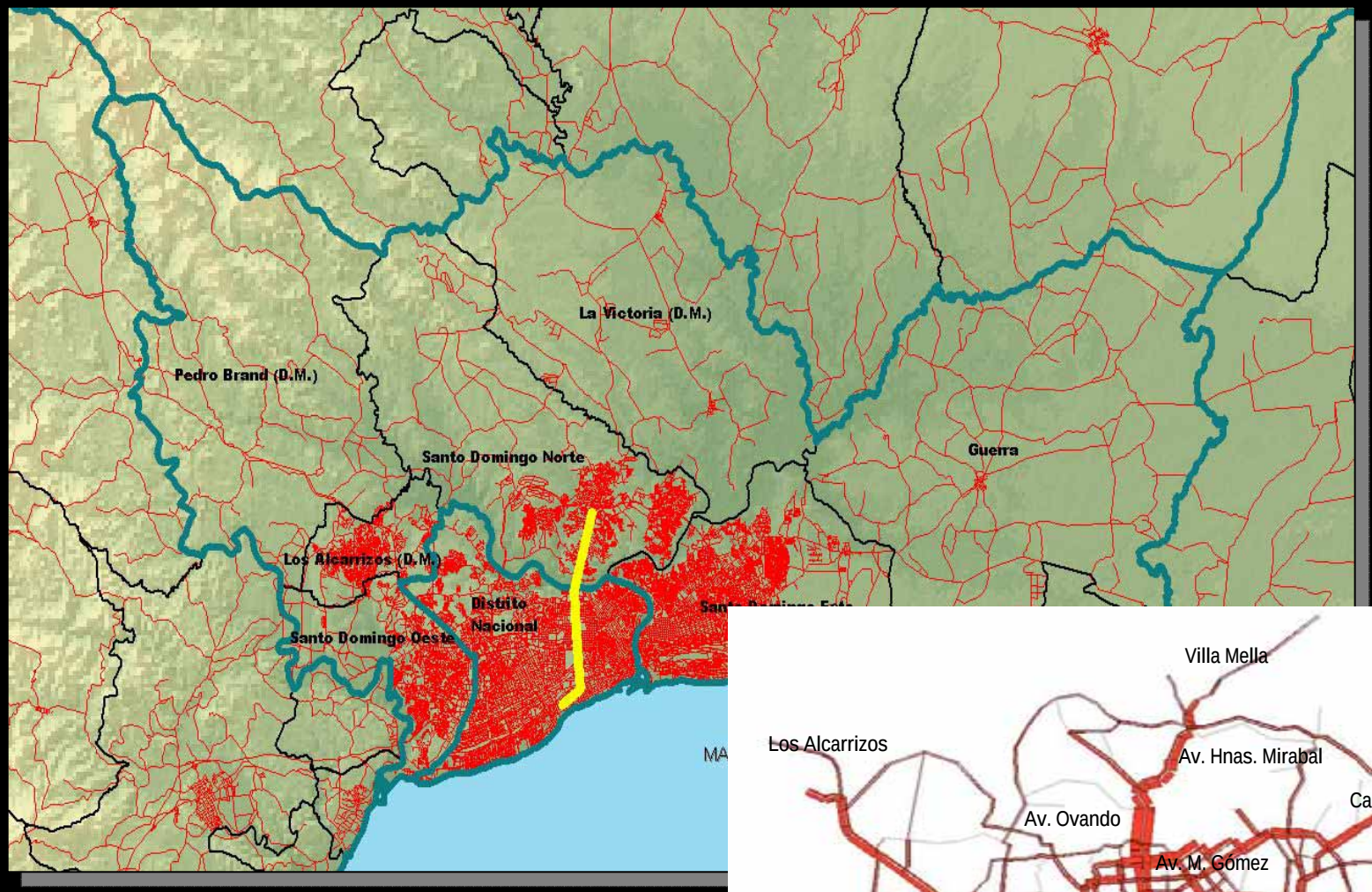
Source: Jordán and Livert (2008)

ECONOMIC VALUE OF POSITIVE EXTERNALITIES OF THE HIGH-TECHNOLOGY PARKS IN THE CITY OF MEXICO (PERIOD 2001-2007)

	Employment	Private Investment (dollars)	Created Income (dollars)	Increase % of real estate value during 2002-2007	Collection fiscal base (dollars)	Property tax (dollars)
With project	22.619	463.267.397	65.888.795	58.6 %	342.581.744	3.864.158
Without project	0	0	0	0	26.234.435	329.792

Source: Jordán and Livert (2008) on the basis of data provided by the Secretariat of Economic Development and the Secretariat of Finance of the Government of the Federal District (GFD) 2001-2006.

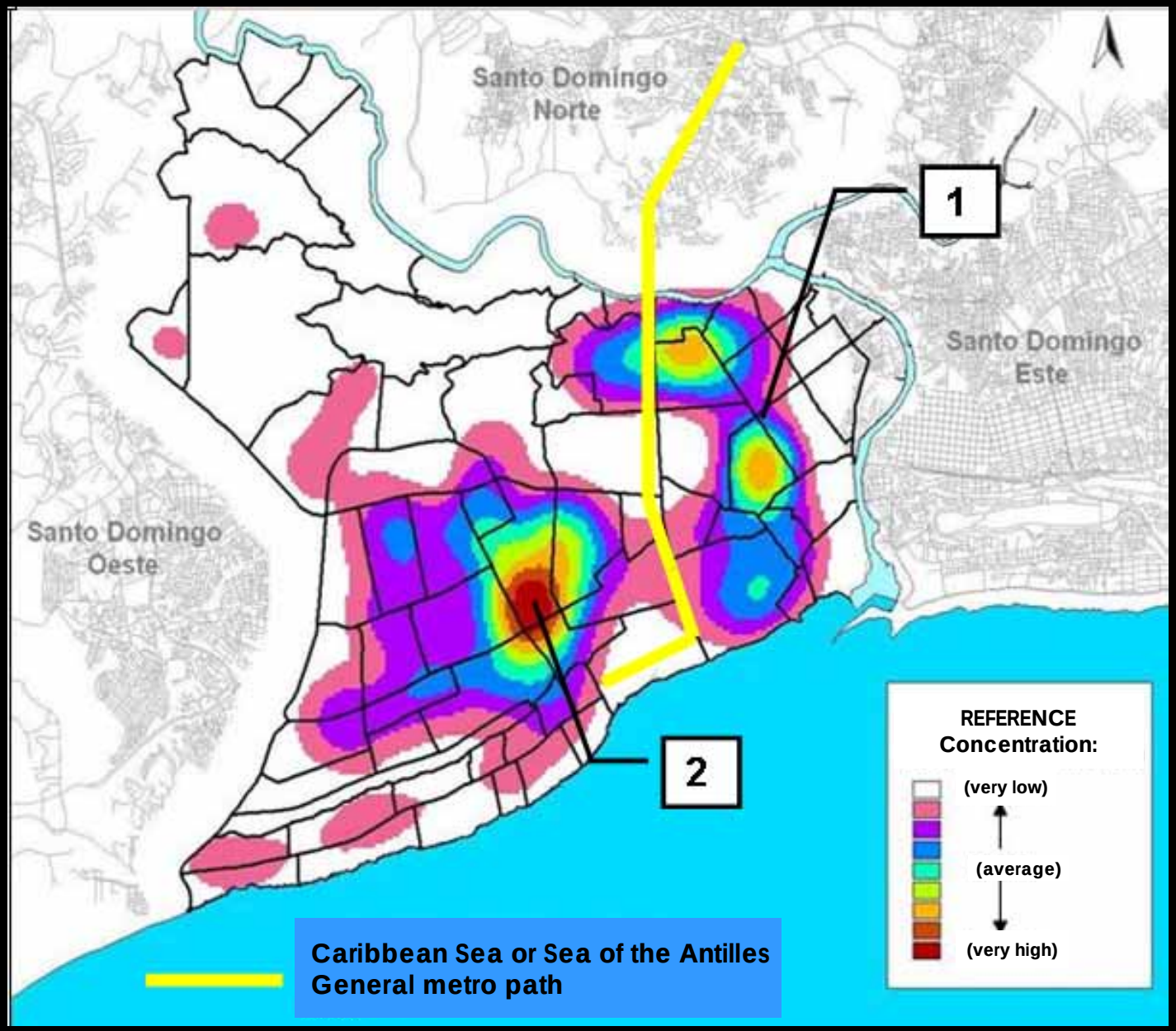
THE METRO IN SANTO DOMINGO (DOMINICAN REPUBLIC)



Source: Raúl Ponce (2007)

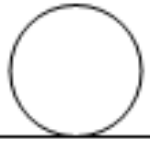
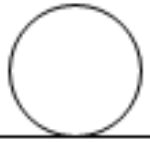
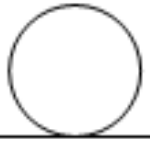
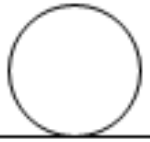
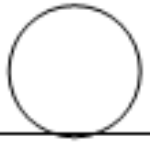
Source: Metropolitan Transportation Authority (2004). Dominican Republic

CONCENTRATION OF THE ECONOMIC ACTIVITY



Source: Latin American Meeting - ESRI 2007. National Bureau of Statistics, Dominican Republic.

42 QUALITATIVE MATRIX OF IDENTIFICATION OF URBAN EXTERNALITIES RELATED TO THE COMPONENTS OF THE METRO PROJECT

COMPONENTS	Reduction of traveling time	Reduction in jams levels	Improvement in air and noise conditions in Santo Domingo	Valuation of the urban real estate soil and increase of fiscal income	Improvement in public health conditions	Improvement of public space
Preparation						
Construction						
Operation						

High
Medium-Low
Low
Indifferent

Source: Raúl Ponce 2007

QUALITATIVE MATRIX OF IDENTIFICATION OF COMPLEMENTARY EXTERNALITIES RELATED TO THE COMPONENTS OF THE METRO PROJECT

COMPONENTS	Minimization of related public investment	Effects that trigger new public and private projects	Risks in payment availability	Technical and operative risks of the project	Citizenship support and reluctance to the project	Long-term socio-political feasibility
Preparation	The greater risk is speculation in the expropriation operation			Speculation in the expropriation operation	Rejection due to lack of Transparency in the decision-making process	
Construction	Existence of high degree expenditure, not considered in the initial financial analysis	Mainly private projects related to the rise in the surplus		Lack of financial flow	Great rejection to investment and to its Externalities related to jams and pollution.	The finalization of the projects is close to presidential elections in 2008.
Operation	Cost transfer from the central government to the local government mainly related to maintenance.	Urban road projects with public financing	Existence of a latent risk if the rate is higher than the external offer.	Energy offer	This factor will be related mainly to the quality of the service Rendered.	Government change possibility and, thus, high risk in the continuity of the service.

High
Medium-Low
Low
Indifferent

Source: Raúl Ponce 2007

Some questions to be answered with both projects at the level of institutional capacities of the governments of the region

- Which are the strengths and weaknesses of the current institutions to face the climate change?
- How can the existing institutions adapt/improve to face the challenges of the climate change?
- Which institutions can adopt a leadership role in this challenges and in which administrative level?
- Which is the compatibility and coherence level in the mitigation and adaptation actions with the urban and local development agendas?
- Which steps must be followed to guide urban sustainability towards the challenges related to climate change?

Sustainable infrastructure and eco-efficiency:

Challenges for Latin America and the Caribbean