SUSTAINABLE

COLOMBIA

A comprehensive Colombian Footprint review

30 June, 2010
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Executive Summary

Background
During the past several months, the Ministry of Environment, Housing and Territorial Development of Colombia has been researching potential indicators that would be useful to assess and possibly adopt – among which included the Ecological Footprint. This work was commissioned in order to provide the Ministry with a deeper understanding of the Ecological Footprint and to train a number of its staff on the scope of the footprint in order to support internal evaluations. As part of this exploratory phase, Global Footprint Network held an Ecological Footprint training workshop in Bogotá, Colombia, from May 21 to June 2, 2010, for an audience mostly comprised of Ministry officials, staff, and related institutions. In addition, Global Footprint Network conducted a more in-depth analysis of Colombia’s Ecological Footprint to determine if there is existing in-country data that is more accurate, comprehensive, and up-to-date than the data reported to the United Nations (which is used for current footprint calculations). This process would create a more refined calculation and help identify areas of improvement for data collection.

A second focus of the work was having an initial understanding of how the Ecological Footprint of Colombia might be used in the future to support decision making. For this, we explored two main areas: how the Ecological Footprint of Colombia plays out across its sectors, and the linkages between biodiversity and the Ecological Footprint.

At the time of writing this report, Global Footprint Network is still attempting to obtain the necessary data (input-output tables) that will enable such a sectoral view, and is assessing the availability of data for a more ‘quali-quantitative’ economic linkage assessment between the Ecological Footprint and biodiversity.

Results
Colombia is the 26th largest nation in the world and consists of approximately 114 million hectares of land and water. Of this, approximately 3.4 million hectares are cropland, 39 million hectares are grazing land, 61 million hectares are forest, 1.3 million hectares are built-up land, and 4.5 million hectares are continental shelf or inland water areas.

Colombia’s Ecological Footprint of consumption (EFC) was 85 million total gha or 1.9 gha per capita. Colombia’s total biocapacity was 176 million gha or 3.86 gha per capita. In comparison, the world’s average EFC was 2.6 gha per capita or 17.1 billion total gha. The world’s total biocapacity was 11.9 billion gha or 1.8 gha per capita. In 2006, the total input — production plus imports — into the Colombian economy was 106 million gha. Colombia imported 30.5 million gha from other nations (EFI): one-third of total input. Colombia also utilized 72.2 million gha of domestic biocapacity (EFP), which is 41 percent of the total available biocapacity in Colombia; some of this total input is exported to the international economy. Colombia consumed approximately 85.1 million gha (EFC), representing 83 percent of the total output — consumption plus exports — and exported 17.5 million gha to other nations (EFE).

Colombia and the Ecological Footprint
With a recent national election and the incoming administration of president-elect Juan Manuel Santos, Colombia is approaching a major inflection point — one which will garner worldwide attention and potentially chart a course for a more prosperous and sustainable Colombia. Its historical voter turnout proved that now more than ever, the people of Colombia are engaged in the nation’s political and social sectors. In fact, the 9 million votes cast for Santos were the most ever given a Colombian presidential candidate. Building up to this momentum, Santos’ campaign focused on continuing efforts to establish a secure and stable society, with a strong emphasis on economic development and a renewed commitment to the environment.

Global Footprint Network believes these two focal points – social and economic well-being – are directly linked to the well-being of Colombia’s most valuable assets – its renewable natural resources, known as its “biocapacity”. These areas – environmental, economic, and social – comprise what is commonly referred to as the three spheres, or pillars, of sustainability. Managing these spheres, therefore, will require a complementary set of indicators to help ensure Colombia’s long-term success.

An essential step in reaching this goal is measuring human impact on the Earth so we can make more informed choices. Among the set of indicators used for this is the Ecological Footprint, a resource accounting tool that measures how much we use, and who uses what. More specifically, it measures the human appropriation of biologically productive land and water – measured as biocapacity.

Beyond carbon, there are numerous challenges we face – and will continue to if we ignore the importance of biocapacity in policy-making. Carbon dioxide emissions should be viewed as part of an overall resource strain – a symptom of human pressure on resources reaching a critical tipping point. It is but one (albeit significant) component of the Ecological Footprint. A deeper, broader understanding of the risks to freshwater resources, food security, forest resources, oil, and – of particular interest to Colombia – biodiversity is critical. All are under threat. And all require careful measurement and management to ensure Colombia’s economic, environmental, and social well-being.
Ecological Footprint Biocapacity Results for North and South American Countries
Ecological Footprint and Biocapacity to Shape Policy

Use of Global Footprint Network’s National Footprint Accounts can be effective in reversing these trends. The National Accounts provide the two aggregate indicators mentioned above: Ecological Footprint and biocapacity. These indicators can synthesize and quantify a complex array of information into results that are meaningful for statisticians, decision-makers, and the general public. The National Footprint Accounts provide a unique framework to analyze resource and waste flows by applying statistical data from nearly 30 source data sets, and containing approximately 50 million data points.

The National Accounts provide national-level results for the biocapacity and Ecological Footprint for more than 150 nations from 1961 to present. Released every year using internationally approved methodology and data sources, the Accounts seek to quantify the relationship between human activities and the planet’s finite resources. Three documents describe in detail the methodology, structure, and results of the National Footprint Accounts (all are available to download at www.footprintnetwork.org): (1) Calculation Methodology for the National Footprint Accounts; (2) Guidebook to the National Footprint Accounts; and (3) Ecological Footprint Atlas.

The National Footprint Accounts Review Committee supports continual improvement of the scientific basis of the Accounts, and independent reviews have been conducted by various governments, universities, and research institutes.

In addition, the Ecological Footprint has its own policy relevance in the capacity to track the demand nations place on ecological assets based on the overall structure of their economies. For example, the Ecological Footprint has been identified as a resource-use indicator as part of the European Commission’s Thematic Strategy on the Sustainable Use of Natural Resources. Other topics that the Ecological Footprint can address include: sustainable production/consumption of coffee, sugar cane, plantains, and beef in Colombia; land-use management, particularly in relation to Colombia’s booming mining projects and expansion of agricultural lands; double decoupling (increasing resource efficiency while reducing negative impacts on the environment), also in relation to mining and agricultural land-use and production; and energy and climate.

The challenge, however, has been in data collection. While most of the data required for these calculations is collected by the various ministries and statistical offices, it is often widely distributed throughout, creating a patchwork of data that varies in classifications, quality, and accessibility for various stakeholders. Oftentimes, better in-country data exists than that which is reported to the UN and other bodies, thus the importance of refining Global Footprint Network’s calculations with in-country data. Conversely, these collaborations can also lead to recommendations for improved in-country data collection and compilation.

One such example is from the United Arab Emirates (UAE). During Phase 1 of Global Footprint Network’s collaboration with the UAE, the nation did not have a statistical office. This collaboration highlighted the growing need for a national statistics office (NSO), which has since been created and is currently helping with numerous other projects in the nation. Similarly, Ecuador is re-evaluating its data sets, looking for opportunities for improvement and expansion. The collaboration on the Ecological Footprint has been folded into this as it is a good complement to the ongoing process.

Process

The National Footprint Accounts provide relevant information in a coherent manner that is accessible for all potential users. However, the timeliness (three-year lag) and accuracy of the National Footprint Accounts can be improved by collaborating directly with NSOs and government ministries.

For this project, Global Footprint Network collaborated with MAVDT to identify the statistical offices and government ministries that collect data relevant to the National Footprint Accounts. More specifically, data were requested for production, import, export, and land cover for cropland, grazing land, forest land, fishing grounds, carbon dioxide emissions, infrastructure, and hydropower. These data were then collected and compared with the data reported by the United Nations FAOSTAT, United Nations ResourceSTAT, United Nations COMTRADE, and Global Land Cover.

Data collection from Colombian statistical offices required a great deal of time during this project. Despite the existence of statistical data portals on-line (e.g. IAvH-SIB, DANE, SISEA, IDEAM, AGRONET, etc.), future efforts in response to this report should include the creation of a comprehensive repository of publicly accessible Colombian statistics to promote the free distribution of data and information throughout Colombia. This is particularly important for tax-funded projects that produce data that are currently unobtainable for the general public. Accessibility to comprehensive in-country data can improve the accuracy and scope of Footprint calculations. For example, nationally generated data on annual carbon dioxide emissions should be reviewed against the carbon dioxide emissions data drawn from International Energy Agency and used in the National Footprint Accounts. This will ensure a nation’s data is correctly reported and stored in the international statistical databases and the most representative data is used by Global Footprint Network.
The same is true when it comes to mental sustainability. Balance economic growth with environmental sustainability, and the vulnerability of these areas to environmental damage. But with more companies operating in Colombia and a growing demand for these resources, the nation must be better equipped to put money into expanding production and are exploring new opportunities for land use in areas that were previously not considered. Colombia faces the challenge of meeting this growing demand without depleting its natural resources. What are the long-term economic and environmental ramifications of converting land to pasture in order to keep up with increased demand for beef production, as opposed to using the land to keep up with the growing demand on crops? While some simple calculations might lead to the conclusion that it is best to convert natural areas to cropland (thereby increasing yield), we know all too well that this tells a very small part of the story. Should improved, in-country data become available, Global Footprint Network will attempt to demonstrate economic linkages for such land-use conversions – forest left as is, or converted to grazing land.

In the organization's next, ever-more influential phase of development, Global Footprint Network is deepening the science behind the Ecological Footprint, and leveraging technology to create robust, policy-relevant tools. Such tools can help inform decisions on how to regulate mining in Colombia, with a focus on optimizing mining activities while minimizing loss of biocapacity – and thus, biodiversity. The goal is to offer leaders a graphically-rich, interactive modeling and decision-making platform, integrating the Ecological Footprint with metrics that capture trade and other key data. This new suite of Footprint-derived tools will allow decision-makers to explore scenarios in detail, and compare potential investments and strategies in light of their full range of consequences.

**Ecological Footprint and Biodiversity**

A report by the Convention on Biological Diversity stated that “Ecological Footprint analysis provides a metric of environmental performance and is therefore a useful tool for visualizing and comparing consumption levels and comparing them to biological capacities available. It provides a valuable form of ecological accounting that can be used to assess current ecological demand and supply, set policy targets, and monitor success in achieving them.”

Colombia’s efforts to protect its nation’s biodiversity must go hand-in-hand with efforts to protect its biocapacity. The Ecological Footprint indicator is identified as a pressure – driven by human activities – on the state of ecosystem health that subsequently impacts the lives of all species.

Although Colombia boasts a wealth of biodiversity, 658 species are threatened by extinction within its borders, including plant, amphibian, bird, mammal, fish and reptile species – many of which can only be found in Colombia. In addition, the nation’s recent mining boom has prompted fears that new mining projects pose a threat to Colombia’s biodiversity and natural wealth, according to a report by Colombian magazine Semana. Such concern was reflected in a recent delay in a new mining project in the Paramo ecosystems high in the Andes. The páramos are ecosystems that consist of mostly glacier formed valleys and plains with lakes, peat bogs, and wet and dry grasslands intermingled with shrub lands and forest patches.

Santiago Madriñán, head of the Colombian business council for sustainable development, recently told Business News Americas there should be zones that are completely excluded from mining in order to protect water resources, biodiversity, and the vulnerability of these areas to environmental damage. But with more companies operating in Colombia and a growing demand for these resources, the nation must be better equipped to balance economic growth with environmental sustainability.

The same is true when it comes to Colombia’s agricultural production. The three products that place the biggest demands on biocapacity within Colombia’s borders are coffee, sugar cane, and plantains. In the span of 46 years (1961 to 2006), beef production grew 141 percent, to 790,000 tonnes. This recent expansion in production has been driven by a combination of healthy economic growth and policy that promotes agricultural expansion. Investors are now more willing to put money into expanding production and are exploring new opportunities for land use in areas that were previously not considered. Colombia faces the challenge of meeting this growing demand without depleting its natural resources. What are the long-term economic and environmental ramifications of converting land to pasture in order to keep up with increased demand for beef production, as opposed to using the land to keep up with the growing demand on crops? While some simple calculations might lead to the conclusion that it is best to convert natural areas to cropland (thereby increasing yield), we know all too well that this tells a very small part of the story. Should improved, in-country data become available, Global Footprint Network will attempt to demonstrate economic linkages for such land-use conversions – forest left as is, or converted to grazing land.

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**Ecological Footprint and the Economy**

Economists see Colombia as recovering from the financial crisis of the past three years, according to the Washington Times. In addition, the report states that the new administration will be bolstered by strong interest in Colombia from numerous international institutions, including the World Economic Forum, which held a seminar for world business leaders in Cartagena in April. During the same month, HSBC Bank Chief Executive Michael Geoghegan termed Colombia “one of the world’s most interesting emerging markets” during a speech to Hong-Kong-based business leaders. In fact, Colombia is counted among the recently formed CIVETS group of nations (Colombia, Indonesia, Vietnam, Egypt, Turkey and South Africa) that are expected to excel in the next decade, rivaling the BRIC nations’ (Brazil, Russia, India and China) development during the past 10 years.

In order for Colombia to continue this global reputation as a good investment, it must be able to monitor and manage its natural resources, upon which its economy depends on. Quite simply, without natural capital, no economy would exist. Yet we continue to use more of the Earth’s renewable natural resources than the Earth can regenerate, which has put us into ecological overshoot.

This means the Ecological Footprint of production exceeds the biocapacity of a given area — or, demand is exceeding supply. This ecological imbalance has had an economic impact on some nations whose bond ratings have been affected by its Footprint. For example, Swiss-based private banking firm Sarasin Bank, with 63.2 billion worth of assets under management, presented a system of rating nation bonds based on sustainability and Ecological Footprint. Nations are required to meet a minimum resource efficiency and availability threshold to be eligible for inclusion in certain portfolios.

To better understand the industry/sector/trade linkages to consumption, and therefore identify courses of action to reduce risk exposure and optimization opportunities, the Ecological Footprint...
can be linked with economic input-output tables. These economic data sets are produced by NSOs as part of their economic National Accounts. Linking these two data sets can provide Ecological Footprint results for industry sectors, government, gross fixed capital, and household consumption (food, mobility, housing, goods, and services). Calculating the Ecological Footprint of economic activities provides an environmental accounting application for sustainable consumption and production (SCP) policies which address four key issues: (1) sustainable production (e.g. resource efficiency), (2) sustainable consumption (e.g. efficient/educated consumption), (3) combining sustainable production and consumption issues (e.g. labelling products according to embodied materials or emissions), and (4) government activities. Such an analysis would require an input-output table from Colombia.

Further disaggregation is possible at both the sector- and spatial-resolution. For instance, Input-Output tables in many nations — including Colombia — are separated into approximately 50 sectors.

Various complementary initiatives are currently underway to analyze the economic benefits of biodiversity and comparing the costs of effective policies in comparison to continued trends in reduced diversity of life on Earth. One of the more ambitious projects is the Millennium Ecosystem Assessment (MA) which, among other things, categorized three types of ecosystem services: (1) provisioning (e.g. food, fresh water, wood and fiber, fuel, etc.), (2) regulating (e.g. climate regulation, flood regulation, disease regulation, water purification, etc.), and (3) cultural (e.g. aesthetic, spiritual, educational, recreational, etc.).

The Economics of Ecosystems and Biodiversity (TEEB) is another ambitious project that reviewed the science and economics of ecosystems and biodiversity; including a valuation framework to improve policy decision making. Within this report five important dimensions of biodiversity were identified in the context of the supporting, regulating, provisioning, and cultural ecosystem services they provide for human well-being: (1) species richness, (2) species rarity, (3) biomass density, (4) primary productivity, and (5) genetic diversity.

In the context of the MA and TEEB analyses, the biocapacity and Ecological Footprint indicators are focused on the biomass-based flows of provisional services and waste uptake of regulating service from the ecosystem. Examples of the services that are quantified in the National Footprint Accounts include food, fiber, timber, and carbon dioxide uptake by forests and oceans. Used in collaboration with one another, the data sets and indicators can provide more realistic assessments linking the monetary value of ecosystem services with the flows of biocapacity through the human economy.
Sustainability Indicators

“Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.”

-- World Commission on Environment and Development (Brundtland Commission) 1987

Conceptual background

Sustainable development is commonly defined as living well within the means of nature. The National Footprint Accounts provide insight into society's utilization of ecosystem services by measuring the Ecological Footprint and biological capacity (biocapacity) for more than 150 countries. Complementary indicators should accompany the Ecological Footprint and biocapacity indicators in analyzing the environmental sustainability, or unsustainability, of a given population's activities. Additionally, social and economic indicators should be linked with the environmental sustainability indicators to provide a more comprehensive understanding of sustainability in what is commonly referred to as the three spheres, or pillars, of sustainability.

It is important to identify the research question and intended outcome of compiling a complementary set of indicators. The optimal set of indicators will depend on the type of policy decisions the indicators will help guide. For overall societal health, an initial set of indicators might include: Ecological Footprint and biocapacity for the biological resource situation, living planet index for the outcome on ecological health, and human development index. Additionally, genuine savings could complement these indicators to better understand wealth impact, and GDP, inflation, and unemployment, since they do affect societal stability. This report presents information on the Ecological Footprint, carbon Footprint, biocapacity, biodiversity, human development, and economic indicators for Colombia and the world. These indicators are presented in the context of environmental, social, and economic sustainability, with an emphasis on the human pressures on the environment in Colombia. The Ecological Footprint and biocapacity are emphasized throughout this report to identify the key types of resource flows, waste emissions, and the capacity of the biosphere to produce these resources and absorb these wastes.

The three spheres of sustainability. Adapted from the 2002 University of Michigan Sustainability Assessment
Environmental Sustainability Indicators.

The ecological network or sphere of sustainability is commonly disaggregated into five sub-components: Anthrosphere, biosphere, atmosphere, hydrosphere, and lithosphere (geosphere).

The anthrosphere represents the part of the environment modified or created by humanity and utilized for human activities. The activities by humanity within the anthrosphere strongly impact the biosphere, atmosphere, hydrosphere, and lithosphere. Most notably, these human impacts can be seen in the constructs of infrastructure, dams, and mines or flows of materials and energy.

The anthrosphere encompasses the world’s cities. The first cities developed around 9,000 years ago in Central Asia. However, it was not until two years ago (2008) that a majority of humanity lived in urban areas. This represents a historic movement to cities during a time of historic growth in population. The urban population of the world increased by 2.2 billion from 1961 to 2006; during this same period of time, Colombia’s urban population increased by 319 percent while the rural population increased by 28 percent.

These urban areas comprise less than 5 percent of the world’s land area; thus, in many cases it is the location in sensitive areas and peripheral development that can heavily influence the biosphere. This, however, is a complex topic because the cities are the drivers of land-use change and approximately 80 percent of the world’s greenhouse gas emissions occur in cities. For this reason it is encouraging that Bogotá is one of the ‘C40’ cities - 40 of the world’s largest cities that have committed to improving the efficiency of energy use and reducing carbon dioxide emissions.

Common anthrosphere-centric indicators include the Ecological Footprint and material flow indicators (e.g. direct material input).

“A network is... a web of connections among equals. What holds it together is not force, obligation, material incentive, or social contract, but rather shared values and the understanding that some tasks can be accomplished together that could never be accomplished separately.”

- D.H. Meadows, Beyond the Limits
The biosphere represents the global ecological system and its interactions with the anthrosphere, atmosphere, hydrosphere, and lithosphere. Common biosphere indicators that are directly related to human activities include biocapacity, net primary productivity, and IUCN’s Red List (IUCN 2010).

The atmosphere represents the gaseous part of the environment that protects the biosphere by moderating temperature, absorbing solar radiation, and providing additional functions such as providing essential gases for life. The atmosphere is comprised of five principal layers: Troposphere (6-20 km), stratosphere (20-51 km), mesosphere (51-85 km), thermosphere (85-690 km), and the exosphere (690-10,000 km). The Earth’s atmosphere is comprised of approximately 78 percent nitrogen, 21 percent oxygen, and 1 percent other gases. Common atmosphere indicators that are directly related to human activities include the global warming potential of the six major greenhouse gases, gas emissions that deplete the ozone, and water vapor concentrations.

The hydrosphere represents the water on the surface of the Earth, under the surface of the Earth, and over the surface of the Earth. Common hydrosphere indicators that are directly related to human activities include the water footprint and virtual water flows.

The lithosphere (geosphere) represents the Earth’s crust and outmost layer of the mantle. The thickness of the lithosphere ranges from approximately 40 kilometres to 200 kilometres and includes the tectonic plates. Colombia is located on the South American plate with the northwest border of the country near the Nazca and Caribbean plates. Common lithosphere indicators that are directly related to human activities include measuring the remaining deposits of fossil fuels, minerals, and ores.
Social Indicators

Social well-being can be defined in numerous ways. Utilizing national and international statistics, the United Nations Human Development Index includes literacy rate, life expectancy, and income. These values are obtained at the national level and reported in the annually published Human Development Report. These national-level statistics can be disaggregated by income group and gender to analyze the discrepancies in opportunity, quality of life, and social conditions within a nation.

There are 6,912 recognized languages of the world with living speakers; approximately 80 languages are spoken in Colombia. It is estimated that half of the world’s languages will no longer have living speakers by 2100. The northern South and Central America region (Colombia, French Guiana, Guyana, Suriname, and Venezuela) is home to 131 languages of which six are identified as endangered: Cacua, Carabayo, Palenquero, Secoya, Tinigua, and Totoro (Living Tongues Institute for Endangered Languages 2007).
Selected Human Development Indicators

- Life Expectancy at birth (years): 76.5 (Female), 69.1 (Male)
- Literacy (% aged 15 and above): 92.8 (Female), 92.4 (Male)
- School Enrollment (%): 80.9 (Female), 77.2 (Male)
- Income (PPP US$): 7,138 (Female), 10,080 (Male)

Economic Indicators

Economic stability is important for individuals and cultures in order to maintain a high quality of life. In most countries there are inequalities in income based on gender and education. One particular indicator that measures the statistical dispersion, or inequality, of income or wealth within a nation is the Gini Index.

In Colombia the Gini Index is 58.5, indicating that income in Colombia is amongst the most unequally distributed in the world.

Source: 2000 World Development Indicators
Introduced in the early 1990s (Rees 1992), the Ecological Footprint measures the human appropriation of biologically productive land and water—measured as biocapacity (Wackernagel et al. 1999, 2002). The Ecological Footprint addresses a specific research question: “How much of the regenerative capacity of the biosphere—expressed as biocapacity—is demanded by a given human activity” (Kitzes and Wackernagel 2009)? The Ecological Footprint thus accounts for the pressure humanity places on the planet in terms of the aggregate demand that resource-consumption and the release of CO2 emissions place on ecological assets.

The Ecological Footprint is a flow indicator; however, it is measured in terms of the bioproductive land areas needed to generate such flows, and thus is expressed in the unit of global hectares (gha). There is an advantage in expressing demand for flows in terms of bioproductive land appropriation, in that the use of an area better reflects the fact that many basic ecosystem services and ecological resources are provided by surfaces where photosynthesis takes place (bioproductive areas). These surfaces are limited by physical and planetary constraints, and presenting results in units of global hectares clearly communicates the existence of physical limits to the growth of human economies.

A situation where the Ecological Footprint of production exceeds the biocapacity of a given area results in ecological overshoot. Overshoot in a given land-use type subsequently leads to a higher likelihood of degradation of the stock and harming ecosystem health. In the case of the carbon Footprint, as the anthropogenic emissions of carbon dioxide exceed the biosphere’s ability to uptake carbon dioxide, this leads to accumulation of atmospheric concentrations of carbon dioxide.

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EF_C = EF_P + EF_I - EF_E
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Use of Ecological Footprint in Policy Decisions

“In the end, we will conserve only what we love, we will love only what we understand, and we will understand only what we are taught.”

-- Baba Dioum, 1968 speech in New Delhi,

Policy Applications

The National Footprint Accounts provide two aggregate indicators: Ecological Footprint and biocapacity. These indicators can synthesize and quantify a complex array of information into results that are meaningful for statisticians, decision makers, and the general public.

The National Footprint Accounts provide a unique framework to analyze resource and waste flows by applying statistical data from nearly 30 source data sets and containing approximately 50 million data points. Data collectors within countries are often widely distributed through various departments, ministries, and statistical offices; thus creating a patchwork of data that varies in classifications, quality, and accessibility for various stakeholders. These data are subsequently difficult for national agencies, international data collectors (e.g. United Nations Statistics Division), and primary users to obtain. It is therefore imperative for national governments to create a data warehouse that acts as a repository of information that can be utilized to guide policies.

According to a report by the Convention on Biological Diversity (2005), “Ecological Footprint analysis provides a metric of environmental performance and is therefore a useful tool for visualizing and comparing consumption levels and comparing them to biological capacities available. It provides a valuable form of ecological accounting that can be used to assess current ecological demand and supply, set policy targets, and monitor success in achieving them. Using the Footprint as an aggregate measure of demand on ecosystem resources provides a system perspective that allows researchers to calculate global overshoot, and show the extent to which a policy solution is actually reducing rather than shifting humanity’s footprint to ecosystems elsewhere. Disaggregated into its components, the Footprint can be used to set specific policy targets (for example, reducing the footprint of transport, energy, or other categories of consumption).”

The National Footprint Accounts provide aggregate indicators that convey a clear message for the general public. This is a key driver behind successfully creating legislation or regulations; thereby encouraging compliance by key stakeholders. As Donella Meadows noted, “aggregation is necessary to keep from overwhelming the system at the higher levels of the hierarchy.” This model is further illustrated in the pyramid structure below:

Source: Weber and Martin 2009

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1 The Convention of Biological Diversity (CBD) was created in 1992 following the Rio Summit. Colombia ratified the CBD in 1994.
The Ecological Footprint has its own policy relevance in the capacity to track the demand countries place on the ecological assets based on the overall structure of their economies. For example, the Ecological Footprint has been identified as a resource use indicator as part of the European Commission’s Thematic Strategy on the Sustainable Use of Natural Resources. Other topics that the Ecological Footprint can address include (Best et al., 2008) 1. sustainable production/consumption; 2. land use management; 3. double decoupling; and 4. energy and climate.

To address these areas, Ecological Footprint results can be presented through both:

1. Detailed sets of indicators allowing for in-depth reporting of each component:
   - Footprint by land category
   - Footprint by households, governments, and for investments
   - Footprint by industrial sectors
   - Footprint by consumption activities

2. Final aggregate indicators facilitating communication and reporting to policy makers:
   - World-average Ecological Footprint (in relation to global biocapacity)
   - National Ecological Footprints (in relation to national or global biocapacity)
   - Sub-national Ecological Footprint (in relation to sub-national, national, or global biocapacity)

Following the DPSIR framework (Driver-Pressure-State-Impact-Response) of analyzing environmental sustainability and policy strategies, the Ecological Footprint indicator is identified as a pressure—driven by human activities—on the state of ecosystem health that subsequently impacts the lives of all species; the Ecological Footprint can also aid policymakers in creating the appropriate response to maintain or improve ecosystem health.

DPSIR Framework

Adapted from Rapport and Friend, 1979
World Results

The world consists of approximately 51 billion hectares of land and water. Of this, approximately 1.6 billion hectares are cropland, 3.4 billion hectares are used for grazing land, 3.9 billion hectares are forest, 0.2 billion hectares are built-up land, and 2.9 billion hectares are continental shelf or inland water areas. These areas of high productivity are included within the biocapacity indicator that is calculated in the National Footprint Accounts.

Humanity’s demand (Ecological Footprint) first exceeded the Earth’s capacity (biocapacity) to meet it around 1980. In 2006, the ecological overshoot was 44 percent, meaning that it took the Earth the equivalent of one year and 5 months to regenerate the resources used and assimilate the wastes produced.

![World Ecological Footprint Graph](image)
The challenge of reaching a high level of human well-being while ensuring long-term resource availability is illustrated in the graph below. The United Nations Development Programme (UNDP) defines a high level of development as an HDI score of 0.8 or above, while 1.8 global hectares is the average productive area available for each person on the planet. Countries with an HDI score of 0.8 or higher, and a Footprint of 1.8 global hectares per person or lower, meet two minimum criteria for global sustainable development: a high level of development and an Ecological Footprint per person that could be globally replicated to a level less than global biocapacity.

The well-being of human society is intrinsically linked to the biological capital on which it depends. Accounting for the biological capacity available to, and used by, a society can help identify opportunities and challenges in meeting human development goals. The loss in human well-being due to ecological degradation often comes after a significant time delay, and is difficult to reverse once the stock of resources has been significantly depleted. Short-term methods to improve human lives – such as water purification, basic medicine, and electricity for hospitals – must be complemented by effective long-term resource management in order to address and reverse humanity’s cumulative ecological degradation.

Short-term methods to improve human lives – such as water purification, basic medicine, and electricity for hospitals – must be complemented by effective long-term resource management in order to address and reverse humanity’s cumulative ecological degradation.
A global analysis of the Ecological Footprint provides a first look at the distribution of the human demand on nature. However, to better understand how the Footprint is distributed worldwide, it is important to provide analysis of the demand generated across income groups.

Using the following World Bank classifications -- where high-income countries are defined as having a per-person gross national income (GNI) of $10,066 or more; middle-income countries are defined as having a per-person GNI ranging from $826 to $10,065; and low-income countries are defined as having a per-person GNI of $825 or less -- we gain insight into the relationship between income level, changes in population, changes in consumption, and available biocapacity over time (World Bank).
Colombia is the 26th largest nation in the world and consists of approximately 114 million hectares of land and water. Of this, approximately 3.4 million hectares are cropland, 39 million hectares are grazing land, 61 million hectares are forest, 1.3 million hectares are built-up land, and 4.5 million hectares are continental shelf or inland water areas. These areas of high productivity are included within the biocapacity indicator that is calculated in the National Footprint Accounts.

Colombia’s Ecological Footprint of consumption (EFC) was 85 million total gha or 1.9 gha per capita. Colombia’s total biocapacity was 176 million gha or 3.86 gha per capita. In comparison, the world’s average EFC was 2.6 gha per capita or 17.1 billion total gha. The world’s total biocapacity was 11.9 billion gha or 1.8 gha per capita. In 2006, the total input—production plus imports—into the Colombian economy was 106 million gha. Colombia imported 30.5 million gha from other countries (EFI); one-third of total input. Colombia also utilized 72.2 million gha of domestic biocapacity (EFP), which is 41 percent of the total available biocapacity in Colombia; some of this total input is exported to the international economy. Colombia consumed approximately 85.1 million gha (EFC), representing 83% of the total output—consumption plus exports—and exported 17.5 million gha to other countries (EFE).
The population figures to the right show that Colombia had a relatively young population with a lower life expectancy in 1979. The population structure has steadily transitioned to a stabilized population growth with a longer life expectancy.
Transparency and Standards

The National Footprint Accounts provide national-level results for the biocapacity and Ecological Footprint of more than 150 nations from 1961 to present (Ewing et al., 2009). Released every year using internationally-approved methodology and data sources, the accounts seek to quantify the relationship between human activities and the planet’s finite resources. Three documents describe in detail the methodology, structure, and results of the National Footprint Accounts.

- The Calculation Methodology for the National Footprint Accounts describes the methodology for calculating the Ecological Footprint and biocapacity indicators within the National Footprint Accounts (Ewing et al. forthcoming). This document includes the fundamental principles, assumptions, and equations utilized in the National Footprint Accounts.

- The Guidebook to the National Footprint Accounts documents the collection of the calculation templates (spreadsheets) that transform data inputs into results and perform the calculations in the National Footprint Accounts (Kitzes et al. forthcoming). This document provides detailed information regarding the structure and flow of information—from source data sets to results within the National Footprint Accounts.

- The Ecological Footprint Atlas summarizes the results from the National Footprint Accounts and describes the research question, basic concepts, and science underlying the Accounts (Ewing et al. 2009). This document describes recent advances to enhance the consistency, reliability, and resolution of the National Footprint Accounts.

The National Footprint Accounts Review Committee is elected by the nearly 100 partner organizations affiliated with Global Footprint Network and follows the Global Footprint Network Committee Charter (Global Footprint Network 2006). This Charter also stipulates the activities of the Ecological Footprint Standards Committee, which is comprised of 18 researchers (Global Footprint Network 2010b), follows the ISEAL Alliance Standard Setting Code (ISEAL 2010), and developed the Ecological Footprint Standards (Global Footprint Network 2006, 2009).

Independent reviews have been conducted by various governments, universities, and research institutes. A sample list of these reviews include are included in Appendix A.

Limitations of the National Footprint Accounts

The National Footprint Accounts are designed to quantify the biosphere’s regenerative capacity and the demand for this biocapacity by humanity. The limitations of the Ecological Footprint fall into four broad categories: scope, comprehensiveness, implementation, and extent of implications.

1. Limitations of Scope: The Ecological Footprint is an indicator of human demand for ecological goods and services linked directly to ecological primary production. As such, it addresses very specific aspects of the economy– (living) environment interaction, and should not be taken as a stand-alone overall sustainability indicator. Rather, it should be used in the context of a broader set of indicators that provide a more complete picture of sustainability.

2. Limitations of Current Methodology and Data: The current National Footprint Accounts have significant potential for improvement. Such potential improvements include: better assessments of biocapacity required for uptake of carbon dioxide emissions; consideration of bioproduction occupied by hydroelectric reservoirs and other infrastructure; and further analysis of ecological tradeoffs of land conversion.

3. Potential Errors in Implementation: As with any scientific assessment, Ecological Footprint results need to be evaluated in terms of reliability and validity. This is a complex task given that the National Footprint Accounts draw on a wide range of data sets, many of which have incomplete coverage, and most of which do not specify confidence limits. Considerable care is taken to minimize any data inaccuracies or calculation errors that might distort the National Footprint Accounts, including inviting national governments to collaboratively review the assessment of their nation for accuracy, and develop improvements in the method — either specific to their country or to that of all nations. In addition, efforts are continually made to improve the transparency of the National Footprint Accounts, allowing for more effective internal and external review. Conceptual and methodological errors include:

   a. Systematic errors in assessing the overall demand on nature;
   b. Allocation errors;
   c. Data errors in statistical sources for one particular year;
   d. Systematic misrepresentation of reported data in UN statistics; and
   e. Systematic omission of data in UN statistics.

4. Interpreting the Ecological Footprint: Overshoot reflects demand rates that exceed supply rates, and thus has physical ramifications; either a drawdown of stocks of natural capital or an accumulation of wastes. However, the National Footprint Accounts do not identify particular outcomes attributable to a specific level of overshoot, regardless of cause. In addition, overshoot in some ecological demand categories may be masked by lower Footprint in others (Ewing et al. 2009).
Source Data


Production statistics for agricultural, forestry and fisheries primary and derived products are obtained from the FAO ProdSTAT, FAO ForesSTAT and FAO FishSTAT Statisical Database. In the National Footprint Accounts, 2009 Edition (NFA 2009), there are production data for 164 crop products, 41 livestock products, 33 forest products and 1,439 fish products expressed in tonnes produced or harvested per year. Production data are presented in the FAO commodity classifications and HS+ commodity classifications where possible. HS+ is an extended version of HS 2002 created by FAO to provide increased resolution and harmonize the FAO and HS commodity classifications. Production statistics for carbon dioxide emissions are obtained from the International Energy Agency. In the National Footprint Accounts 2009, there are emission data for 45 products and categories expressed in tonnes of carbon dioxide emissions per year.

Yields are based on regeneration rates for all land-use types except cropland; cropland yields are calculated for each crop using the ratio of crops produced and harvest area. Grazing land yields are the average above-ground net primary production for grassland. Forest yields are calculated using net annual increment, which is the gross annual increment less that of the natural losses to the growing stock due to natural mortality, disease, etc. Fishing grounds yields are calculated for each species as the product of the inverse primary production rate and available primary productivity (Kitzes et al. 2009).

Equivalence factors are calculated using the suitability index from the Global Agro-Ecological Zones model along with land cover data from CORINE Land Cover (CLC 1990, 2000, 2006), Global Land Cover (GLC 2000), SAGE (University of Wisconsin 1992), GAEZ (FAO and IIASA 2000), and FAO ResourceSTAT (FAOSTAT).
# Background

The quality of accounting frameworks, statistics, and indicators rely on many key characteristics, including: (1) relevance and comprehensiveness, (2) accuracy, (3) timeliness, (4) accessibility, (5) interpretability, methodological soundness, and transparency, and (6) coherence (Statistics Canada 2009). The National Footprint Accounts provide relevant information in a coherent manner that is accessible for all potential users. However, the timeliness (three-year lag) and accuracy of the National Footprint Accounts could be improved by collaborating directly with national statistical offices (NSOs) and government ministries.

For this project, Global Footprint Network collaborated with MAVDT to identify the NSOs and government ministries that collect data relevant to the National Footprint Accounts. More specifically, data were requested for production, import, export, and land cover for cropland, grazing land, forest land, fishing grounds, carbon dioxide emissions, infrastructure, and hydropower. These data were then collected and compared with the data reported by the United Nations FAOSTAT, United Nations ResourceSTAT, United Nations COMTRADE, and Global Land Cover.

A systematic comparison of the source data sets was conducted for the information that was made available by the Agricultural Ministry and Rural Development, Corporacion Colombiana Internacional, IDEAM, and DANE. Future research should obtain data from the entities listed below to help validate the source data for the National Footprint Accounts.

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<tr>
<th>Type of data</th>
<th>Data requested to validate the NFA</th>
<th>Entities who have the information</th>
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<tbody>
<tr>
<td>Crops</td>
<td>Crop area and production for 165 crops</td>
<td>Agricultural Ministry and Rural development: &quot;Anuario estadístico 1998&quot; and CCI &quot;Corporación Colombia Internacional&quot;</td>
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<td>Agriculture imports and exports for 570 agriculture products</td>
<td>DIAN (IMPORTS AND EXPORTS), DANE</td>
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<td>Food aid imports and exports for 16 agriculture and fish products</td>
<td>Agricultural Ministry and Environmental Ministry</td>
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<td>Crops used as feed for 80 crops</td>
<td>DANE</td>
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<td>Grazing Land</td>
<td>Livestock production and yield for 41 products</td>
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<td>Livestock stocks for 16 species</td>
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<td>Fisheries</td>
<td>Fish marine capture for 1439 species</td>
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<td>Fish inland capture for 268 species</td>
<td>ICA-DANE</td>
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<td>Fish imports and exports for 118 products</td>
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<td>Forestry</td>
<td>Forest yield for 33 products</td>
<td>DANE, IDEAM (Sistema de Información Forestal)</td>
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<td>Forest production for 33 products</td>
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<td>CO2 Emissions</td>
<td>Total CO2 emissions from domestic production activities</td>
<td>IDEAM (DATA FROM 2000 AND 2004)</td>
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<td>Import and Export data for 625 products</td>
<td>DIAN (IMPORTS AND EXPORTS)</td>
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<td>Infrastructure area (and type of land type prior to infrastructure—if possible (e.g. cropland covered by infrastructure))</td>
<td>UDME and MAVDT</td>
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<td>Hydropower production and yield (type of land type prior to infrastructure—if possible (e.g. cropland covered by infrastructure))</td>
<td>ASOCARS AND INDEPENDENT ENERGETIC ENTERPRISES</td>
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<tr>
<td>Land Cover</td>
<td>Land cover or water area for cropland, inland water, forests, grazing land, infrastructure, marine EEZ, and continental shelf</td>
<td>IGAC - Land use cover map (MAVDT - IDEAM)</td>
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<tr>
<td>Human Population</td>
<td>Population of country</td>
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Data relating to the ‘Crop area and production for 165 products’ was obtained from the Agricultural Ministry and Rural Development and Corporacion Colombiana Internacional. Of the 165 products requested, the 19 most important products for the Colombian economy were obtained for this analysis.

The National Footprint Accounts utilize carbon dioxide emissions data reported by the International Energy Agency. The ‘CO2 Sectoral Approach’ category consists of “total CO2 emissions from fuel combustion as calculated using the IPCC Tier 1 Sectoral Approach and Corresponds to IPCC Source/Sink Category 1A. Emissions calculated using a Sectoral Approach include emission son when the fuel is actually combusted.

The CO2 emissions obtained from IDEAM include “Energy, Industrial Processes, and International Bunkers.”

The National Footprint Accounts utilize population data from FAOSTAT. Comparing this data with the summation of population for 1122 municipalities using DANE data for the year 2006 provides a 5 percent decrease in the population for the year 2006.
A vast majority of the data requested to validate the National Footprint Accounts has been formally requested from statistical offices and government ministries. As data becomes available it will be analyzed alongside the United Nations data sets to identify discrepancies and potential improvements to the National Footprint Accounts.

Data collection from Colombian statistical offices required a great deal of time during this project. Despite the existence of statistical data portals on-line (e.g. IAvH-SIB, DANE, SI3EA, IDEAM, AGRONET, etc.) future efforts in response to this report should include the creation of a comprehensive repository of publicly accessible Colombian statistics to promote the free distribution of data and information throughout Colombia. This is particularly important for tax-funded projects that produce data that are currently unobtainable for the general public. Ideally, there would be a data warehouse combining the databases from each statistical source by the following category of statistics:

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<th>Climate, air, waste</th>
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One potential application of the National Footprint Accounts is to link the Ecological Footprint with economic input-output tables. These economic data sets are produced by national statistical offices (NSOs) as part of their economic National Accounts. Linking these two data sets can provide Ecological Footprint results for industry sectors, government, gross fixed capital, and household consumption (food, mobility, housing, goods, and services). Calculating the Ecological Footprint of economic activities provides an environmental accounting application for sustainable consumption and production (SCP) policies.

This figure shows the type of results that be obtained by linking the Ecological Footprint with a country’s input-output table (in this case, Japan’s). For Colombia, additional research is required to obtain an input-output table or a supply and use table in basic prices.

Further disaggregation is possible at both the sector- and spatial-resolution. For instance, input-output tables in many countries—including Colombia—are separated into approximately 50 sectors. However, some nations—such as the Australia, Netherlands, United Kingdom, and United States—have input-output tables with approximately 500 sectors. Similarly, input-output tables are only available for approximately 80 countries. However, some countries—such as Japan—have national and sub-national input-output tables. Sub-national environmentally extended input-output analyses for the Ecological Footprint are possible by using sub-national input-output tables or combining the national input-output tables with sub-national household expenditure and energy intensity data.
Sub-National Biocapacity Accounts for Colombia

The current National Footprint Accounts provide biocapacity results for more than 150 countries. However, calculations and results at the national level conceal the sub-national variability in land cover and bioproductivity.

Biocapacity is defined as “[t]he capacity of ecosystems to produce useful biological materials and to absorb waste materials generated by humans, using current management schemes and extraction technologies.” Biocapacity is measured for any land-use or fishing grounds area as the land cover area of each mutually exclusive land-use type, multiplied by a yield factor—that accounts for yield differences between countries—and an equivalence factor—that approximates the inherent productivity of the land.

The source data for land cover and administrative areas are available from publicly accessible geographic information system (GIS) data portals. This report utilized the Global Land Cover map to create a sub-national land cover map for Colombia. National average yields were utilized for this analysis. Future analyses could combine a higher resolution land cover map with a spatially explicit yield map. The quality of source data sets could also be improved by collaborating with the Colombian statistical offices and environmental ministries to obtain land cover maps produced specifically for Colombia or regions within Colombia.

Applications with the sub-national biocapacity accounts for Colombia include linking the National Footprint Accounts data with additional GIS data sets, such as protected areas, species habitats, ecosystems, or land-use change. Ideally, sub-national biocapacity accounts will be analyzed in parallel with sub-national Ecological Footprint accounts and other related data sets.
Maintaining ecosystem health provides the foundation for services such as regulating climate, pollution control, water purification, and soil conservation. Healthy ecosystems also serve as the foundation for biodiversity to flourish. There are many benefits of preserving species diversity including cultural, ethical, spiritual, and financial. This notion that the human economy is a sub-set to the surrounding ecology is an integral point to identifying the economic linkages between nature, human activities, and biodiversity.

The biological diversity of life on Earth is estimated to be 10-100 million species with 1,740,330 species currently described. However, the number of threatened species is increasingly large. In 2000 there were 11,167 species threatened by extinction. This number has increased annually and in 2010 there are currently 17,315 species listed as threatened by extinction (IUCN 2010).

Notable groups of organisms with the largest percentage of species categorized as threatened include 32 percent of gymnosperm species (e.g. coniferous trees), 29 percent of amphibian species, 21 percent of mammals, 12 percent of birds, 11 percent of corals, 5 percent of fishes, and 5 percent of reptiles.

Within the boundaries of Colombia, 658 species are threatened by extinction, including 223 plant species, 211 amphibian species (including 158 species that are only found in Colombia), 90 bird species (including 42 species that are only found in Colombia), 52 mammal species (including 9 species that are only found in Colombia), 37 fish species, and 15 reptile species. Of these 658 species, 112 are categorized as critically endangered, 220 are categorized as endangered, and 326 are categorized as vulnerable (IUCN 2010).
Most of the protected areas in Colombia are found in the Amazonian forests of southern Colombia. However, the previous map identified the Tropical Andes and Tumbes-Chocó-Magdalena biodiversity hotspots are in the northern mountainous region of Colombia. The map on the next page includes a land cover map with protected areas and major roads; most of which are found in unprotected lands where crops are predominantly grown. Preservation of Colombia's biodiversity rich areas will require a greater emphasis on protecting the land that is most vulnerable to human expansion.
In 2006, 8.3% percent of Colombia’s land was protected areas according to the IUCN categories I-V; 24.7% percent was protected areas according to categories I-VI. Preserving land and water areas is integral to maintaining a rich stock of resources and preserving life within Colombia. It is important that the land and water areas that are preserved are those also strategically located where they can provide the greatest benefits. For instance, Tumbes Choco-Magdalena and Tropical Andes regions of northern Colombia are critical ecoregions where human pressure increases in the mountainous northwest of Colombia. This will become increasingly important more significant as human pressure is expected to expand onto biodiversity-rich and sensitive biomes.

Various initiatives are currently underway to analyze the economic benefits of biodiversity and comparing the costs of effective policies in comparison to continued trends in reduced diversity of life on Earth. One of the more ambitious projects is the Millennium Ecosystem Assessment in which they categorize three types of ecosystem services: (1) provisioning (e.g. food, fresh water, wood and fiber, fuel, etc.), (2) regulating (e.g. climate regulation, flood regulation, disease regulation, water purification, etc.), and (3) cultural (e.g. aesthetic, spiritual, educational, recreational, etc.). In this context, the biocapacity and Ecological Footprint indicators are focused on the biomass-based flows of provisional services and waste uptake of regulating service from the ecosystem. Examples of the services that are quantified in the National Footprint Accounts include food, fiber, timber, and carbon dioxide uptake by forests and oceans.
The Economics of Ecosystems and Biodiversity (TEEB) is another ambitious project that reviewed the science and economics of ecosystems and biodiversity, including a valuation framework to improve policy decision-making. Within this report, five important dimensions of biodiversity were identified in the context of the supporting, regulating, provisioning, and cultural ecosystem services they provide for human well-being: (1) species richness, (2) species rarity, (3) biomass density, (4) primary productivity, and (5) genetic diversity.

The figure below provides an overview of the biodiversity supported ecosystem services that improve human well-being. The biocapacity indicator within the National Footprint Accounts quantifies some of the flows within the provisioning services: including food, fiber, and timber.

Land explicitly set-aside to uptake carbon dioxide emissions can also be measured within the National Footprint Accounts and serves as a regulating ecosystem service. Human well-being requires, in part, the material consumption of provisioning services provided by the ecosystem. These flows from the ecosystem to the economy are measured as the Ecological Footprint for that nation or region.

Future research related to this project could focus on the valuation techniques of ecosystem services in Colombia utilizing the TEEB framework or the System of Integrated Environmental and Economic Accounting (SEEA). The SEEA categorizes valuation methods into four types: “(1) real costs incurred due to legally binding avoidance, compensation or, restoration obligations; (2) expenditure voluntarily undertaken to avoid or limit damage; (3) people’s “revealed” preferences for obtaining specified environmental services or amenities; and (4) people’s “stated” or hypothetical preferences as elicited through contingent valuation (that is, willingness to pay or willingness to accept enquiries).”

The Millenium Ecosystem Assessment, TEEB, and SEEA provide a framework to measure the value of ecosystem services. Additional research could utilize these frameworks along with data from Colombian statistical offices and government ministries to analyze the environmental and economic benefits and costs associated with land management policies in Colombia.

Adapted from TEEB, 2009
Sample list of external reviews of the National Footprint Accounts

• Switzerland - http://www.bfs.admin.ch/bfs/portal/en/index/themen/21/03/blank/blank/01.html (both the technical and the descriptive report).

• Germany - http://www.umweltdaten.de/publikationen/fpdf-l/3489.pdf

• France - Stiglitz commission (http://www.stiglitz-sen-fitoussi.fr/documents/Issues_paper.pdf);


• European Union's Beyond GDP conference (www.beyond-gdp.eu) a strong endorsement arose from the European Economic and Social Committee.

• Ireland – http://erc.epa.ie/safer/iso19115/displayISO19115.jsp?isoID=56#files

• Belgium - www.wwf.be/_media/04-lies-janssen-ecologische-voetafdrukrekeningen_236536.pdf


• United Arab Emirates – Al Basama Al Beeiya Initiative http://www.agedi.ae/ecofootprintuae/default.aspx

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Photos

Cover: Bogota Cityscape. Stephen Downes.
Table of contents: Wax Palms in the Coracora Valley. Paul Bridgewater.
9: Colombia. Nina Volare.
10: Afro Colombians. Alejandro Quintero Sinisterra.
26: Explorando el desierto. Aztelex.
Back cover: Colombia 179. Rosellen Lloyd.

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