



## Interaction between Science and Policy: Biodiversity and ecosystem services in city-regions<sup>1</sup>

MARINO Juana<sup>2</sup>; MEJIA, María<sup>3</sup>

*May the relevant knowledge, democratically constructed and effectively applied, without arrogance, incomplete, non-perfect but honest, one which generates an ethics of vitality, a government, a culture of biodiversity, be the essential and wonderful characteristic from our landform.*

Brigitte L.G.Baptiste, General Director – Humboldt Institute

### Abstract

In this article, the National Institute on Biodiversity “Alexander von Humboldt” approaches the interaction between science and policy based on three case studies in which the Institute is advancing in mainstreaming biodiversity and ecosystem services into urban-regional planning. This project is coordinated by the Policy Program and actively supported by the Information and Knowledge Management and the Communication and Social Awareness programs of the Institute.

The structure of this project is motivated by “integrative science” principles and is framed by the following institutional missions: (i) To strengthen scientific knowledge on BD and ESS based on robust and rigorous analysis and tools; (ii) To make this information valuable, indispensable and “readable” to policy-makers’ inquiries; and (iii) To spread scientific knowledge socially in order to promote citizens’ awareness and responsibility.

Some of the questions to be solved or reconsidered during this research are: What information is needed to mainstream biodiversity and ecosystem services into urban-regional planning? How do we generate useful knowledge to society in order to reach real sustainability of and within cities? How do we integrate this knowledge into policy decisions? How do we make this information valuable to citizens?

Policy agents are to be supported by technical inputs<sup>4</sup> to analyze and model how BD and ESS respond to changes with uncertain degrees of intensity and consequences and how this affects human wellbeing and ecosystems’ sustainability. Taking into account these future scenarios, decision makers will be able to define and adopt policies and also promote social behaviors towards adaptability and resilience; therefore achieving real sustainable conditions.

Policy makers need to understand that one of the most challenging issues to be resolved is to mainstream BD and ESS conservation<sup>5</sup> outlines into urban policies and therefore advance in achieving real sustainability.

**Keywords:** Biodiversity (BD), Ecosystem Services (ESS), integrative science, Multi-scale analysis, Governance, Decision Making.

<sup>1</sup> Abstract ID - 2012 Berlin Conference: 388

<sup>2</sup> Humboldt Institute. Policy Program - Coordinator - [jmarino@humboldt.org.co](mailto:jmarino@humboldt.org.co)

<sup>3</sup> Humboldt Institute. Policy Program - Researcher [mmejia@humboldt.org.co](mailto:mmejia@humboldt.org.co)

<sup>4</sup> Outlines that can match their language and meet their needs.

<sup>5</sup> This implies understanding conservation as the result of: preservation, sustainable use, and knowledge generation strategies and restoration measures (NPCMBES 2012).



## 1. LINKING BIODIVERSITY AND URBANIZATION: OUR POLICY AND SCIENCE FRAMEWORKS

### 1.1. Global Framework

Colombia signed the Convention on Biological Diversity (C.B.D.) in 1992 at the Earth Summit in Rio de Janeiro and ratified it by Law 165 of 1994. The C.B.D. promotes conservation, sustainable use of biodiversity and the equitable sharing of benefits that arise from the use of genetic resources. Since the Humboldt Institute is responsible for researching biodiversity on the national level, it is the national focal point in relation to the C.B.D.

To address the significant impact of urbanization on ecosystems, the Convention adopted in 2010 the City and Biodiversity Decision, thereby combining earlier efforts focused on linking biodiversity and urbanization phenomena; i.e. Meeting of Mayors at Curitiba, Brazil (2007), Conference on Biodiversity and Urban Design – URBIO first held in Germany (2008), Local Governments for Sustainability –ICLEI and its City Lab Initiative starting with 21 pioneer cities. The X/22 Decision addressed the need to empower local authorities to implement the Convention at the local level aligned with Aichi Targets and promoting local biodiversity strategies and action plans.

To achieve this end, the C.B.D Secretariat conjoined with the Stockholm Resilience Center, ICLEI and a committee of experts and advisors, and in 2011, began the compilation of the first City Biodiversity Outlook (CBO-1): “(...) combining science and policy, scientists from around the world will analyze how urbanization and urban growth impact biodiversity and ecosystems, delivering key messages on the conservation and the sustainable use of natural resources to decision-makers” (Proposal 2011).

Some of the new considerations that have motivated this kind of proposal are the establishment of information systems to support the decision-making process, understanding “communication” in a broader sense, beyond the production and spreading of information (CDB); and the approach to ecosystem services as the base for human well-being (Millennium Ecosystem Assessment, MA).

The ecosystem services are defined as the benefits that people obtain from ecosystems. The Millennium Ecosystem Assessment (MA) classifies ESS among four categories: *provisioning services* such as food, water, timber, and fiber; *regulating services* that affect climate, floods, disease, wastes, and water quality; *cultural services* that provide recreational, aesthetic, and spiritual benefits; and *supporting services* such as soil formation, photosynthesis, and nutrient cycling.

The link between ESS and territory considerations allowed the CDB to define the Based-on Ecosystem Approach. This approach promotes adaptive measures to respond to uncertainty, dynamism and the complexity of ecosystems and their transformations. It also recognizes cultural and biological diversity as central aspects of ecosystem management. Ecosystem



management in the “hands of society”<sup>6</sup> implies negotiations and agreements based on the recognition of all intrinsic values of ecosystems and their tangible or intangible benefits to people. This approach has been considered a pillar for sustainable development.

These conceptual advances -along with firm commitments from local authorities- motivated synergies and public awareness to make evident linkages among biodiversity, ecosystem services and urbanization dynamics. During the 2007 Curitiba meeting, Sebastian Winkler from ICLEI noted that cities represent 2% of the total land on planet Earth, but demand almost 75% of its resources<sup>7</sup>. This unprecedented pressure on biodiversity has serious consequences for climate change and ecosystem services crucial for human life, like the availability of food, the purification of water, and soil formation, among others.

## 1.2. National Policy for the Comprehensive Management of Biodiversity and Ecosystem Services -NPCMBES

The recently adopted National Policy for the Comprehensive Management of Biodiversity and Ecosystem Services (hereafter referred to as NPCMBES) is the result of a four-year process in which environmental authorities, research institutes and universities analyzed major conceptual innovations about the management of biodiversity and ecosystem services grounding them to the Colombian context.

Taking into consideration these global and national goals, the Institute defined a research line in order **to mainstream biodiversity and ecosystem services into city-region management, carried out three case studies in which geographical, socio-ecosystem, political and economic differences are determinant.**

Through this initiative, the Institute has strengthened important housing, building, land and environment inter-sector dialogues at the national level, responding to its national mandate to provide policy outlines to the Ministry of Environment and Sustainable Development (MADS, its acronym in Spanish) and other key stakeholders from productive sectors with great impact on biodiversity and ecosystem services conservation. Some examples of this institutional mission are the inter-institutional roundtable called upon Colombia’s proposal on sustainable cities to present at the Earth Summit Rio +20, coordinating meetings with housing and land planning authorities and the revision process of national legislation regarding the promotion of urban vegetation and sustainable building.

The research being formulated takes into account the National Policy main challenges and conceptual and methodological frameworks; approaches related to resilience, uncertainty, changing scenarios, and multi-scale analysis motivate us to address how crucial it is to promote Biodiversity and Ecosystem Services Comprehensive Management not only within protected areas but especially within social-ecosystem intense interactions.

---

<sup>6</sup> NPCMBES considers the socio-ecosystem approach as a definition that makes explicit the role of human beings as integral part of ecosystems and their management (CBD).

<sup>7</sup> *Ciudades le apuestan a la biodiversidad*, consulted at [www.iclei.org/index.php?id=11059](http://www.iclei.org/index.php?id=11059)



Human wellbeing cannot be considered in short term pictures and linear scenarios. Science works with long term models based on uncertainty; policy agendas work with a short-term logic and avoid all sorts of uncertainty. That divergence in terms of goals and assumptions brings science and policies to an irresolvable divorce.

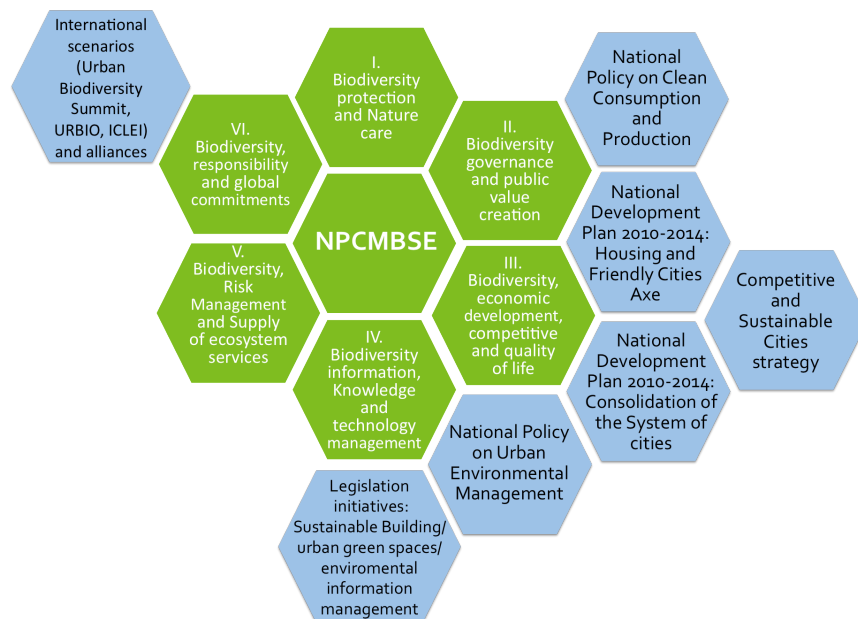
The NPCMBES seeks to promote Biodiversity and Ecosystem Services Comprehensive Management, maintaining and improving the resilience of socio-ecological systems, and also supporting with scientific evidence several land use strategies and occupation patterns at the national, regional and local levels. This goal has to be achieved defining and modeling changing scenarios and through the promotion of coordinated and concerted actions among the national government, private sectors and civil society.

In terms of challenges and opportunities, the National Policy proposes four strategic implications for implementation: Mining (*Páramos* and wetland excluded from mining), Agriculture (eco-efficient landscapes), Food, Health and Nutrition (useful plant and animal wild relatives preserve) and Infrastructure and Urban Growth (citizen science and multi-scale analysis).

### 1.2.1 Sector policies and other initiatives

The Institute needs to present the NPCMBES as a common denominator among policies -and not as an additional individualized policy. The Biodiversity and Ecosystems Services Comprehensive Management implies the need to define easy-to-adopt conservation strategies in order to achieve sustainability of private sector plans and productive sector projects.

Fig. 1. Policies to be harmonized with the NPCMBES: Biodiversity and ecosystem services in city-regions.





All axes proposed by the NPCMBES relate differently to national strategies and projects. Among all of the axes the following are the ones that have more relevance to this research:

- *Governance and public value creation*: this axis relates with all components of this research. Its strategic frames refer to the (i) promotion of opportunities and mechanisms to strengthen social participation in decision-making processes, (ii) inter-institutional and inter-sector coordination, (iii) empowerment of national authorities based on biodiversity's public value creation and, (iv) development of conceptual and methodological frameworks to mainstream BD and ESS comprehensive management into national planning goals.
- *Biodiversity, Economic Development, Competition and Quality of Life*: This axis has the most evident and probably challenging link between urbanization national processes. To achieve this inter-sector dialogue, strategies to assess ecosystem services in city-regions contexts have to be defined, socialized, validated and applied accordingly each territory.
- *Knowledge and Information Technologies Management*: This axis represents a key opportunity to incorporate scientific evidence into the decision-making process. Traditionally, and despite the laborious efforts of national authorities to estimate environmental indicators across years demanding an impressive amount of human and financial recourses, it has been identified how data management doesn't really impact governing processes.

## 2. PROBLEM CHARACTERIZATION

### 2.1. Our “megadiverse” condition

Though this research topic is quite universal, it should be emphasized that it is profoundly related to Colombian ecological, socio-economic and institutional conditions. As one of the world's “megadiverse” countries, Colombia hosts close to 14% of the planet's biodiversity; consequently, this research addresses the “megadiverse” conditions within its multi-scale approaches and systems of knowledge.

To this end, the selected case studies are significant examples of our “megadiverse” biodiversity and therefore of our “megadiverse” way to adapt, respond and mitigate both anthropic and natural changes.

According to the CBD, Colombia was ranked as one of the world's richest countries in terms of aquatic resources, which is partly explained by the fact that the country's large watersheds feed into the four massive sub-continental basins of the Amazon, Orinoquía, Magdalena and Cauca. The largest source of biological diversity is found in the Andean ecosystem, characterized by a significant variety of endemic species, followed by the Amazon rainforest and the sub-humid ecosystem in the Chocho biogeographical area. **This varied richness presents Colombia with a unique opportunity for the implementation of sustainable development initiatives.**



However, a considerable part of these natural ecosystems have been transformed for agriculture, primarily in the Andean and Caribbean regions. It has been estimated that almost 95% of the country's dry forests have been reduced from their original cover, including close to a 70% of typically Andean forests.

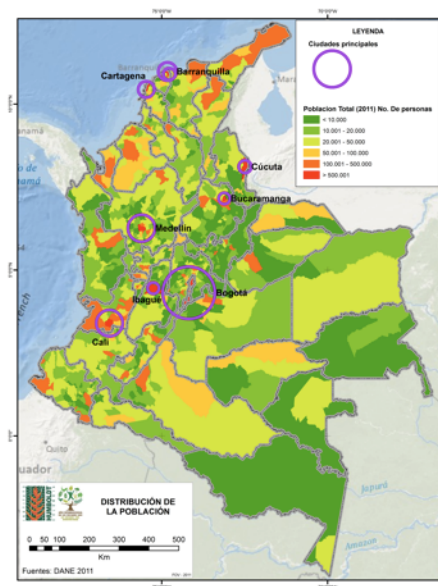
## 2.2. Development processes, urbanization and consequences

As can be seen in the maps below, Colombian system of cities is basically located on the Andean and Caribbean regions. The National Policy diagnosis found that biodiversity loss rates in our country were dramatically evident. National studies have estimated that Caribbean ecosystems have been transformed by 72.4% and Andean ecosystems by 62.1% on average (NPCMBES 67). From 2005 to 2010, the Andean Region presented the highest national deforestation rate at 37% (87.090 Ha/year) followed by the Amazon at 33% (79.797 Ha/year). Thereby ecosystem fragmentation and expansion of the agricultural frontier, two of the main biodiversity loss causes, are mostly due to urbanization expansion phenomena.

### Maps of development processes



Map 1. System of cities (2010)  
 Source: Instituto Humboldt, 2011



Map 2. Population distribution and main cities.  
 Source: Instituto Humboldt, 2011

Population concentration and crucial economic development processes have taken place mostly in the Caribbean and Andean regions. Since 1950, national urbanization rates have grown exponentially. In 1951, 814 municipalities revealed a 38.9% rate of urbanization; in 2005, 1119 municipalities had a 74.4% rate of urbanization (National Statistics Department -DANE, per its acronym in Spanish).

The territorial changes that most affect the BD and the SES are directly related to urban expansion and its ecological footprint. Increased suburbanization around the cities,

continued development of energy infrastructure, and the extension of infrastructure networks for interconnectivity are the main culprits.

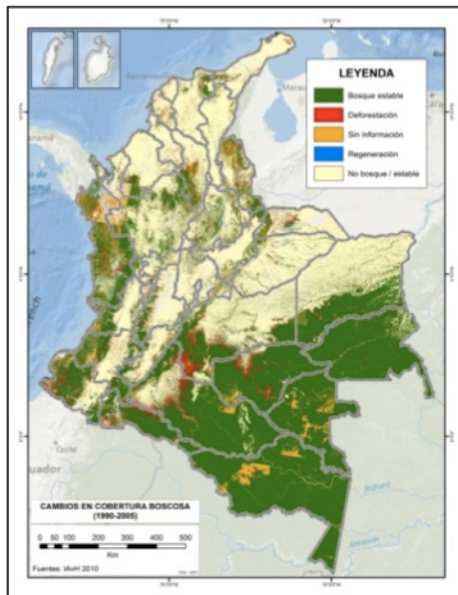


Map 3. Primary and Secondary Roads  
 Source: Instituto Humboldt, 2011

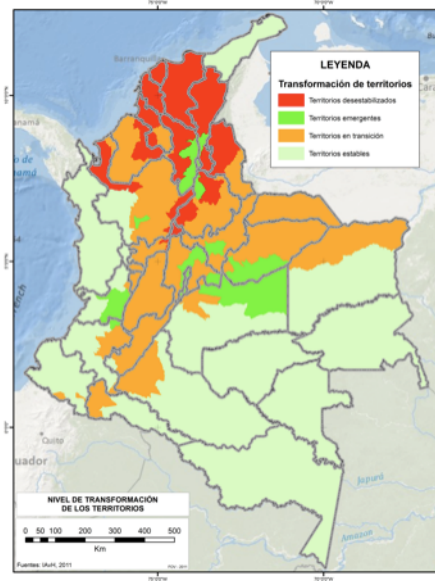


Map 4. Energy network  
 Source: ISA 2009

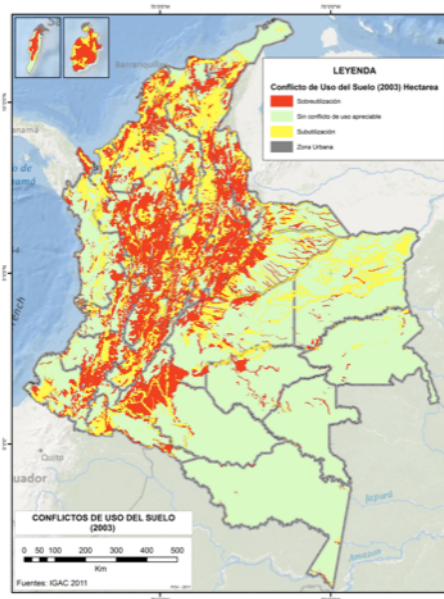
### Effects of the System of Cities' Footprint



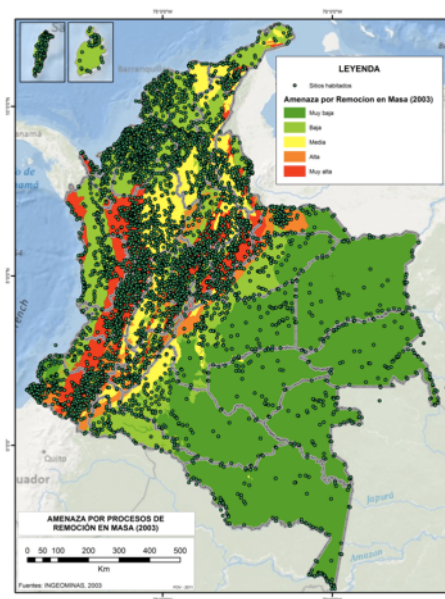
Map 5. Deforestation rates map (1990-2005)  
 Source: Instituto Humboldt 2011



Map 6. Ecosystem Transformation  
 Source: Instituto Humboldt 2011



Map 7. Land use conflict (1990-2005)  
 Source: Instituto Humboldt 2011



Map 8. Mass removal risk and settlements  
 Source: Instituto Humboldt 2011

Because of the demand for food, the cities have promoted the expansion of the agricultural

Due to the poor management of the basins and the deforestation of the Andean region, these areas are now more vulnerable. The situation is reflected in the direct relationship between the threat of floods and the threat of landslides. Here, the overlap between the city system maps and the risk maps demonstrate that land use conflict and deforestation make evident that the probability of disaster is higher in Colombian cities and their capacity for resilience is lower.

Ecosystem degradation implies biodiversity and ecosystem services loss, services that are absolutely necessary for human wellbeing. Ecosystem services are crucial to protect streams and river channels, to prevent coastal shore erosion, to generate and preserve soil and fertility renewal, to mitigate droughts and floods, to manage decomposition and detoxification of wastes, and to purify water and air, among others. Ecosystem services represent an inter-connected system that must be addressed from territorial insights Rather? than from emerging projects and laws. Beyond politic and administrative boundaries, the impact of the city is not fully explained by the area that it occupies, but by the area that it needs to satisfy its demands.

These ecological interactions and exchanges, and also the aforementioned conceptual and methodological innovations regarding biodiversity management, motivated a multi-scalar approach for the development of this research: sustainability “within” and “of” cities.





### 3. CONCEPTUAL AND METHODOLOGICAL FRAMEWORK

#### 3.1. Conceptual framework

##### **Integrative science: Three complementary fields of knowledge**

The comprehensive management of biodiversity and ecosystem services emphasizes that information, knowledge and decisions on biodiversity conservation and ecosystem services are produced by most diverse society stakeholders who must be explicitly integrated as valid interlocutors, despite the fact that their expectations in relation to biodiversity may be contradictory.

Also, the National Policy approaches and analyzes any territory as a socio-ecosystem where inhabitants and their culture are integral aspects of biodiversity.

To this end, this project focuses on the following complementary fields of knowledge: (i) Information and knowledge of BD, ESS and urban dynamics; (ii) Public policy and (iii) Social appropriation as follow-up mechanisms.

##### 3.1.1. Information and Knowledge Comprehensive Management

According to the NPCMBES diagnosis, the accessibility and quality of environmental information is not optimal. The generation of information (studies and research) promoted by local, regional and national authorities doesn't imply its understanding, appropriation and impact on policy decisions. Furthermore, they are mostly "written" in scientific and academic languages -leaving policy makers excluded from the possibility of understanding technical arguments.

The first component of the project promotes critical and permanent analysis of information: strategies to add value according to certain conceptual frameworks, scientific needs and political opportunities.

- What kind of data is needed?
- What kind of knowledge (understanding) is needed? What for?
- For whom? When? With what frequency?
- How is the information and knowledge presented and how should we apply it?
- Is it biased? To what extend?
- What does the research seek to change and therefore what set of variables must be measured and tracked?

##### 3.1.2. Public policy

According to NPCMBES diagnosis, society and stakeholders perceive biodiversity as an obstacle to economic development or as a "luxury" affordable only when economic growth allows it instead of recognizing biodiversity as the base of productive and extractive activities as it provides ecosystem services. Therefore, biodiversity recognition strategies are still being based on ethic and charismatic aspects, instead of taking into account quantitative and qualitative arguments revealing its real input to economic and social wellbeing.



On the other hand, environmentalists have tended to study and manage biodiversity outside social dynamics, promoting the declaration of protected areas as the key strategy for biodiversity conservation. Declaring protected areas is undoubtedly important and much needed, but definitely insufficient in order to guarantee the biodiversity and related ecosystem services needed today and tomorrow

Taking into consideration this diagnosis, our initiative approaches BD/ESS and public policy as related systems of knowledge, and hence, it approaches public policy as an object of study itself and as an articulator field. Public policy<sup>8</sup>, governance conditions<sup>9</sup> and institutional behavior<sup>10</sup> are fundamental aspects to acknowledge when considering science-policy interactions. Unless the institutional map –in which our biodiversity is taking the most challenging negotiations- is fully recognized, then qualitative and quantitative arguments would still be insufficient to impact crucial decisions. We are seeking an innovative approach and applied research in order to understand key interactions between science policy and society –one that needs new definitions, arrangements and tools; one that is more adaptive and therefore capable to handle changes and uncertain scenarios.

### 3.1.3. Social appropriation strategies as follow-up mechanisms

*Information and knowledge Comprehensive Management*, and *public policy analysis* are significant but not sufficient aspects when thinking about science-policy interactions. Our research considers social appropriation strategies beyond individual dimensions; strategies are being promoting on the basis of active and critical participation across public policy implementation phases and scales. Furthermore, to be critical one needs to be informed, sensible and motivated to participate. The National Policy frames this proposal, specifically, addressing its second axis: *Governance and Public Value Creation*.

While developing this research, the Institute has identified a set of preliminary criteria that is relevant to achieve scientific outputs in line with policy demands at the local level.

- Public policy itself is analyzed and considered as an entire field of study.
- To impact the decision-making process, it is necessary to identify and prioritize policy instruments that are easy to rethink and to re-define.
- Once policy instruments have been prioritized, research processes would become clear in terms of which scientific information is needed to guarantee its impact.
- While selecting different study cases, universal patterns become important references to understand the development of organizations in the future, but become insufficient criteria to understand how certain urban dynamics impact different territories in terms of BD & ESS.

---

<sup>8</sup> Motivations, goals and instruments promoted by the central government.

<sup>9</sup> How society is being informed and empowered.

<sup>10</sup> Culture, time and own manner of doing politics.



## 3.2. Methodological Framework

**Multi-scalar approach:** Biodiversity and Ecosystem Services Comprehensive Management (BESCM) processes are expressed through various scales and it can be understood as the interdependent relationship between social and ecologic systems.

In this regard, BESCM must assume the dynamic connectivity among time-space frames to ensure the maintained resilience of socio-ecologic systems. This scalar connectivity means that those activities, which take place on a local scale, may have different synergic effects on larger scales on regional or global bases through combining with other local events (lost species, contamination, among others). Furthermore, events which take place on major scales may have impacts on local scales through modifying regimes in which local activities are adapted (climate change).

Motivated by these statements, this research focuses on the following multi-scalar approach.

### 3.2.1. System of cities

The national approach aims to estimate the aggregate impact of the system of cities on continental, marine and coastal ecosystems in order to generate scientific evidence to support BD and ESS conservation strategies and also to guide population and economic productivity policies.

Each economic development policy reads and understands national land according to its particular logic, frameworks and motivations. Traditionally, mining projects analyze national territory in terms of mining requests, mining stocks and water availability. The infrastructure sector focused on roads and industry hotspots to identify connectivity opportunities. Housing considers normative criteria regarding urban land expansion and protected areas. Consequently, each policy has its map but when through the agreement of inter-sector coordination it is important to share, socialize, rethink and adjust all possible biases.

### 3.2.2. City-region

This approach seeks to develop strategies of biodiversity and ecosystem services assessment in order to identify and estimate supply-demand relations between the urban center and its nearby ecosystems. These changes are in essence emerging logistics yet to be understood and modeled.

### 3.2.3. City level

This scale focuses on environmental management within the urban fabric itself. Traditionally, urban authorities in Colombia have managed “green and gray” agendas to achieve sustainability within cities.

“Green” efforts promotes the conservation of urban areas, the generation of data on urban flora and fauna, the implementation of green open spaces and lately, sustainable building outlines and the city’s Main Ecological Structure<sup>11</sup>.

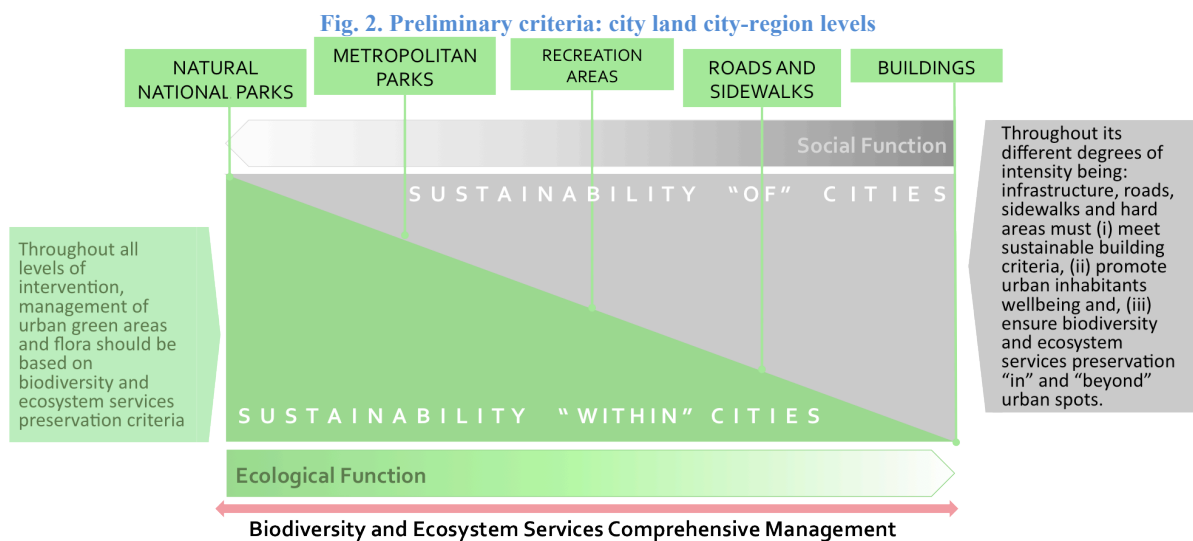
---

<sup>11</sup> Regional Environmental Authorities in Colombia generally identify the MES (EEP<sup>11</sup> per its acronym in Spanish) grouping the protected areas, urban parks, ecological corridors and areas of special management at the urban-regional level. Some authorities have also identified the Complementary Ecological Structure including smaller urban parks, country schools and universities, private and public gardens, among others ecological figures within the urban fabric.

“Gray” plans mainly promote measures of basic sanitation, pollution mitigation and energy consumption rationalization. This research proposes two arguments in order to achieve real sustainability “in” and “of” cities (meaning by this last term the city and its nearby ecosystems exchanges).

The following criteria have been stated to propose sustainable guidelines in city-region contexts.

- Throughout all levels of intervention, management of urban green areas and flora should be based on biodiversity and ecosystem services preservation criteria, and to respond to proper urban center proper dynamics.
- Recreational green spaces must meet both ecological and social functions. Ecological goals shall be achieved by taking into consideration environmental planning strategies (ecological corridors, urban forests, among others) and social goals most promote health, recreation and cultural dimensions.
- Throughout its different degrees of intensity - infrastructure, roads, sidewalks- hard areas must (i) meet sustainable building criteria, (ii) promote urban inhabitants wellbeing and, (iii) ensure biodiversity and ecosystem services preservation “in” and “beyond” urban spots.



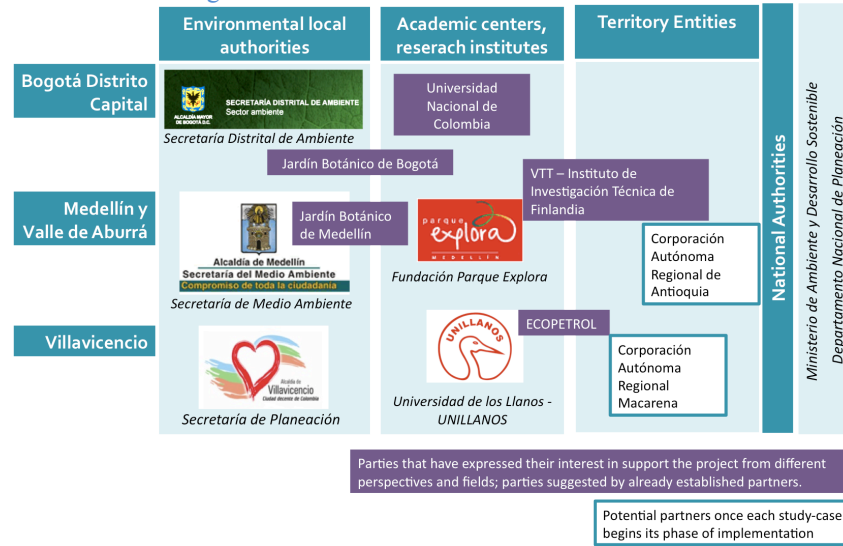
### 3.3. Stakeholders characterization

The Institute has been promoting inter-institutional coordination strategies since 2011 in order to socialize this initiative and identify cooperation opportunities with local, regional and national authorities. The coordination process is being framed according to the conceptual and methodological approach of this research: interaction of diverse systems of knowledge across scales.

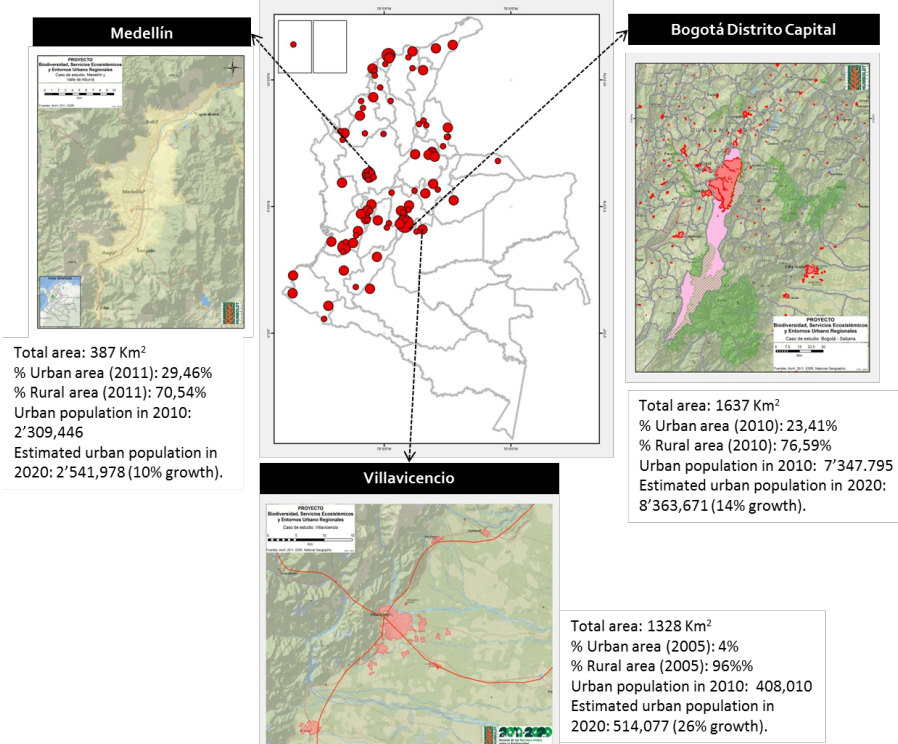


To achieve this purpose, the Institute is developing working plans with Environmental Local Authorities, academic centers/research institutes and Territory Entities from each of the three case studies: Bogotá Distrito Capital, Medellín and Villavicencio. The way alliances are established ensures the missioner profiles and level of commitment required to implement this project.

**Fig. 3. Characterization of Stakeholders -2012**



**Fig.4. Three case studies: Comparative view**







#### 4. CASE STUDIES' SCOPE

The scope of this project is being defined according to each case study: their particular vocation, needs and baseline in relation to the knowledge systems proposed in this research:

- Technical information about biodiversity and ecosystem services.
- Urban environmental management background.
- Governance conditions (Social and institutional frameworks and mechanisms in order to facilitate environmental governance).
- Emerging issues.
- Systematization, analysis and harmonization with land planning processes (locally, regionally and nationally).

##### 4.1. Bogotá Distrito Capital

Bogotá's vision for 2038 aims to integrate completely all protected areas into land planning processes; eco-infrastructures will predominate at the city level, increasing biodiversity and the services ecosystems services supply, guaranteeing the effectiveness of conservation strategies and the articulation of the city with its regional contexts. Consequently, Bogotá will reduce its footprint and will improve the quality of life of its inhabitants (District Policy for Biodiversity Conservation Management 2010).

Taking into consideration what the District Policy promotes, *Secretaría Distrital de Ambiente*, an environmental local authority, and the Institute are developing the Collaborative Agreement signed in December of 2011. This Agreement addresses the need to make the exchange of information more effective between both institutions and also to cooperate in defining an integrated strategy to support SDA environmental research agendas and determine their impact on policy decisions. The agreement has begun with the implementation of three technical committees aligned to our conceptual framework. Each roundtable has defined priority activities in a short-term horizon and is viable in terms of human, financial and governance facilities.

Fig. 5. Methodological scheme proposed to develop the Agreement



Taking into consideration the recent brainstorming exercise and review of its goals and activities, the *Secretaría Distrital de Ambiente* has expressed three main needs and priorities

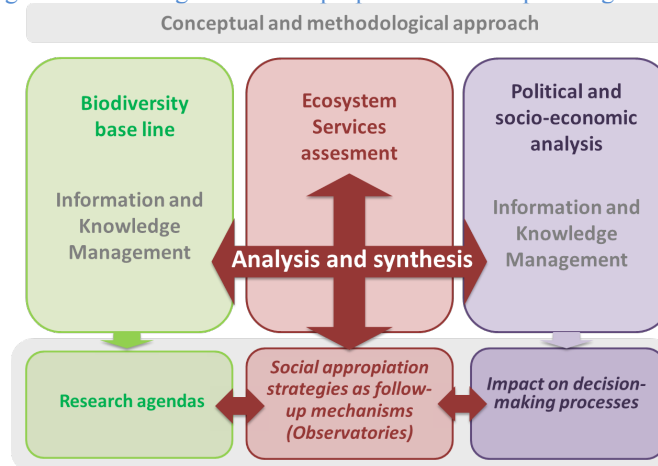
to be considered in the development of the Agreement Friendly and easy-to-adopt biodiversity and ecosystem services indicators at the local level: based on geo-referred and panel-data methodologies.

- Impact of researching initiatives on decision-making processes.
- Increase of research and strengthening of institutional capacity to establish follow-up mechanisms and evaluation of all district policy implementation.

#### 4.2. Medellín y Valle de Aburrá

In September of 2012 five institutions signed a Collaborative Agreement to formulate the policy proposal on the comprehensive management of biodiversity and ecosystem services to the city of Medellín. The Agreement is coordinated by the General Committee and will be developed by ten technical experts -biologists, ecologists, science politicians, lawyers and anthropologists- with experience on biodiversity management, land planning, environmental urban management and information and knowledge management.

Fig. 6. Methodological scheme proposed to develop the Agreement



The agreement establishes a plan for the comprehensive management of the Biodiversity and Ecosystem Services in Medellín and will be a conceptual and methodological test case for other urban regions in the country. In its first phase, the agreement will proceed with the compilation of information and knowledge available in diverse institutions and scales, which establishes a base line for the biological, political, social and institutional aspects for the definition of a comprehensive management strategy that permits formulating complementary forces and promotes the synergy between the different institutions of environmental management and planning in support of self-regulation and the capacity for resilience of the living systems in Medellín.

#### 4.3. Villavicencio

In past meetings, the representatives of this case study recognized that the region's problems were becoming increasingly serious and demanded immediate answers and a large institutional capacity to withstand the economic pressures faced by the region (namely the oil boom beginning in 2008).



Villavicencio bears witness to problematic accelerated development. This is magnified because of the current situation of the country. There exists a national policy decision and a decision of economic policy (of the private sector) to consider la Orinoquia as the new frontier of agro-industrial, forestry and mineral development.

In addition to the already existent structural imbalances (low population density in a large area: the region has 5 governors and 45 mayor's offices), these expectations darken the possibilities of productive and territorial environmental planning.

Recognizing these challenges, a specific component of the *Convenio Marco* between the Universidad de los Llanos and the Institute will be developed. As part of the master's program in urban environmental management, the city projects will be given priority in the first phase, supported in part by the Institute. This will begin in approximately one year. As part of this alliance, the Institute looks to strengthen the established capacity of the University's strategies to identify the baseline on information and knowledge that is appropriate to approach urban issues at Villavicencio and to strengthen its management from the same academy.

## Bibliography

- CDB. «Decisión 6.» *Informe final V Conferencia de las Partes*. Nairobi: CDB, 2004. 4.
- Convenio sobre la Diversidad Biológica. *Carta del Convenio*. Rio de Janeiro: CDB, 1992.
- . *CBD*. 27 de Octubre de 2011. [www.cbd.int/sp/targets/](http://www.cbd.int/sp/targets/) (último acceso: 20 de mayo de 2012).
- . «Informe Final.» *X Conferencia de las Partes*. Nagoya, 2010. 384.
- . Country Profile <http://www.cbd.int/countries/?country=co>
- Departamento Administrativo Nacional de Estadística –DANE. Proyecciones poblacionales 2005-2020 por área en:  
[http://www.dane.gov.co/index.php?option=com\\_content&view=article&id=75&Itemid=72](http://www.dane.gov.co/index.php?option=com_content&view=article&id=75&Itemid=72)
- Departamento Nacional de Planeación. «Avances de la implementación de una política para el sistema de ciudades.» Pereira, 28 de Marzo de 2012.
- Millennium Ecosystem Assessment. *Ecosystems and Human Well-being: Synthesis*. Washington D.C.: Island Press, 2005.
- Ministerio de Ambiente y Desarrollo Sostenible. Desarrollo Territorial. *Política de Gestión Ambiental Urbana*. Bogotá: MAVDT, 2008.
- . Política Nacional para la Gestión Integral de la Biodiversidad y sus Servicios Ecosistémicos en [http://www.minambiente.gov.co/documentos/normativa/250712\\_politica\\_nacional\\_biodiversidad.pdf](http://www.minambiente.gov.co/documentos/normativa/250712_politica_nacional_biodiversidad.pdf)
- Portal web Secretaría de Ambiente de Medellín / Preguntas frecuentes en <http://www.medellin.gov.co/irj/portal/ciudadanos?NavigationTarget=navurl://a412ebe632f2cb62b37dbdf30c1b1aae>. Consultado el 14 de septiembre de 2012
- Instituto de Investigación de Recursos Biológicos Alexander von Humboldt. Programa de Política, Legislación y Apoyo a la Toma de Decisiones. Memorias Taller casos de estudio Proyecto “Biodiversidad, Servicios Ecosistémicos y entornos urbano-regionales”. Bogotá, Noviembre 2011
- Secretaría Distrital de Ambiente. II Foro Ambiental para la Bogotá del Futuro. Ajustes Ambientales al Plan de Ordenamiento Territorial del D.C. Noviembre 2009
- . Política Distrital para la gestión de la conservación de la biodiversidad. Bogotá, 2010