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Wealth Accounting and the Valuation of Ecosystem Services

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Working Document

WAVES

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Wealth Accounting and the
Valuation of Ecosystem Services

Contents

WAVES – Global Partnership for Wealth Accounting and Valuation of Ecosystem Services

Wealth Accounting and Valuation of Ecosystem Services (WAVES) is a global partnership led by the World Bank that aims to promote sustainable development by mainstreaming natural capital in development planning and national economic accounting systems, based on the System of Environmental-Economic Accounting (SEEA). The WAVES global partnership (www.wavespartnership.org) brings together a broad coalition of governments, UN agencies, nongovernment organizations and academics for this purpose. WAVES core implementing countries include developing countries—Botswana, Colombia, Costa Rica, Guatemala, Indonesia, Madagascar, the Philippines and Rwanda—all working to establish natural capital accounts. WAVES also partners with UN agencies—UNEP, UNDP, and the UN Statistical Commission—that are helping to implement natural capital accounting. WAVES is funded by a multi-donor trust fund and is overseen by a steering committee. WAVES donors include—Denmark, the European Commission, France, Germany, Japan, The Netherlands, Norway, Switzerland, and the United Kingdom. Country work on natural capital accounting and their policy applications are reported in a publication series, WAVES Technical Reports.

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1| Global context: the WAVES Partnership

The Wealth Accounting and Valuation of Ecosystem Services (WAVES) Initiative is a global partnership led by the World Bank that aims to promote sustainable development by ensuring that natural resources are mainstreamed in development planning and national economic accounts.

This global partnership brings together a broad coalition of United Nations (UN) agencies, governments, international institutes, non-governmental organizations and academics to implement environmental-economic accounting where there are internationally agreed standards and develop standard approaches for ecosystem service accounts. The following are the initiative's specific objectives:

- Help countries adopt and implement accounts that are relevant for policies and compile a body of experience.
- Develop internationally agreed guidelines and approaches to develop ecosystem accounts.
- Establish a global platform for training and knowledge sharing.
- Build international consensus and partnerships around natural capital accounting.
- Assist countries in implementing environmental accounts, using international standards.
- Incorporate the results of natural capital accounting into decision-making (public policies and development planning).
- Spread natural capital accounting through partnerships among countries.

Beyond generating technical skills in accounting and valuation of ecosystem services, WAVES seeks to generate changes in institutional visions. As such, the initiative is implemented through a participatory process of mutual learning among donors, implementing countries and technical support agencies. It is essential that countries share their experiences and support other countries that are beginning the process.

As of May 2016, there has been a great deal of progress in the implementation of WAVES, and the country-led WAVES initiative is being implemented in Botswana, Colombia, Costa Rica, Guatemala, Indonesia, Madagascar, Philippines, and Rwanda. The level of confidence in the success of WAVES has increased and a regional cooperation program is being developed between core implementation countries in order to share lessons learnt.

2| Colombia WAVES Initiative

2.1| Background

Despite its apparent natural wealth, Colombia does not occupy a prominent position internationally in terms of overall wealth. According to the World Bank (2011), in 2005 Colombia's per capita wealth was US$54,000, compared to the worldwide average of US$115,000, and the Latin American average of US$79,000. However, when comparing natural capital as a proportion of overall wealth, Colombia has a higher-than-average indicator, with 13 percent compared to 6 percent globally, and 15 percent in Latin America. As a consequence, Colombia's natural capital represents a significant proportion of overall per capita wealth, and therefore its valuation and proper management have become priorities for the country. It is estimated that environmental degradation in Colombia represents losses equivalent to 3.7 percent of Gross

Domestic Product (GDP), a figure that includes the costs associated with urban and indoor air pollution, insufficient supply of water, sanitation and hygiene services and soil disasters and degradation, all of which are associated with higher rates of morbidity and mortality, especially among the poorest persons (World Bank, 2006).

The Colombia's 2014-2018 National Development Plan (NDP) "All for a New Country" states that the Colombian economy achieved solid growth in 2013 with an annual average rate of increase of 4.3 percent between 2000 and 2013, and continued with a positive performance in 2015 with a 3.1 percent growing rate (DANE, 2016). The economic growth has helped to alleviate poverty and inequality and increase per capita income. However, from an environmental standpoint, this economic growth is unsustainable because it is based on the depletion of wealth. While economic gains have generated benefits to Colombia, challenges have also arisen in terms of sustainable conservation and management of the country's natural capital. The last decade's economic activities, in addition to increasing population pressures, have led to land use changes that have heavily affected biodiversity and environmental assets; integrated land-use planning is required to sustainably manage these resources.

The close relationship between natural capital and wellbeing makes up an important chapter in Colombia's NDP, highlighting the overall focus on green growth. In order to achieve this goal, Colombia has established three primary mid-term objectives:

- Advancing towards sustainable, low carbon growth.
- Protecting and ensuring the sustainable use of natural capital, including strengthening governance of environmental assets.
- Achieving resilient growth and reducing vulnerability to natural disasters and climate change.

Natural capital Accounting (NCA) has a proven track record in Colombia,[1] with many years of development of the Environmental Satellite Account (*Cuenta Satélite Ambiental, CSA*). The CSA's main objective is to systematically measure for each accounting period, in physical and monetary units, the variation in the stock of environmental assets as well as the interactions between the environment and the economy and within the economy. At the same time, and in line with the System of National Accounts (SNA), the CSA measures efforts made by different economic sectors to protect the environment.

In Colombia´s conventional economic analysis, the SNA has been widely used as a tool for decision-making. However, this type of accounting does not reflect the fact that economic activity—the level of production of goods and services—does not depend solely on what occurs in the economic sphere, but also from the resources provided by the biosphere. If natural capital is consumed and not replaced or substituted, product growth rates reflected in national accounting are barely noticeable; in other words, they cannot be maintained indefinitely. This generates an unchecked process of natural capital depreciation that jeopardizes the sustainability of consumption.

In effect, the information provided by national accounts becomes unreliable in at least two aspects. First, national accounts do not provide any information about the actual well-being that society derives from the production of goods and services it obtains from its natural resources. Second, they don't indicate whether the consumption level reached can be maintained in the future.

1 Environmental accounting work started in 1992 with CICA Committee. Please refer to this link: http://www.dane.gov.co/files/investigaciones/pib/ambientales/Met_Ctas_Sat_Amb_11_12.pdf

Therefore, it is important to build environmental accounts that shed light on the status and evolution of natural capital. In other words, information is needed on the stocks of natural assets and their use so that society and decision-makers can predict trends and assign values to these stocks and flows in the economic sphere. The focus is on understanding natural capital can depreciate, and limit potential economic growth. Thus, the purpose of environmental accounts is to reduce the asymmetry between physical and natural capital within the national accounts system by incorporating not only the value of natural capital depreciation but also correctly assigning the income to the production factors that generate it and estimating the flow of income associated with natural asset flows not traded on markets.

Colombia was one of the first five countries that showed interest in joining the WAVES Partnership. Implementation in Colombia began in 2011 aiming at strengthening the valuation of the country's natural capital as well as to support the design of policies suited to the achievement of a harmonious relationship between the environment and the economy. Findings during the scoping phase confirmed that rather than focusing on the technical development of environmental accounts, in which the country was relatively strong, WAVES support was more useful in closing the gaps between the production of environmental accounts and their use for priority decision-making processes, without leaving aside some technical implementation where gaps were found such as in forest and water accounting. The Colombia WAVES initiative was implemented in two phases: Phase 1, which was centered on the institutional arrangements necessary to ensure that its advances would be institutionally internalized; and Phase 2, which focuses on implementing natural capital accounting at national and regional level as well as promoting their use for decision-making after a promising Phase 1.

2.2| Institutional Arrangements

The implementation process of the initiative in Colombia was led by the WAVES National Steering Committee (NSC) and the WAVES National Technical Committee (NTC) set up in 2012. Both committees were integrated by public officials of different levels from all the institutions involved in the environmental accounts process as producers and/or as users: the National Planning Department (*Departamento Nacional de Planeación, DNP*); the National Administrative Department of Statistics (*Departamento Administrativo Nacional de Estadística, DANE*); the Ministry of the Environment and Sustainable Development (*Ministerio de Ambiente y Desarrollo Sostenible, MADS*); and the Institute of Hydrology, Meteorology and Environmental Studies (*Instituto de Hidrología, Meteorología y Estudios Ambientales, IDEAM*). The Office of the Comptroller General of the Republic (*Contraloría General de la República, CG*R) acted as an observer of the process (Table 1).

Table 1. Members of the National Steering and Technical Committees

Institution	National Steering Committee	National Technical Committee
DNP	Deputy Director of Sustainable Environmental Development	Delegate of biodiversity and ecosystem services valuation of the Department of Sustainable Environmental Development
MADS	Vice-Minister	Delegate of Forests, Biodiversity and Ecosystem Services Office Delegate of Integrated Water Resource Management Office Delegate of Sustainable Green Business Office
DANE	Technical Director of Synthesis and National Accounts Office	Delegate of Methodology and Statistical Production Office Delegate of Synthesis and National Accounts Office
IDEAM	Ecosystems and Environmental Information Director Environmental Studies Director Hydrology Director	Delegate of Environmental Studies Office Delegate of Hydrology Office Delegate of Ecosystems and Environmental Information

The NSC approves, recommends and defines guidelines and approaches to the initiative's work; it defines and guides policy priorities, work plan and their updates. The NTC's role is to implement and monitor the work plan, in order to implement the strategic decisions taken by the NSC. This committee also proposes strategic changes and decisions to the NSC, approves terms of reference for the implementation of the agreed work plan, and monitors and reports on the initiative's progress. The NSC focuses on the successful completion of the initiative's goal: the use of environmental accounting as a tool for decision-making processes. As such, it ensures the internalization of the developed tools under the WAVES initiative in Colombia and identifies institutional and financial sources to scale-up the initiative in the future. The NTC provides guidance and promotes active communication and coordination, and makes suggestions on the establishment of advisory groups in order to attend to specific technical matters.

A Memorandum of Understanding (MoU) was agreed and is in the process of being signed by the participant institutions as a formal mechanism to ratify the achieved progress up to now and to set the basis for establishing the Environmental Accounts National Committee (EANC). Additionally, WAVES NSC is elaborating a road map of Colombia's natural capital accounts until 2020.

The institutionalization of the WAVES initiative in Colombia is supported by the 2014-2018 NDP "All for a New country," in the Green Growth chapter where it specifies the need to establish the EANC. The objectives of this Committee are already defined in the MoU as follows:

- Define, establish and consolidate spaces for dialogue, analysis and collective building around NCA.
- Facilitate the sharing of statistical documents, databases and information systems related to NCA.

- Establish planning mechanisms that allow the carrying out of work plans as well as their monitoring and assessment.
- Generate analysis, discussion, adjustment and development of methodologies that facilitate the adoption of NCA.
- Design capacity building strategies and mechanisms for the development and use of NCA.
- Execute instrumental and implementation strategies for NCA in the framework of Environmental Policy and National Statistics.
- Develop from institutional competencies the research required in order to fill data gaps and correct weaknesses in the elaboration of NCA.
- Plan and execute constant communication strategies around wealth accounting and valuation of ecosystem services in Colombia.
- Promote institutional culture around the development and use of NCA.

2.3| Program Implementation

The preparation phase, called Phase 1, started in 2011 and ended in June 2014. Essentially, this phase involved configuring the WAVES Initiative in the country, including articulating which entities will be involved.

Key results of Phase 1 can be summarized as follows: (i) the establishment of the NSC and NTC, as shown in Table 1; (ii) the definition of the competencies and roles of the stakeholders, as shown in Annex 2; and (iii) the definition of main goals for the implementation stage and public policy priorities (Table 3) and work plan as detailed in Annex 1 (initially until June 2015, and later extended one more year).

The following are two key lessons learned during Phase 1 that were essential to the initiative's implementation phase and are also likely to be useful to other countries:

- During the initial phase, a dedicated Coordinator is needed to meet the initiative goals and institutional coordination requirements. Recent developments under the WAVES Initiative in Colombia have largely been the result of having established a position of National WAVES Coordinator.
- Rather than devoting a lot of efforts to formalizing institutional arrangements during the initial phase of the initiative, which in the case of Colombia took more than one year, efforts should be directed to show preliminary results and the initiative's value-added. This will provide incentives to the relevant institutions to participate, contribute and collaborate, speeding implementation.

The implementation phase officially began in July 2014 after the NSC gathered in June that same year and approved the main components of WAVES Work Plan.

The technical component of the WAVES Initiative in Colombia is based upon the elaboration of NCA at national, regional and local level. At national level, the water account will link the environmental and economic elements of water resources in order to inform Colombia's Integrated Water Resource Management Policy. Having used the account to highlight main water uses and users, the goal is to provide efficient, regulate and adequate water use. At the same time, the national forest accounts will help to determine the causes of change in vegetation cover and to identify and maintain the contribution of timber products to the economy, highlighting the influence of forest ecosystem services to the community.

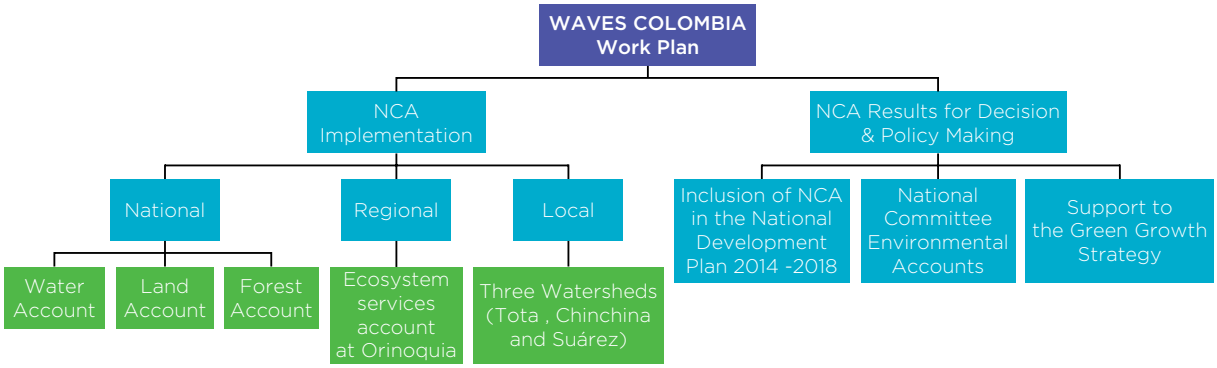
At the regional level, ecosystem services accounts in the Orinoquia will inform policy making such as the National Development Plan and/or the Strategic Plan for the Orinoco River macro

basin, providing insights on the contribution of natural capital to economic activities as well as the potential costs of its loss.

At the local level, water, forest and ecosystem accounts were developed in two country's strategic watersheds: Tota Lake and Chinchiná River; and a base line scenario for the accounting was also developed for Alto Suarez watershed[2]. These accounts provide essential information for environmental management, watershed plans, regional water assessments and environmental regional authorities' action plans.

Guaranteeing the use of environmental-economic accounting in the planning, monitoring, management and use of natural capital is the main aim of the policy component of the WAVES Colombia Work Plan. In sum, WAVES Colombia seeks to design and apply cross-sectoral agendas that promote green growth, develop relevant macroeconomic indicators, and strengthen institutional capacities in relation to their competencies and roles within the WAVES Initiative framework and the EANC (as stated in the National Development Plan 2014-2018).

Figure 1. WAVES Colombia Work Plan 2014-2016[3]



3| Policy Priorities

During the preparation phase of the WAVES initiative in Colombia both the NSC and the NTC agreed on the main priority areas, fundamental to all environmental services in the country: water and forests. In discussing how best to pilot the initiative, three micro-watersheds were selected based on their relevance to national level policies as well as local level management issues.

The NTC led a rigorous analytical exercise to choose the pilot watersheds that would be covered under the WAVES Initiative. The selection was done based on several key variables, including the possibilities of working with regional authorities, the quality and availability of information, as well as where there was conflict of use. As a result, the watersheds of Tota Lake, Chinchiná River and Suárez River were chosen.

Nevertheless, as the initiative was advancing into the implementation phase, information produced by WAVES' institutions such as IDEAM and DANE highlighted opportunities to

2 Steering Committee decided to focus technical work in Tota and Chinchiná watersheds in order to reach the most effective results in the available time.

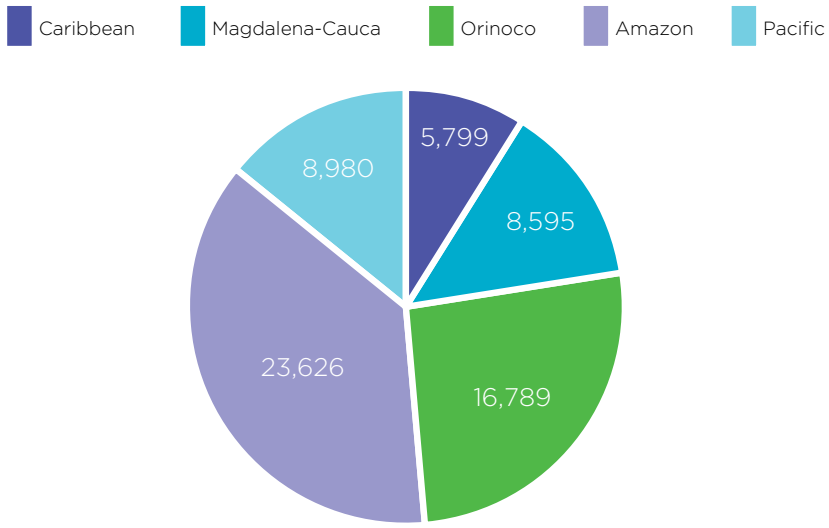
3 The initial version of work plan was defined by the NSC in September of 2013. This one was adjusted in the implementation Phase II, due to new opportunities identified by the NSC, related with more available information, interinstitutional coordination and initial technical advances of WAVES implementation, besides others.

produce national natural capital accounts. This led to an agreement to develop water and forest accounts at a country scale which to date has yielded significant information on the supply and use of natural capital in Colombia.

3.1| Efficient water resources management

According to the 2014 National Water Study prepared by IDEAM, Colombia has annual water surface resources of approximately 2,012 km^3 and a flow of approximately 63,800 m^3/second (See figure 2, for flow by hydrographic area). While at the beginning of the Twentieth century Colombia ranked 24th among 203 countries in the world in terms of per capita water availability, at the end of the century Colombia was ranked fourth, which according to IDEAM suggests that there have been significant changes and pressures on the resource, reducing the quality and quantity of water. It is known that population increase is related to the use of water in household, industrial and agricultural activities, which explains the deterioration in water supply and quality indicators. In effect, the agricultural, household and industrial sectors in the Magdalena- Cauca hydrographic are generating more than 660,000 tons of organic material that contaminates surface waters. The following figure shows water distribution by region.

Figure 2. Distribution of Flows (m^3/sec) by Hydrographic Areas

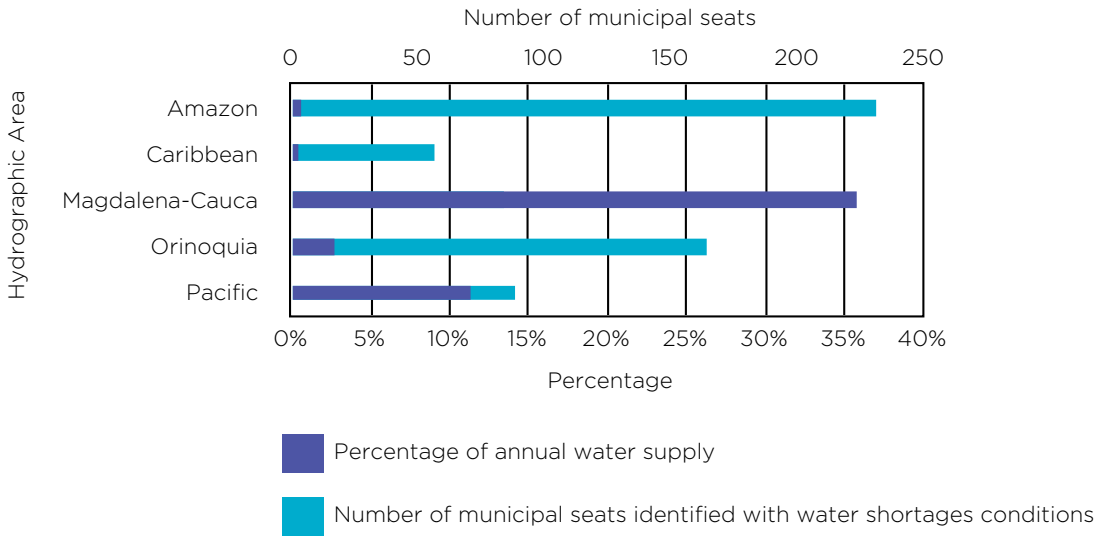


Source: IDEAM (2014)

Another important indicator of the water availability is the water yield or runoff, which for Colombia is 56 liters per second per kilometer square (l/sec/km^2), almost six times higher than the global average (10 l/sec/km^2) and approximately three times higher than the Latin America region's average (21 l/sec/km^2). It is worth mentioning that the Andean region of Colombia, where there is greater pressure from population and economic activities, does not have the highest water yield, which leads to the need for significant water management to guarantee supply over time.

Figure 3 shows the distribution of the water supply in relation to the number and percentage of municipal government seats by hydrographic area. There is no doubt that there is a high concentration of population and therefore household and economic activities in the Magdalena-Cauca hydrographic area. Compared to, for example, to the Amazon region, which has the largest water supply and the smallest concentration of municipal seats.

Figure 3. Distribution of water supply and municipal seats identified with water shortages by hydrographic area



Source: IDEAM (2014)

3.2| Conservation of forests and vegetation cover

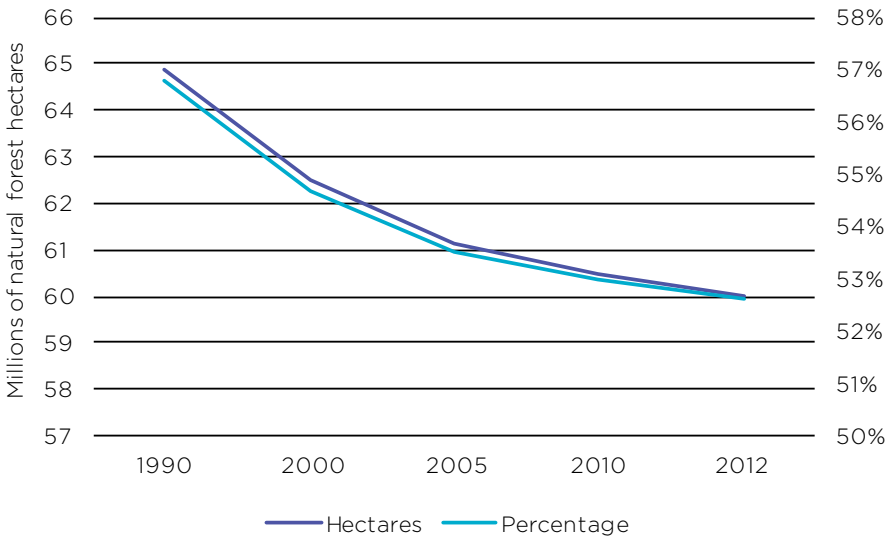
Colombia's land area covers 114 million hectares, of which 61.2 million hectares were covered by natural forests in 2010. These forest are home to a large proportion of the country's mega diversity, representing 10 percent of the world's biodiversity. As a result, Colombia has been recognized as one of the countries with the greatest biodiversity on the planet. In addition, the country ranks seventh in the world in terms of area covered by tropical forests (FAO, 2008), with 6.42 percent of the total supply for tropical South America and 1.5 percent of all forests on the planet. Colombia ranks second after Brazil in terms of the number of plant species (World Resources Institute, 1997) and ranks seventh in the world in terms of the amount of "frontier forests" (FAO, 2005).

Figure 4 shows the proportion of surface covered by natural forest in Colombia in which 57 percent of the total forest area was natural forest in 1990, while in 2012 the proportion decreased to 53 percent.

This is an indication of the importance of this resource for the country in terms of timber products and non-timber products, as well as environmental services, such as the regulation of flow volumes, habitat for biodiversity and carbon fixation, among others.

Despite Colombia's forest wealth, the country has not avoided intense deforestation processes associated with the culture of colonization for agricultural and livestock-raising expansion. According to the Agustín Codazzi Geographic Institute (Instituto Geográfico Agustín Codazzi, or IGAC), from 1987 to 2002, 3.3 million hectares of natural forest were lost. Today, these lands are largely used for agriculture and livestock, and in many cases consist of fragmented forest. IDEAM (2010) also evaluated the situation in a similar time period, and found that the amount of forest loss between 1986 and 2001 was 1,289,649 hectares, 33 percent of the forest loss found by the IGAC. It then adds that from 2002 to 2007, more than 2 million hectares were lost, primarily in the Amazon region.

Figure 4. Proportion of surface covered by natural forest in Colombia



Source: IDEAM (2014)

Indiscriminate deforestation has been a key reason why Colombia now faces a situation of conflicting land uses. In 2005, according to figures from the Statistical Yearbook of the Ministry of Agriculture, while the potential for agricultural use was 12.6 percent of the territory, the actual use was 3.9 percent. In the case of forests, while 68.6 percent of the country's area should have vegetation cover, actual forest use is 57 percent, including natural forests. The portion of national territory with potential for grazing and livestock is 19.2 percent, but in 2005 more than 40 percent of the territory was used for this purpose (Ministry of Agriculture, 2005).

Water resources are directly affected by the management of vegetation cover, even more so in a country with heavy rainfall such as Colombia, with an average of 2,500 mm per year, and with mountainous, rugged land that represents approximately 45 percent of its continental territory. According to the Ministry of Agriculture, the agro-ecological maps of the Agustín Codazzi Geographic Institute (IGAC) show that Colombia has a reforestation potential of 18 million hectares with significant comparative advantages in terms of rotation of several species used for timber, without taking into consideration the advantages of non-timber products, beside all of the environmental services generated by forests. As indicated above, vegetation cover contributes to one of the most important environmental services, which is the regulation of flow volumes that in turn improve the water supply, particularly in mountainous areas such as the Andean zone.

Given the current state of the forests and the evolution of vegetation cover, strategies to conserve them are needd. According to data from the Colombia ecosystems map for 2002, 33.7 percent of the natural cover in the country's biomass had already been transformed (IDEAM, 2010). For this reason, the Government has committed to the REDD mechanism and has adopted it as one of the strategies in its Development Plan for managing biodiversity and its ecosystem services. Toward this end, the plan aims to: (i) formulate the national REDD strategy with co-benefits, enabling the economic development of communities and ethnic groups through access to the global carbon market; (ii) stimulate the implementation of the inter-sector agreement on legal timber; (iii) make progress toward land use planning of 1 million hectares of

natural forest; (iv) formulate and develop a social co-responsibility strategy to combat forest fires; and (v) define a policy for environmental management and land use planning of the Colombian Amazon.

3.3| Watersheds and land use planning

Since the enactment of Colombia's 1991 Constitution, there has been an effort to implement land use planning to ensure that economic activities are compatible with the base of renewable natural resources, particularly water resources, and to improve the quality of life of the country's inhabitants. The general framework for land use planning has been the decentralization process that grants autonomy to territorial entities for their development and transformation with a focus on sustainability. However, more than 20 years after the 1991 Constitution came into effect, the country has not yet achieved an effective land use plan that improves utilization and leads to sustainable use of natural resources.

The WAVES Initiative in Colombia can contribute substantially to land use planning by developing water and forest accounts in watersheds, since the country adopted the watershed as the basic geographic planning unit, as per Decree #1729 in the year 2002. The enactment of this decree is aimed at linking the Watershed Use and Management Plans (*Planes de Ordenamiento y Manejo de las Cuencas de Abastecimiento, or POMCA*) with the new land use planning and development model so it becomes the main instrument for aligning the planning and environmental management system. These plans combine competencies and resources for watershed conservation. In addition, the POMCAs should include the design, agreement and execution of the monitoring, evaluation and oversight phases and the shared responsibility of authorities, organizations, territorial entities, responsible third parties and communities for watershed land use programs. In addition, one of the most important challenges of the POMCAs is achieving financial viability and institutional sustainability.

One of the critical aspects for the development of the POMCAs has been the precariousness of environmental information systems and the scarce availability of scientific and technical knowledge about the environmental situation of the watersheds, particularly regarding water supply and demand and the evolution of vegetation covers. In this sense, creating environmental accounts for watersheds will undoubtedly generate key inputs for decision-making process by environmental authorities in terms of managing watersheds and related forest ecosystems, to achieve more efficient and sustainable allocation.

3.4| Specific Policy Questions

Given the above outlook, the Steering Committee and the Technical Committee have decided on the following policy questions:

How can water resources be managed for different human activities that require them, such that the supply and quality can be guaranteed over time? Key issues for water resource management in watersheds arise from this question, and the response will be used as an input to address problems such as:

- **How can we achieve greater coverage and quality of departmental water plans?** Colombia has been developing a water resources management strategy through departmental or regional water plans, as regulated by National Planning Department (CONPES) Document 3463 of 2007. WAVES will provide resources for both regional governments and communities to obtain information and knowledge about the quantity of water resources to supply their aqueducts and ensure more efficient use of those resources.

- **How can we assign water concessions in a more efficient, regulated and appropriate way?** As the accounts for water resource assets and flows, broken down by activity type are developed, the environmental authorities will have more information to better define concessions. Currently, there is evidence that some water concessions grant amounts greater than their usage levels, which means that the state is transferring property rights to users who do not need the quantities being granted through concessions and this could be creating deficits for others.
- **Who are the stakeholders and what are the uses that should be taken into account by the institutional framework for water management?** Overcoming the challenge represented by the five growth drivers defined in the Development Plan requires an institutional framework that is agile, modern, transparent and decentralized. This will require the best technical and scientific information for decision making, linkages between the environmental information system and systems belonging to other public and private institutions, high technical capacity and appropriate exercise of environmental authority. Greater use of information and communication technology is also needed.

How has Colombia's vegetation cover been transformed and what is its current situation? Answering this question will provide instruments for environmental and economic authorities to regulate agriculture and livestock expansion processes, generate incentives for reforestation, control illegal cutting of the forest, assign a value to natural capital and strengthen the national biodiversity policy, among other benefits. By constructing the forest account for each watershed, WAVES contributes to answering the following questions such as the following:

- **What are the causes of the transformation of vegetation cover in Colombia?** Construction of the forest account and identification of services provided by this ecosystem can help us understand why the country's vegetation cover has constantly changed (in many cases toward deforestation processes) and design mechanisms and incentives to prevent these transformations as well as to protect the biodiversity of the forest habitat, preserving the flow of services that they provide.
- **How can the impact of illegal deforestation be prevented and mitigated?** There is no doubt that quantifying, in physical and monetary units, the assets and flows of timber and non-timber goods from forests can help reduce uncertainty about data on supply and demand of these goods and identify illegal cutting. The construction of a supply-utilization matrix for each watershed is a key input.
- **How do forest ecosystems and their services affect the wellbeing of communities?** Because a significant part of the national territory (approximately 50 percent) is covered by natural forest, including protected areas and natural parks, there are many communities living in those areas that derive their sustenance from the forest or use it for fuel (firewood). Valuing forests contributes to more rational and sustainable use by the communities who benefit from its services.
- **How can we ensure and maintain the flow of ecosystem services from forests?**

4| Achievements and Lessons Learned

Phase I concluded in June 2014 having achieved its main goals, and Phase II was looking for more detailed results and consolidation of environmental accounts as key instruments of policy making at national level, and at regional and local level.

In June 2014, a general work plan was updated based on the lessons learned from the arduous process of establishing a stable institutional arrangement that is likely to continue with or without WAVES initiative support. The three key components in that work plan are: (i) continued advances on the technical aspects of environmental accounting; (ii) influence on public policy and (iii) institutional management. As shown in Table 2, each component has an objective, a public policy priority, guiding questions, main products and budget.

Table 2. Components of Colombia WAVES Initiative and main products

Component	Public policy priority	Main products achieved*
Technical component of accounts	Promote protection and efficient management of water resources	Water accounts for two watersheds Water account at national level
	Promote conservation and sustainable use of ecosystems and their vegetation cover	Forest for two watersheds Forest account at national level Ecosystem services account at regional level
Public policy influence	Guaranteed use of environmental accounts for government tracking, management and sustainable use of natural capital.	Preparation of road map 2020 for NCA
Institutional management	Strengthen institutions in regard to their competencies and roles within the WAVES Initiative	Communications strategy and dissemination of results, coordination and monitoring

*All technical component products include an executive summary, final report and database.

Generally, the technical component supported decision makers with solid and consistent environmental accounts and data, in order to promote the protection and efficient management of water resources, encouraging the sustainable use of ecosystems and their vegetation cover. The main products of this component are related to water accounts in two watersheds: the Tota Lake and the Chinchiná River. The results of a preliminary forest account including timber stock at the national level and ecosystem services account at regional level will help to define of the needs for work on this issue.

The second component intended to influence public policies and sustain processes to track the status of natural capital in the country. Based on that, the WAVES Initiative in Colombia seeks to ensure that public policy decisions take into account environmental variables and macroeconomic indicators in a joint manner, tracking the status and dynamic of natural capital through environmental accounts. One of the main products under the second component is the elaboration of a road map that supports the ongoing construction of environmental accounts, besides the dissemination of results.

Finally, the institutional management component of the initiative aims at putting in place an operational tracking system for the WAVES Initiative, in order to support the achievement of the expected results. Construction of monitoring and tracking system is part of this component.

4.1| Key outcomes

Key results achieved are listed below:

- Water and forest working groups were established within IDEAM and DANE to develop accounts at national level. Results of the water and forest account at national level will be presented at the Partnership Meeting in early June 2016.
- The national forest account is a result of the commitment and persistence of WAVES institutions, which identified an opportunity to work together in the elaboration of the account and move forward in the monitoring of environmental assets. A detailed assessment of available information has been completed, and close collaboration has been developed between IDEAM, MADS and DANE. DANE published the first approach of the national forest account on its official website. An update has been developed and will be published in June 2016.
- The national land account was elaborated in early 2015 and DANE published its first approach on its official site on internet.
- An experienced team worked on the elaboration of the national water account and preliminary results were published at DANE's official site on internet on November 2015. Moreover, an update of the national water account was developed.
- Natural capital accounting has been included in the National Development Plan 2014-2018 giving a solid base to consolidate the National Committee of Environmental Accounts.
- Natural capital accounting has attracted the attention of regional environmental authorities as CORPOCALDAS and capacity building was carried out by way of workshops delivered to local stakeholders. Additionally, the WAVES team worked with CORPOBOYACA on the update of water accounts developed previously in order to build capacity in the regional authority, and has presented the results to the Tota Lake watershed council.
- Steering and Technical Committees of WAVES Colombia have participated in several events, meetings and missions in order to build their capacity building around natural capital accounting.
- A program assessment mission conducted in December 2015 was an essential milestone in shifting from the elaboration of accounts to their use, encouraging the Steering Committee to focus on the natural capital accounting links with policy issues. Since then the accounts have been used in the forest and water management, green growth strategy and the environmental impacts of the peace process.

4.2| Capacity Building

- Global WAVES partnership meetings. Washington D.C., USA. June de 2013, 2014 and 2015.
- International Conference in SEEA. New York, EEUU. June 17-19, 2013
- Natural Capital Accounting: A decision-making and public policy and development tool. January 9 2014
- Global Workshop on Forest Accounting. Washington. DC. May 11-13, 2014
- "Use of Environmental Accounts in Colombia". Bogotá, Colombia. September 15, 2014.

- Regional workshop of natural capital accounting for Latin America and the Caribbean with emphasis in Water Accounts. San José Costa Rica. December 17-19, 2014
- First WAVES Workshop on global knowledge exchange about ecosystems and its valuation. Los Lagos, The Philippines, February 23-27, 2015
- Expert Forum on SEEA Experimental Ecosystem Accounting. New York. USA April 28-30,2015
- Capacity- building workshop on Water cycle- Community for spatial and hydrographical information for Latin America and the Caribbean. Cartagena, Colombia. May 19-22, 2015.
- Ecosystem Accounting Workshop Bogotá, Colombia. August 19-20, 2015
- World Bank and Nasa Workshop on Evapotranspiration mapping for water security. September 16,2015
- UNESCO Workshop on Remote Sensing use for the evaluation of water use by agriculture. November 25-27, 2015.
- Regional Forum on Green Economy of Latin America, November 2015
- USGS Workshop on agro- climatological analysis using data in raster format and tools FEWS NET, March 7- 18th, 2016
- Colombia Sustainability Leadership Programme sponsored by Cambridge and Los Andes University, February 2016
- Latin American and the Caribbean Regional Workshop on Environmental Accounting for Policy analysis, March 16-17, 2016
- Regional LAC Communications Workshop, March 18-19, 2016
- UNESCO Workshop "Estimating water consumption on a 30 m grid for irrigated land in Colombia during 2012" March 29-31, 2016

4.3| Lessons learned

- Inter-institutional coordination is necessary for the construction and use the NCA in Colombia, and it is not feasible that just one institution assumes the complete responsibility of the account construction in the country.
- Especial articulation and joint work is required from the institutions in charge of the orientation and consolidation of the economic information (DANE) and the environmental information (IDEAM). Information and approaches arise from different viewpoints, and the NCA are a tool to find a conjunction point between them. The accounts are the result of dialogues and discussions about conceptual differences, looking for agreements about country positions over specific topics.
- Confidence on available data and their use in the accounts construction grows step by step, through iterations processes, understanding that perfect data do not exist. Finding gaps on data and opportunities for institutions to improve national and regional information is also a key result of the program.
- Use of the accounts is based in the trust of the users on the results achieved. Clarity on the frameworks and limits of the accounts is complete necessary for their institutionalization. In addition, NCA use has to be integrated with other information tools, techniques and approaches; most of the cases, policy makers require complete answers that accounts do not

provide by themselves, but when they are articulated in a proper and coherent way with other data and analyses, are a strong instrument for policy decisions.

5| Summary of results

WAVES work in Colombia had initially been focused on developing NCA for two pilot watersheds (Tota Lake and Chinchiná). Besides these, the WAVES support included integrated national level accounts. Work on national forest account began in June 2014 and on a national water account began in 2015. Additionally, ecosystem services accounts at the level of the Orinoco River macro basin started in mid-2015.

5.1| Natural capital accounts at national level

5.1.1| Land account

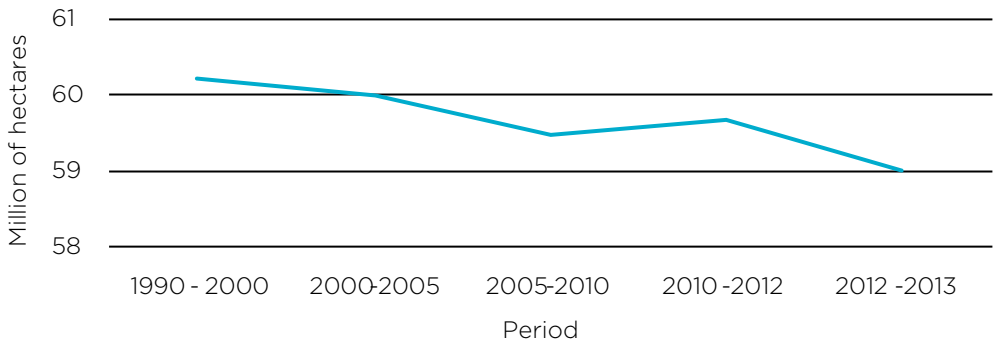
In 2014 when work started to develop the national forest account, the NSC identified that based on the current land cover and use data for Colombia it was possible to elaborate a national land asset account. A first methodological approach was developed and published in August 2015 n DANE's website and a new version of the land asset account will be available in June 2016.

5.1.2| National forest accounts

In 2014 the NSC oversaw the production of a national forest account, working closely with the institutions and their available data. The commitment of the institutions working with the WAVES team in Colombia has allowed the development of the national forest account. The country now has preliminary results for areas covered by natural forest, a physical asset account for timber resources and a physical asset account for carbon.

The time series for natural forest area between 1990 and 2013, shows that even when the deforestation rate has decreased by more than one half over 23 years, the trend for area covered by natural forest in Colombia is still downwards (See figure 6). Deforestation in the country is mainly caused by illegal mining, logging, forest fires and conversion of forest land into agricultural and grassland.

Figure 6. Natural forest area (ha) closing stock between 1990 and 2013



Most of the extracted timber that entered the economy between 2010 and 2012 was obtained from shrub land and a smaller proportion corresponded to timber obtained from plantations (Please refer to Figure 7). With regard to natural forests, a higher proportion of timber extracted corresponded to 'not available' timber (in Natural Parks or protected areas) than to available timber.

DANE reported that in 2012 the total supply of forest products was 8.5 million tons, where timber products represented 99.9 percent of total supply, the remaining corresponding to non-timber products, are mainly natural rubber and latex.

During 2012, forestry and timber extraction represented a share of 3.03 percent of the agriculture economic activity value added and a 0.17 per cent of share of national GDP.

Moreover, the physical asset account for timber assets shows that the timber asset from plantations is increasing while the timber asset in shrub land is decreasing, as demonstrated in Figure 3.

On the contrary, the trend in natural forests is highlighting that, additions to stock are surpassing timber extraction, producing a slight increasing trend for the asset. Nevertheless, from an ecosystem accounting approach, timber extraction from natural forest implies a reduction in the carbon storage service provided by both available and not available natural forest (please see Figure 9).

Figure 7. Timber extraction in Colombia between 2010 and 2012

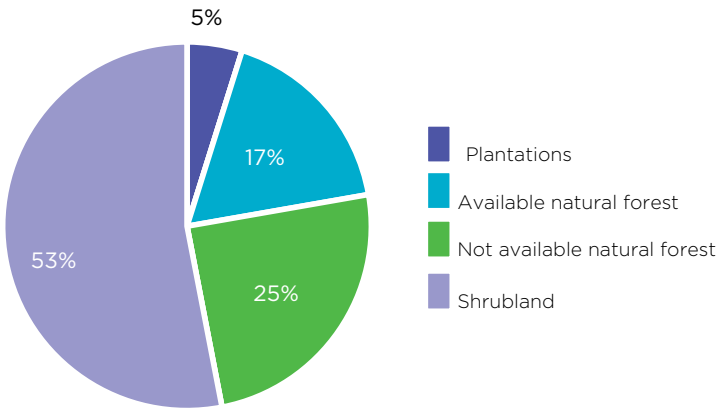


Figure 8. Physical asset of timber resources between 2010 and 2012

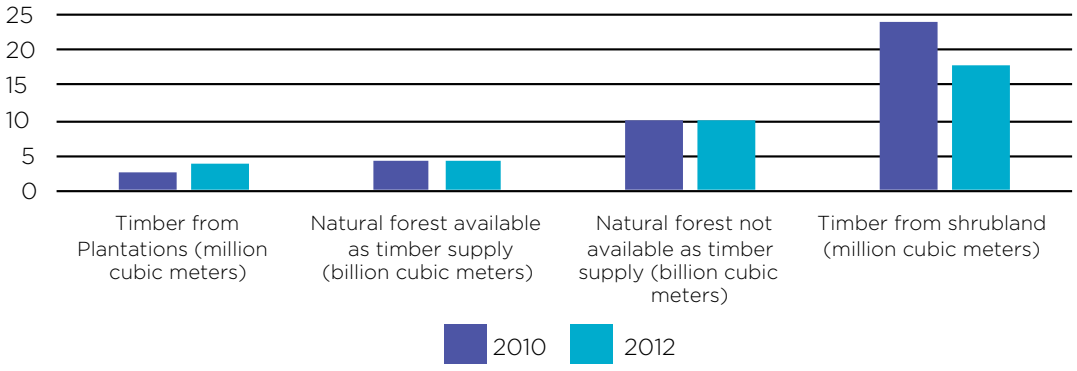
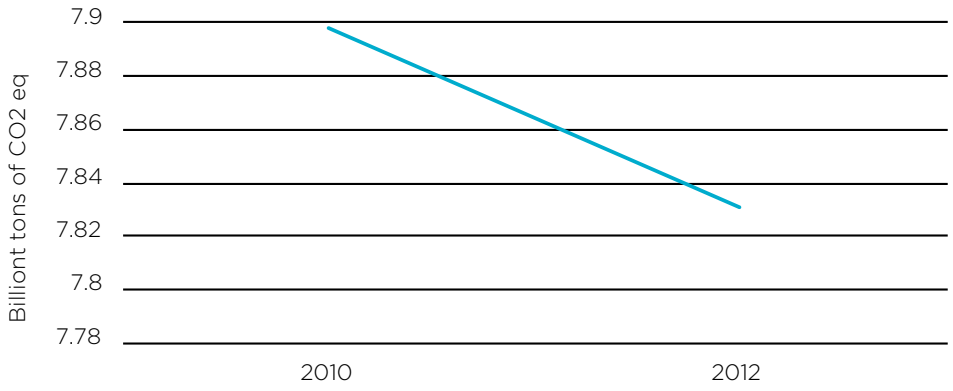


Figure 9. Carbon asset in natural forest cover



5.1.3| National water account

In March 2015 representatives from DANE and IDEAM had a meeting with international technical experts to plan the construction of a national water account. They developed a temporary and spatial reference framework for the development of the account and a work plan until March 2016. Results for the national water asset account, use-supply tables, emission accounts as well as preliminary indicators, are presented below.

Besides the fact that groundwater represents approximately 98 percent of fresh water resources in Colombia, most of the water used by economic activities in the country comes from rivers and streams, which represent 76 percent of surface water.

Figure 10. Type of water resource

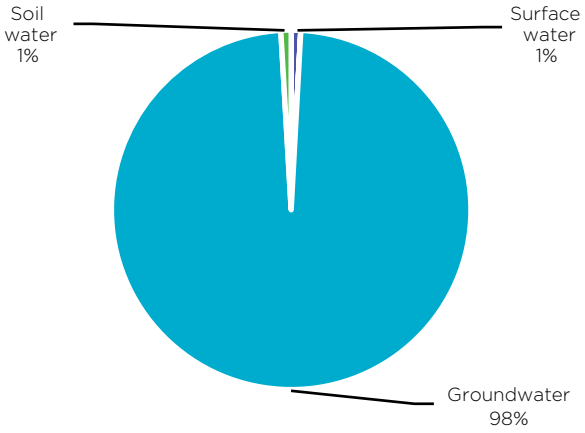
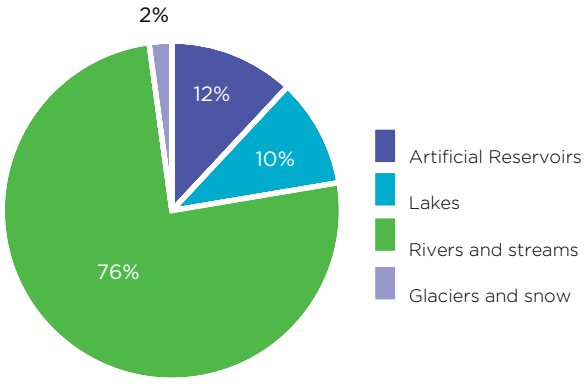


Figure 11. Share of surface water by water body



In 2012, the main water users in the Colombian economy were agriculture, gas and electricity supply, industries and water supply companies. Additionally, the sectors with higher water use intensity measures (m^3/COP), were the gas and electricity supply sector as well as agriculture: showing their dependency on the natural resource.

Figure 12. Water use by sector in Colombia

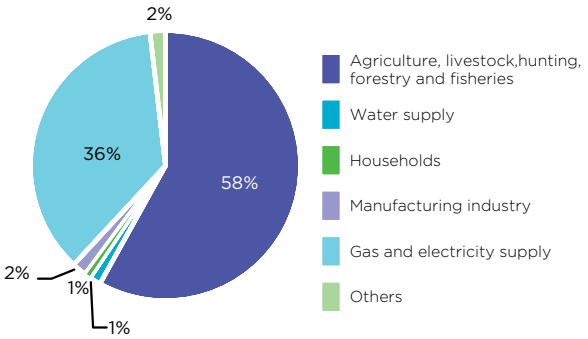
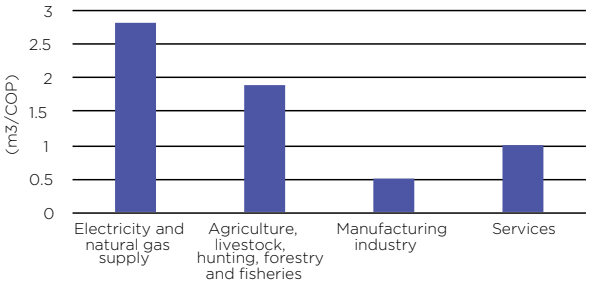


Figure 13. Water intensity

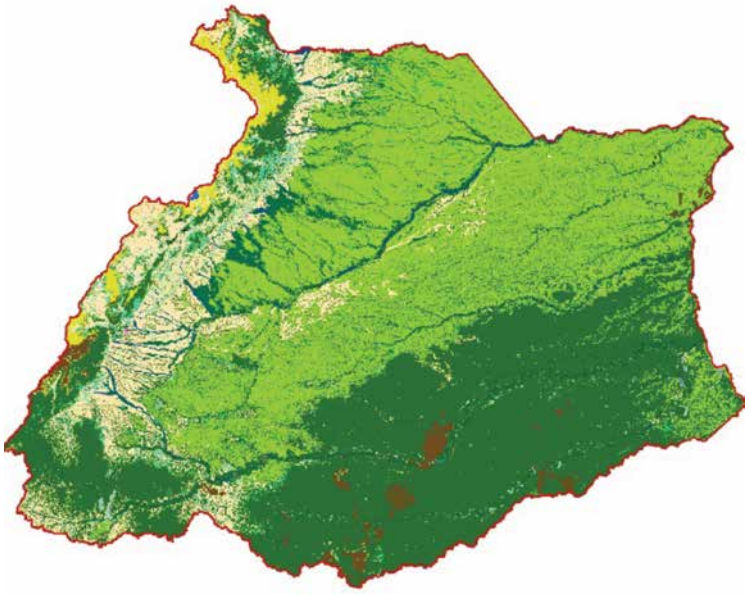


5.2| Natural capital accounts at regional level

5.2.1| Ecosystem accounts at Orinoco River macro basin

The national government is strongly committed to the development of the Orinoquia region. In fact, a regional strategy within the NDP makes explicit that environment, agribusiness and human capital are the real triggers of growth and welfare for the region. As a result, the WAVES NTC decided to proceed with developing the Orinoquia ecosystem accounts in the Orinoco river macro basin to inform the decision-making dialogue and land planning in the region. The accounts could providing insights on the contribution of natural capital to economic activities as well as on the potential costs of its loss.

Figure 12. Orinoco river macrobasin



The work plan for the development of the accounts considers three main activities:

- Diagnosis of information related to ecosystem services
- Development of a conceptual and methodological framework for ecosystem accounting adapted to Colombia
- Development of a short-term exercise involving accounts such as land, carbon and forest for the Orinoco river macro basin and preliminary ecosystem services like tourism and fisheries.

5.2.2| Land accounts in Orinoco river macro basin

During 2001 and 2007, 15 percent of the area in the Orinoco river macro basin has changed. Approximately half of the changes corresponded to managed changes while the other half were classified as natural changes. The cover that presented most reduction in area was forest cover with a reduction of more than 753,000 hectares. This decrease corresponded mainly to a dense forest and riparian forest reduction as a result of forest fragmentation and the expansion of agricultural and livestock activities.

Figure 15. Land cover distribution in 2001

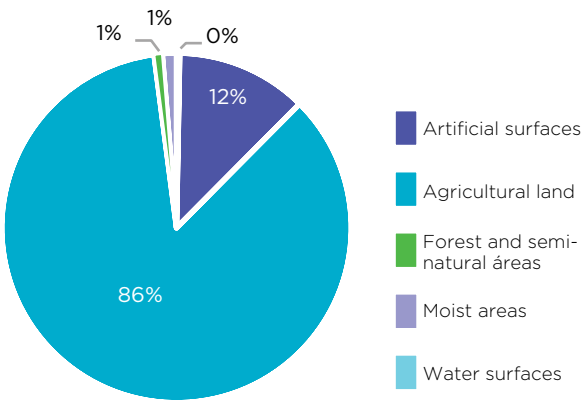
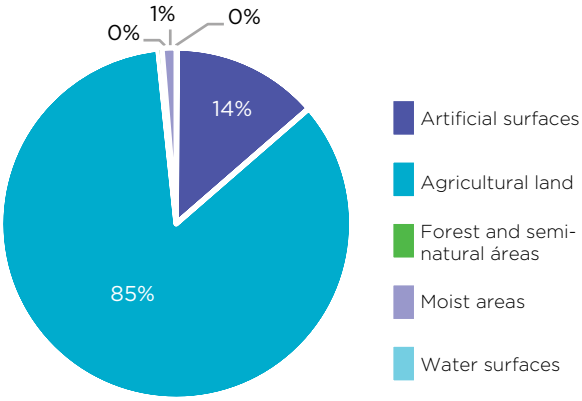


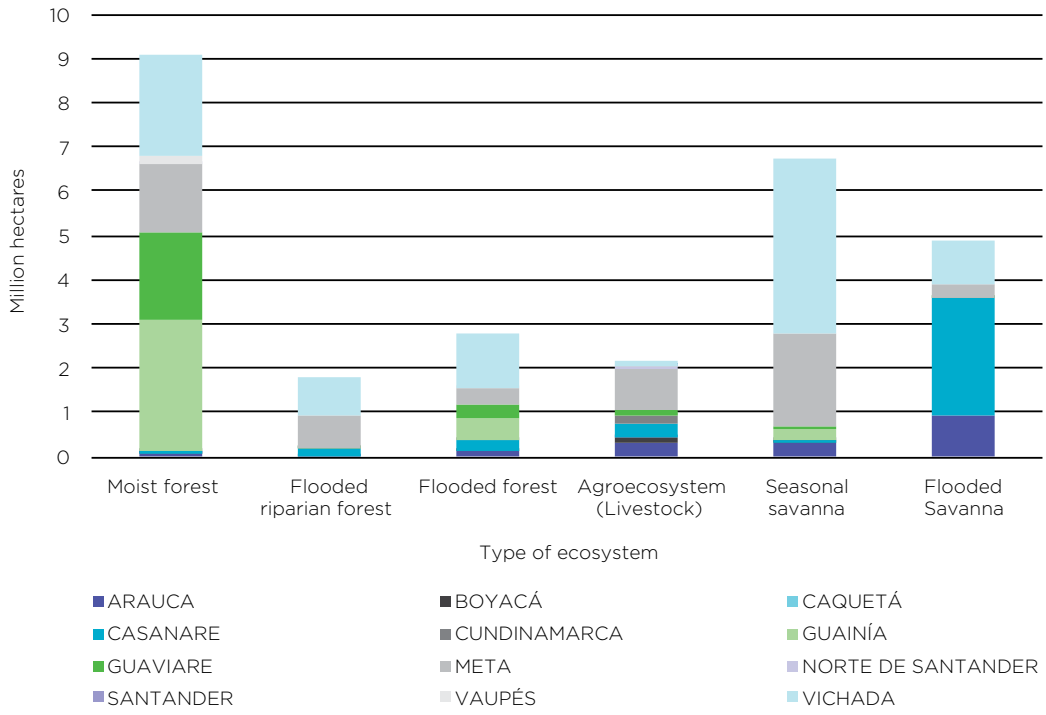
Figure 16. Land cover distribution in 2007



5.2.3| Ecosystem extent in Orinoco river macro basin

Assessing the ecosystem extent in the macro basin reveals the main ecosystems and their relationship with the macro basin's departments. The ecosystem with the greatest area is moist forest covering approximately 26 percent, seasonal savanna with 19.3 percent of the area and flooded savanna covering 14 per cent of the macro basin. Among agroecosystems, livestock areas have the greatest extent (6.3 per cent) followed by palm plantations.

Figure 17. Distribution of departments within the main ecosystems of Orinoco River Macrobasin. 2007



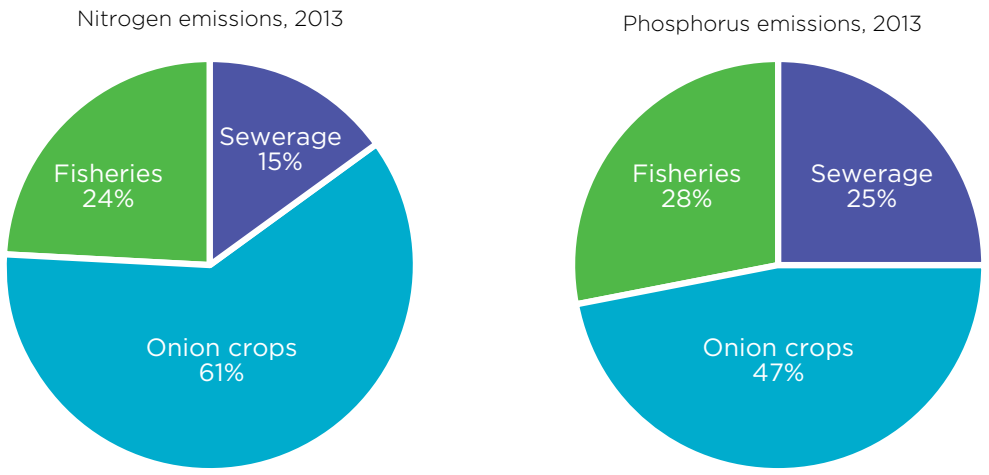
5.3| Natural capital accounts at local level

5.3.1| Tota Lake Water accounts

The Lake Tota watershed has a high social, environmental and economic significance both regionally and nationally. It provides a variety of ecosystem services such as water for human consumption as well as for agricultural and industrial activities. The accounts clearly identify water users and the impact of economic activities upon the water resource, providing accurate information to monitor and evaluate the water management process.

Lake Tota is the source of drinking water for around 160,000 inhabitants in Boyacá department. The watershed also supports the production of 60 per cent of the country's spring onion crop. The environmental regional authority, CORPOBOYACA, supports the development of water accounts for the Lake Tota Watershed given the relevant information they provide for water management plans and policy. Additionally, the NPD elaborated a policy document in 2014 (CONPES 3801) suggesting some policy principles to enable an integrated approach for the Lake Tota Watershed management. Considering the previously mentioned strategies, the water accounts provide some insights for analyzing the watershed contribution to the local economy, water users and emissions by economic activities.

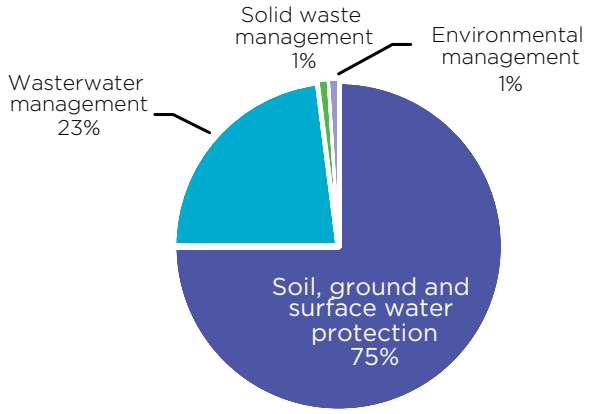
Figure 18. Nitrogen and phosphorus emissions affecting Lake Tota, 2013



Strengthening knowledge about demand for water by municipalities supplied by Tota Lake's watershed is one of the strategies of the watershed policy. Water accounts show that the main users of water from the watershed are water supply companies inside and outside the watershed, fisheries and agriculture (mainly spring onion crops). Hotels, households, irrigation systems and water supply companies for rural areas and households are secondary users.

Water abstraction from Lake Tota in 2013 was 39.7 million cubic meters (hm^3). This was mainly for agriculture (18.4 hm^3), followed by water supply companies based outside the watershed, (12.9 hm^3) and fisheries (3.8 hm^3). Of the total water abstracted, 60 percent is used within the watershed and the remainder by users outside the watershed.

Figure 19. Environmental expenditure

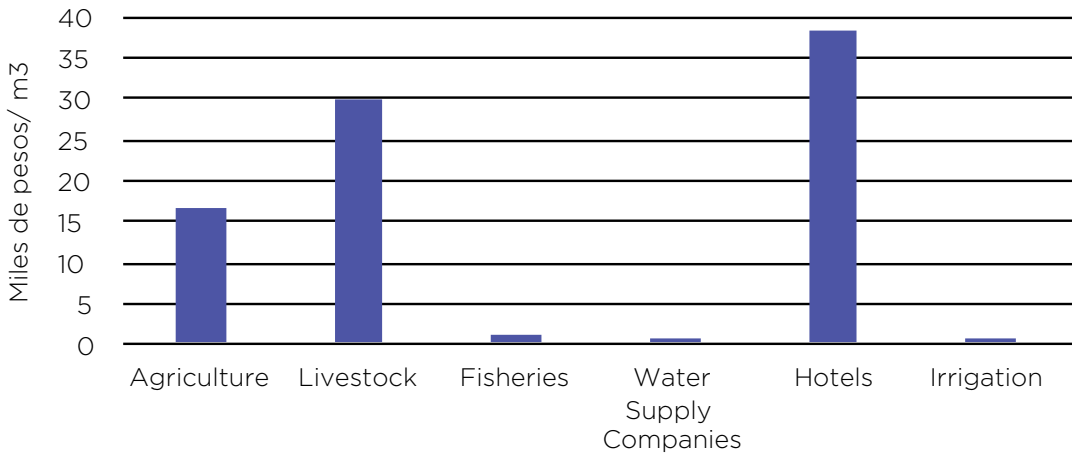


The emissions account has helped to clarify the origin of the lake pollution caused, mostly from agricultural activities in the watershed, as described in the main policy tool for the watershed (CONPES 3801) . For instance, discharge of untreated sewage to the watershed threatens the life of aquatic ecosystems (including trout) in the lake by reducing dissolved oxygen in the water. Nutrients (i.e. nitrogen and phosphorus) present in untreated sewage and runoff from fertilized soils cause the proliferation of aquatic weed (e.g. elodea) in the lake. Annually, 147 tons of nitrogen reach the lake, of which approximately 83 tons is a by-product of spring onion farming.

Likewise, almost 25 tons of phosphorus is deposited every year, around half of which is a result of the same activity (between 10 and 13 tons per year). Sewerage systems emit between 7 and 8 tons of phosphorus per year.

The monetary component of the water accounts in the watershed highlights that agriculture is the economic activity with the highest productivity in the watershed, followed by fisheries and livestock. In turn, when the valued added of each economic activity is related to the amount of water used, hotels present a higher value of productivity followed by livestock.

Figure 20. Productivity (Value added /m³)



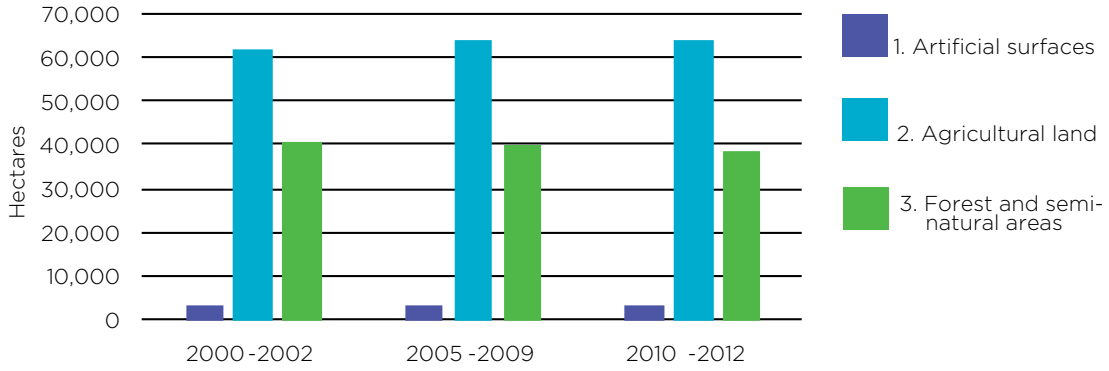
5.3.2| Chinchiná River Watershed accounts

The first approach to natural capital accounts at the Chinchiná river watershed has been through the development of water accounts, land asset account and quantification of provision, regulation and cultural ecosystem services for the watershed. The accounts are a mean to monitor the state of natural capital in the watershed, its impacts on the economy and the assessment of e conservation programs.

Land asset

Between 2000-2012 changes in land assets denoted that the forest was reduced by approximately 3 percent; dense forest by 28 percent and fragmented forest by 89 per cent. This is mainly due to the substitution of forest area with agricultural crops (Figure 21).

Figure 21. Chinchiná river watershed land asset



Water account

The water asset account shows that between 1990 and 2014 the glaciers at Nevado del Ruíz and Santa Isabel have decreased by 73 per cent. Thus, under climate change scenarios, glaciers could disappear in the next 25 years, and river flows could diminish by about 15 to 20 per cent.

The use of water in the watershed is shared by electricity supply (87 percent), household (6 percent) and manufacturing industry (7 percent). Water distribution to households is provided by water supply companies, a service that in 2014 has distribution losses of 35 percent.

Given that 75 percent of pollutants are poured directly into the environment, the environmental regional authority CORPOCALDAS has allocated 21 per cent of its investment budget for wastewater management.

Ecosystem services supply quantification

Provision of services in the watershed refer to food for human consumption such as potatoes, onion, coffee, sugar cane and citrus crops. Likewise, the production of milk and meat from cattle is considered in the fodder production service. Timber from plantations is also included in the analysis as well as water abstraction by households and economic activities such as industry and electricity generation. Regulation services consider water regulation from different types of land cover and greenhouse gas storage. Finally, cultural services related to the entertainment provided by National Natural Parks (Nevado del Ruiz and Santa Isabel) are included.

The table 3 shows the provision, regulation and cultural services supplied by artificial surfaces, agricultural land, forest and semi-natural areas and water bodies present in the Chinchiná river watershed.

Table 3. Ecosystem services supply in Chinchiná river watershed

Supply	Ecosystem unit (in function of land cover)				Total
	Artificial surfaces	Agricultural land	Forest and semi-natural areas	Water bodies	
Service/Benefit					
Provision					
Crops for human consumption (ton)	-	39,736	-	-	39,736
Food production for human consumption (meat and milk) (Number of cattle individuals)	-	74,705	-	-	74,705
Materials: Standing timber volume (m^3)	-	-	993,156	-	993,156
Water withdrawn by economic activities (m^3)	-	-	-	479,865,891	479,865,891

Supply	Ecosystem unit (in function of land cover)				Total
	Artificial surfaces	Agricultural land	Forest and semi-natural areas	Water bodies	
Regulation					
Water flow regulation: Water contribution per type of land cover (m^3)	24,108,727	521,795,236	223,580,285	2,613,693	772,097,941
Carbon sequestration (CO_2e ton)	-	-	1,735	-	1,735
Cultural					
Tourism industry increase (Number of vistors)	-	-	21,102	-	21,102

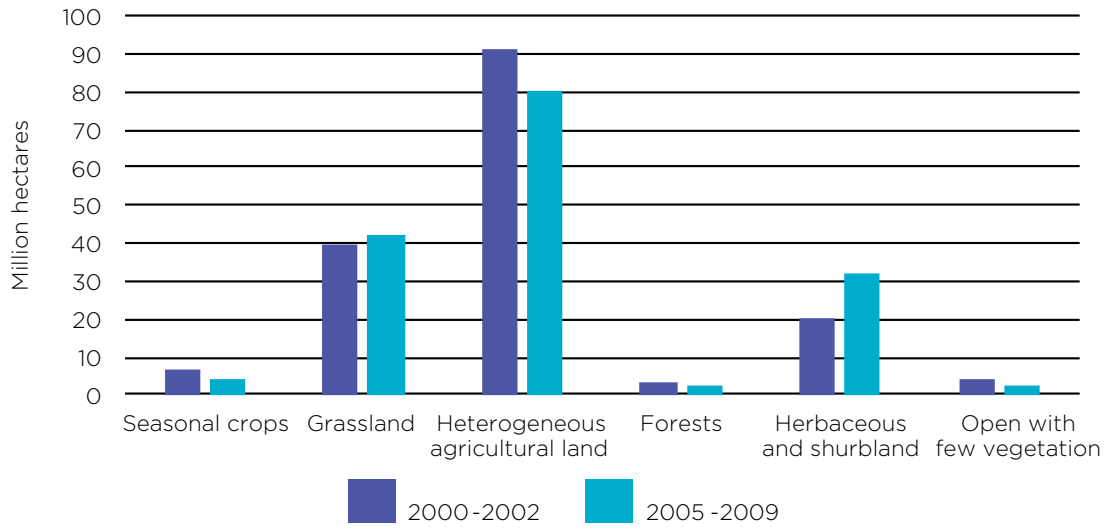
5.3.3| Alto Suárez river watershed pilot

Work in Alto Suárez river watershed was conducted between the end of 2014 and mid-2015, as a draft version. Results from the pilot, selected by WAVES Colombia Steering Committee, are related to land cover change, water use and timber asset. The main issues in the watershed are the inefficient development of water? capture and distribution in irrigation and drainage systems, sedimentation and eutrophication caused by nitrogen and phosphorus contained in runoff.

Land cover change

Certain social dynamics materialize in land occupation models that allow the development of different productive and economic activities. From these, land and natural resource use conflicts arise. Certain dynamics threaten sustainability in Alto Suárez since the land cover matrix shows that there has been a reduction in forests, a decreasing trend with regard to agriculture and gains from grasslands. The latter trend brings challenges to the watershed such as sedimentation and land drying (dissected).

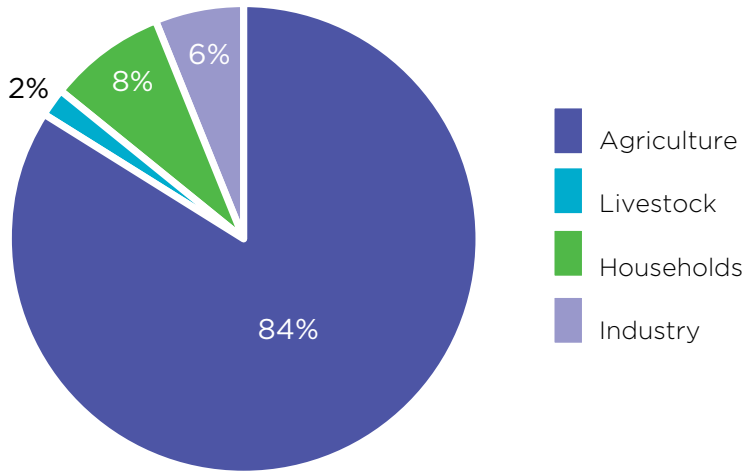
Figure 22. Land cover change in Alto Suárez



Water use in the watershed

Annual water demand in the watershed is directly related to the use of land. In Alto Suárez the agriculture and livestock economic activities use around 85 percent of the water from the watershed. These activities generate conflicts related to the use of land and contribute to the sedimentation and eutrophication of water bodies that serve as reservoirs.

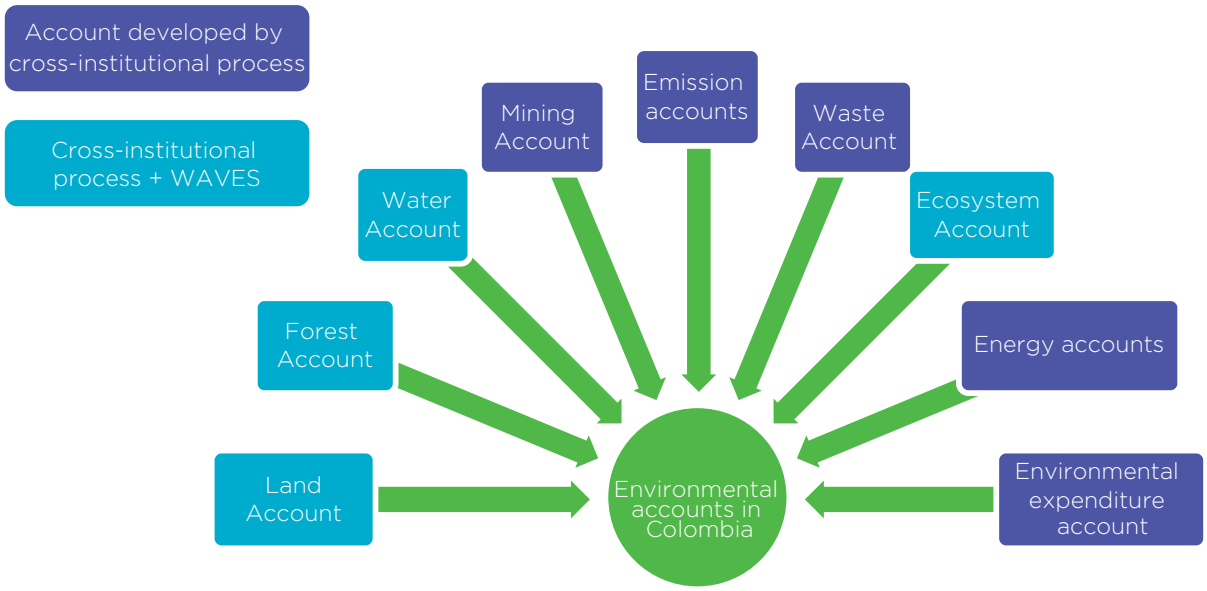
Figure 23. Water use in Alto Suárez watershed



5.4| Roadmap for natural capital accounts in Colombia

Currently the development of environmental accounts in Colombia has been supported by various international organizations such as the World Bank, OECD, United Nations, ECLAC and IDB. This international support together with the commitment of institutions like DANE, IDEAM, MADS and DNP has facilitated the progress of the country on consolidating and updating environmental accounts. Figure 16 shows the environmental accounts developed by DANE and those supported by the WAVES initiative (Wealth Accounting and Valuation of Ecosystem Services) .This program has promoted the cross-institutional elaboration of environmental accounts based on the wide availability of environmental and economic information from institutions like DANE and IDEAM.

Figure 24. Environmental Accounts in Colombia and the support of WAVES initiative



5.4.1| Long-term vision for environmental- economic accounts

In October 2015, the institutions belonging to the WAVES steering committee participated in a strategic planning workshop in order to discuss the present state of environmental accounts and create a vision for the short, medium and long term. Currently, the institutions are defining the road map priorities and it is expected that by June 2016, Colombia will have a final version of this tool.

The main policy topics that guide the use of environmental accounts in Colombia are:

- Peace and Post-Conflict Territories
- Sustainable Development Goals
- Green growth and OECD
- Climate change
- National Forestry Development Plan
- Water Use fee
- Forest use fee
- National Policy of Integrated Management of Biodiversity

5.5| Current use of NCA at policy level

Natural capital accounts construction, results released and cross-institutional agreements, have provided an analytical space for accounts to inform recent policy priorities. Some cases can be mentioned:

Cost of forest fires triggered by El Niño Phenomenon

Timber account (timber available by type of forest) was a base for the analysis of forest fires costs triggered by the El Niño phenomenon. The National Planning Department released an alert and a detailed analysis by regions which informed the country that cost of forests fires in 2015 amounted to 476,000 million (Colombian) pesos (around US$170 million).

Environmental peace dividends

Colombia is in the process of signing a peace agreement. In this context, the environmental peace dividends are economic measures in which it is estimated how much the savings would be per year of peace in terms of environmental degradation. For instance, if net deforestation is reduced, avoided costs of forest loss would amount to 96 billion COP. This estimation was possible due to the timber estimation from the forest account.

Other uses

- Lake Tota Management . Provides indicators for CONPES document (policy document), besides support beneficiary analysis for the future designing of a Payment for Environmental Services scheme.
- Chinchina Management. Provides indicators for the Watershed Use and Management Plans (Planes de Ordenamiento y Manejo de las Cuencas de Abastecimiento or POMCA).
- OECD accession (Specific proposal from DNP and DANE, for indicators based on the accounts).
- Green Growth Strategy (Specific proposal from DNP, for indicators based on the accounts).
- Timber exploitation fee adjustment (used by MADS, to analyze differences between administrative registers of timber use coming from regional environmental authorities, and the account at national level).
- Analysis of the economic impacts of the actual water use fee (DNP and MADS).

5.6| Communications and outreach efforts

Communication's role has advanced alongside WAVES Colombia development of the accounts with. significant progress being made after the endorsement of the Communications and engagement strategy in November 2015. The strategyaims to build awareness of natural capital accounting (NCA) and was elaborated with the support of IIED, World Bank and WAVES Colombia.

Coordinated by the WAVES communications consultant, the communications offices of the Steering Committee have been covering and registering WAVES events on their website, when they are held at their headquarters. They are also releasing the information coming from the program to their stakeholders,

Several means for reporting on WAVES program progress in Colombia, have been developed.. A monthly digital newsletter to stakeholders identified in a mapping exercise as part of putting the strategy together started in September 2015. The mass media is playing an important role in communicating about natural capital accounts, through publishing interviews with NCA specialists and representatives of the WAVES Global partnership.. Thus, the subject has been highlighted by the newspapers with suggestive titles such as: "*Is it vital to calculate natural wealth*" when the Director of WAVES, Stig Johansson was interviewed; or *How much does it cost the country ecosystems wealth* after an interview with the director of the Green and sustainable business department in the Ministry of Environment.

In addition, regular social media messages regarding NCA progress in Colombia have been posted on the Latin American Countries social media sites. Currently a video on NCA in LAC is under production. The communications consultant has written several feature articles for the WAVES global website in order to inform to the global WAVES and NCA community.

The WAVES Colombia Coordinator has also played a very important role in raising awareness of NCA through his participation and presentations at different national and international events such as "Water and Territory: Development as a Responsibility of All," organized by the Semana magazine and Corpoguavio; a regional forum on Green Economy for Latin America organized by the Partnership for Action on Green Economy (PAGE), and the first Leadership Programme organized by the Cambridge University in alliance with Andes University. A presentation of the water accounts results of the Tota Lake watershed to the permanent watershed council took place on May 2016 with positive feedback from the stakeholders, who identified the use of the accounts' results such as productivity indicators in the implementation and monitoring of the watershed's policy and management tools.

In this way the WAVES program's influencehas increased, as well as the interest in NCA. New stakeholders, such as research institutions, academia, mass media, and international organizations like UNESCO, the International Finance Corporation arm of the World Bank have become engaged as well as the Statistics Division of the UN. Economic Division for Latin America and the Caribbean (ECLAC), and the Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH (GIZ).

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Annex 1: Work Plan

Work plan Version Approved in March 2014

Objective	Public policy priorities	Guiding questions	Main product	Activities	Indicators	Leader / Other stakeholders	Semester						
							1st 2013	2nd 2013	1st 2014	2nd 2014	1st 2015	2nd 2015	1st 2016
Develop a solid and consistent base of accounts and economic-environmental data to inform public policy and strengthen planning for development	Promote protection and efficient management of water resources	How can greater coverage and quality of departmental water plans be achieved? How can water concessions be assigned in a more efficient, regulated and appropriate manner? Who are the stakeholders and what are the uses that should be considered by the institutional framework for water management?	Water accounts for three watersheds	Determine the framework for compilation and valuation in regard to water resources	Methodological document	DANE / IDEAM, MADS, DNP	X	X	X	X	X		
				Watershed 1: Lake Tota									
				Collection and assessment of basic data	Database and assessment document		X	X					
				Framework compilation	Database			X				X	
				Valuation of assets and flows	Database					X	X	X	X
				Validation process	Workshop reports			X	X		X		X
				Preparation of outputs	Final report							X	X
				Watersheds 2 and 3: Chinchiná and Suárez									
				Collection and assessment of basic data	Database and assessment document			X	X	X	X		
				Framework compilation	Database				X	X	X		
				Valuation of assets and flows	Database				X	X	X	X	
				Validation process	Workshop reports							X	
				Preparation of outputs	Final report						X	X	X
			Water national account	Collection and assessment of basic data	Assessment document						X		

Objective	Public policy priorities	Guiding questions	Main product	Activities	Indicators	Leader / Other stakeholders	Semester						
							1st 2013	2nd 2013	1st 2014	2nd 2014	1st 2015	2nd 2015	1st 2016
Develop a solid and consistent base of accounts and economic-environmental data to inform public policy and strengthen planning for development	Promote protection and efficient management of water resources	How can greater coverage and quality of departmental water plans be achieved? How can water concessions be assigned in a more efficient, regulated and appropriate manner? Who are the stakeholders and what are the uses that should be considered by the institutional framework for water management?	Water national account	Valuation of assets and flows	Database	DANE / IDEAM, MADS, DNP					X	X	X
				Validation process	Workshop reports						X	X	X
				Preparation of outputs	Reports						X	X	X
	Promote conservation and sustainable use of ecosystems and their vegetation cover	What are the causes of changes in vegetation cover in Colombia? How can the impact of illegal deforestation be prevented and mitigated? How do forest ecosystems and their services affect the well-being of communities? How can the flow of forest ecosystem services be ensured and maintained?	Pilot implementation exercise for the forest and ecosystem account	**Conceptualization and pilot exercise for the national forest account**									
				Review of existing frameworks and development of a methodological proposal	Methodological document		X	X	X	X	X		
				Collection and assessment of basic data	Database and assessment document				X	X	X	X	X
				Framework compilation	Database				X	X	X	X	X
				Valuation of assets and flows	Database				X	X	X	X	X
				Validation process	Workshop reports				X	X	X	X	X
				Preparation of outputs	Final report						X	X	X
				Ecosystem Pilot exercise									
				Collection and assessment of basic data	Database and assessment document							X	
				Framework compilation	Database							X	
				Valuation of assets and flows	Database							X	X
				Validation process	Workshop reports							X	X
				Preparation of outputs	Draft report								X

Objective	Public policy priorities	Guiding questions	Main product	Activities	Indicators	Leader / Other stakeholders	Semester						
							1st 2013	2nd 2013	1st 2014	2nd 2014	1st 2015	2nd 2015	1st 2016
Adoption of environmental accounts as a priority instrument for public policy decision-making	National Development Plan 2010-2014: In sector planning and environmentalland use planning, and in order to protect and restore biodiversity and its ecosystem services, it is imperative to "promote environmental account schemes to differentiate national production, adding the value of associated ecosystem services and recognizing this factor as a comparative advantage in international markets" (p. 437).	What are the assets that are part of the patrimony account for the water resource and forest resource? What methodologies exist to measure the physical units of these assets? What methods exist to assign a monetary value to these assets? What methodologies exist to calculate the depletion of these assets?	Proposed structure of the patrimony account in the framework of National Accounting	Review of theoretical frameworks for structuring patrimony accounts	Document	DANE / IDEAM, MADS, DNP	X						
				Identification of information and basic statistical series	Document and database		X						
				Preparation of the measurement proposal	Document			X					
				Validation of the proposed methodology	Workshop reports			X					
				Final report	Document			X					
	Guaranteed use of environmental accounts for government tracking, management and sustainable use of natural capital.	How to integrate the results of the accounts system into planning and definition of public policies	Preparation of Road map document for the environmental accounts system	Review of existing environmental accounting regulations in the country									
				NCA Road Map									
					Review document								
				NCA included in National Development Plan 2014-2018						X			
				Define the plan of action						X			
				Prepare the entire draft document							X	X	
				Review the technical, budget and legal content of the doc.								X	
				Present the Road Map	Review document							X	X

Objective	Public policy priorities	Guiding questions	Main product	Activities	Indicators	Leader / Other stakeholders	Semester						
							1st 2013	2nd 2013	1st 2014	2nd 2014	1st 2015	2nd 2015	1st 2016
Adoption of environmental accounts as a priority instrument for public policy decision-making	Guaranteed use of environmental accounts for government tracking, management and sustainable use of natural capital.	How to integrate the results of the accounts system into planning and definition of public policies	Preparation of Road map document for the environmental accounts system	Review and organize results of the WAVES initiative, both partial and general, including pilots		DANE / IDEAM, MADS, DNP	X		X		X		
				Prepare the final proposal	NCA Road Map document								X
			Communication of results	Communication strategy	Strategy document			X	X		X	X	X
				Implementation	Reports				X	X	X	X	X
Strengthen institutions in regard to their competencies and roles within development of the WAVES initiative.	Decree 3570 of 2011, Creation of the MADS: Develop agreements between the entities of the administrative sector to share information and improve the efficiency of production, collection, use and availability of information. Decree 262 of 2004,Restructuring of DANE: Design, plan, lead and execute statistical operations needed by the country within the framework of the National Statistical System	How should the institutions within the initiative be organized to generate the proposed results? What are the institutional needs in terms of training to develop the proposed activities? What are the products that should be generated within the initiative and disseminated among decision-makers, the scientific community and the general population?	Institutional organization of the initiative. Communication of initiative results	Proposal for the initiative's institutional organization (functions, roles, activities and products)	Documents, institutional agreements	DNP / IDEAM, MADS, DANE							X
	Law 99 of 1993. The Colombian Environmental Information System (SIAC) "This is the integrated group of stakeholders, policies, processes and technologies involved in managing the country's environmental information [1], to facilitate the generation of knowledge, decision- making, education and social participation for sustainable development."		General coordination	Training	Reports				X	X	X	X	X
			Ongoing initiative tracking	Tracking of Technical Committee	Reports				X	X	X	X	x
				Tracking of Steering Committee	Reports				X	X	X	X	X
				Dissemination strategy for partial and final initiative results	Strategy document								
				Preparation of final initiative document	Document								

Annex 2. Institutional Roles and Competencies

Entity	Competencies	Roles in the project
Ministry of the Environment and Sustainable Development	The main function of the Ministry related to environmental accounts is stated in Article 5, Number 8 of Law 99 of 1993: *"Evaluate the scope and economic effects of environmental factors, their incorporation into the market value of goods and services and their impact on development of the national economy and its external sector; their cost in medium and large infrastructure projects, as well as the economic cost of deterioration and conservation of the environment and of renewable natural resources, and undertake studies, analyses and economic and tax studies in relation to budgetary and financial resources of the environmental management sector and the taxes, fees, contributions, rights, fines and incentives related to it." (Art. 5, Number 8, Law 99 of 1993).* On the issue of valuation of environmental services, Article 5, Number 43 of Law 99 establishes that the Ministry is responsible for "Determining the methodologies for technical valuation of the economic costs of deterioration and conservation of the environment and of renewable natural resources." Finally, in regard to issues related to environmental information, the Ministry is responsible for administering the National Environmental Information System and coordinating implementation of that system with the IDEAM, research institutes and regional and local environmental authorities.	Technical determination of the methodologies for valuing the economic costs of deterioration and conservation of the environment and renewable natural resources. Administer the National Environmental Information System and coordinate its implementation with the IDEAM.
National Administrative Department of Statistics (DANE)	DANE is the entity responsible for planning, gathering, processing, analyzing and disseminating Colombia's official statistics. According to Decree 262 of 2004, DANE's goal is to *guarantee the production, availability, and quality of strategic statistical information, and direct, plan, execute, coordinate, regulate and evaluate the production and dissemination of basic official information."* DANE has three functions, which are: Producing strategic statistics Synthesizing national accounts Producing and disseminating basic official information	DANE is the entity in charge of preparing the national accounts and therefore the environmental accounts as well. In addition, DANE is in charge of guiding the statistical information administration which includes the Agustín Codazzi Geographic Institute (IGAC). Contribute to the design, planning and execution of statistical operations, and statistics derived therein, that are used continuously update the environmental satellite account.

Entity	Competencies	Roles in the project
National Administrative Department of Statistics (DANE)	The national accounts are prepared by the Department of Synthesis and National Accounts, whose functions are, among others, the following: • Guarantee the production, availability and quality of strategic statistical information. • Direct, plan, execute, coordinate, regulate and evaluate the production and dissemination of basic official information. • Regulate, direct and coordinate the National Statistical System through formulation, execution, tracking, evaluation and disclosure of the National Statistics Plan and Sector Statistics Plans. • Prepare the annual and quarterly national, regional and satellite accounts (among them the environmental account) to evaluate the economic growth of the country, departments and sectors. • Prepare and adapt the synthesis and national accounts methodologies, including environmental accounts, to suit the country's conditions and characteristics, in line with international recommendations.	Strengthen the strategic administrative records of the entities assigned to WAVES in the different lines of research related to development of the project. Establish the conceptual and technical guidelines for construction of ecosystem account pilots in the framework of environmental accounting.
National Planning Department	The DNP is the technical entity that promotes the implementation of a strategic vision of the country in the social, economic and environmental fields, through design, orientation and evaluation of Colombia's public policies, management and allocation of public investment and its execution in government plans, programs and projects. As an administrative department that is part of the Presidency of the Republic, it is at the same level as the ministries but does not have the ability to initiate legislation. The DNP has a Deputy Department for Sustainable Environmental Development, whose functions are stipulated in Article 16 of Decree 3517 of 2009. The functions related to environmental accounts and valuation of ecosystem services are as follows: Assist DANE in developing environmental accounts for the country. Support and carry out studies aimed at determining the environmental impacts caused by development policies, regulations, plans, programs and projects, as well as the economic and social costs of environmental degradation and economic valuation of the country's natural assets.	The DNP's functions related to this issue include supporting the DANE in preparing environmental accounts, providing support to carry out studies on the economic valuation of the country's natural assets and the costs of environmental degradation, and in general using environmental accounts to guide and evaluate public policies and allocate the national government's public investment. Advise on the formation and implementation of the Environmental Information System for Colombia.

Entity	Competencies	Roles in the project
National Planning Department	Participate in the design and application of economic, environmental and institutional analysis for tracking the environmental sector and risk, in coordination with the Department of Economic Studies. Advise the environmental authorities and institutions that are part of the National Environmental System (SINA) and the System for Disaster Prevention and Assistance (SNPAD) regarding development and implementation of the Environmental Information System and the Integrated Information System for Disaster Prevention and Assistance.	The Deputy Department of Sustainable Environmental Development, with its four groups (climate change, risk management, sectors and biodiversity) also provides support for the project.
IDEAM	IDEAM is a public agency attached to the Ministry of the Environment that provides technical-scientific support to the organisms that are part of the National Environmental System (SINA). Its main functions are: Generating primary data from the hydrometeorological network and gathering environmental data from other institutions related to different biophysical aspects, pollution and degradation of natural resources, such as: • Real-time data and climate information, disaster prevention alerts and climate forecasts at different regional scales with diverse applications. • Studies on climate impacts, climate variability and climate change in the territory. The status and vulnerability of watersheds, floods and landslides. • IDEAM is the information node of the SINA. It consolidates information about the status of the environment and natural resources in the country. As such, it gathers information on biodiversity and the status of the country's ecosystems produced by the research institutes of the SINA (IAvH, SINCHI and IIAP). • It generates information about the use and quality of natural resources (air, water, soil, etc.). It generates information about the environmental impacts of the different economic sectors and about their benefits for quality of life of the population and environmental health. • It provides the technical basis for decisions made by the Environment Ministry. It serves as a frame of reference in matters related to territorial environmental planning (watershed guides). • It operates the country's network of hydrological and meteorological stations. • It is responsible for consolidation, coordination and production of protocols for the air quality oversight system (24 stations throughout the country). • It guarantees the generation of data on natural resources quality, produced by environmental labs in the country.	IDEAM is the entity in charge of gathering information, carrying out studies and supplying information related to the ecosystems that make up the country's natural assets. In addition, it tracks the country's biophysical resources, particularly with respect to pollution and degradation, and directs and coordinates Colombia's Environmental Information System.

Entity	Competencies	Roles in the project
Comptroller General of the Republic	The CGR is the entity in charge of overseeing fiscal management (management of the nation's funds or assets) and controlling the results of public administration.	Among the Comptroller's government oversight functions is determining the value of environmental costs in order to quantify the use and deterioration of natural resources. It carries this out through the accounting and reporting of the entities it oversees in regard to cost-benefit analyses of conservation, restoration and management of public investment projects, in accordance with the regulations issued by the Comptroller. The Comptroller General must present the results of the impact quantification due to use and deterioration of natural resources in its annual report to the Congress on the status of natural resources. For the purposes of this study, the Comptroller General may use as an input the results of environmental accounts, analyzing them and including them in its annual report on the status of natural resource and the environment.

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Wealth Accounting and the Valuation of Ecosystem Services (WAVES) is a global partnership led by the World bank that aims to promote sustainable development by ensuring that natural resources are mainstreamed in development planning and national economic accounts.

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