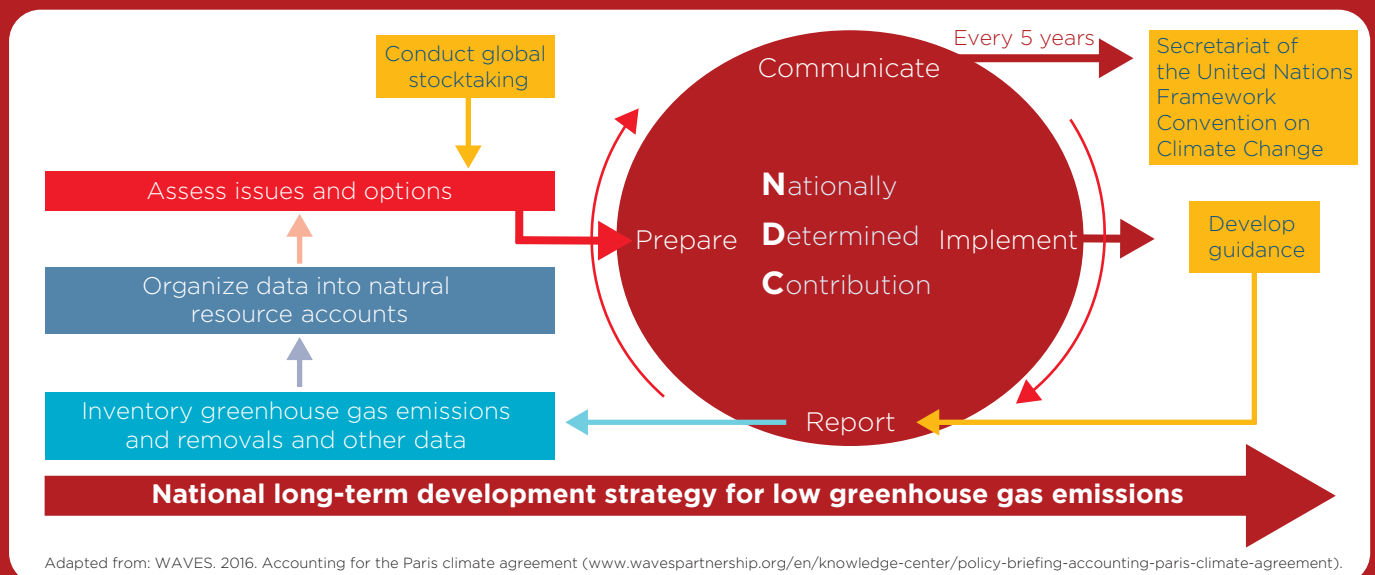


Natural Capital Accounting: Focusing on Energy and Adaptation to Climate Change

Energy accounts record stocks and flows of energy such as coal, peat, natural gas, oil, and electricity within the economy and show how they are connected to other environmental issues.

Energy accounts are used to link the impact of water on energy production, where there is a significant supply of hydroelectricity. The combination of water and energy accounts can also help identify effective ways to reduce carbon and blue-water footprints. Energy security is a vital component of adaptation strategies in response to climate change. Energy accounts provide the detail around the generation and consumption of energy—from household to industry level—that can inform sound policy.

- **Card 1 Energy Investments in Botswana**
- **Card 2 Targeted Investments to Meet Costa Rica's Goals**
- **Card 3 Indonesia's Commitments on Climate Change**
- **Card 4 Climate Change and Flooding Vulnerability in the Philippines**



Card 1 Energy Investments in Botswana

What Do the Accounts Show?

Botswana has energy and coal accounts for 2010 to 2015. These inform the country's energy strategies and help track the impact of energy use on carbon dioxide emission commitments.

The share of domestic electricity production grew from 14 percent in 2010/11 to 69 percent in 2014/15, an increase obtained through investment in a coal power plant. Electricity consumption increased over the same period, while electricity imports declined.

The transition has been challenging. Operational problems at the new plant need to be addressed to guarantee a reliable supply throughout the country and minimize costs of sudden demands for electricity imports.

Why Is This Important?

Coal production is a high emitter of carbon dioxide, and Botswana's emissions increased between 2010 and 2015. This can affect international negotiations about climate change.

Investments in coal have made Botswana more dependent on nonrenewables and could turn the country into a net energy exporter. Energy accounts make it possible to track these developments.

Neighboring South Africa is using energy accounts to model the economic impacts of introducing a carbon tax on coal-fired energy. Results show that a phased-in tax would achieve the national emissions targets set for 2025 while reducing gross domestic product (GDP) by 1 percent and employment by only 0.6 percent.

69% of electricity produced in country using coal in 2014/15

This is up from 14% in 2010/11, the result of adding a coal-fired plant. There are plans for expanding.

22% increase in electricity consumption since 2011

The increase responds to **expanding population but also cheaper and more reliable** electricity.

5x increase in domestic emissions, from 0.7 million tons of CO₂ in 2010 to 3.2 million in 2014

CO₂ emissions will continue to increase as other coal operations come into play. The country is exploring options to reduce its footprint.

By 2025 national emissions targets achievable, using carbon tax on coal

South Africa is modeling the economic impacts of **introducing a phased-in carbon tax** from US\$3 to US\$30 per ton.

Sources: WAVES. 2016. *Botswana Country Report 2016*; Abi, Kgomo. 2009. *The Need for Clean Coal in Africa. The Case of Botswana*. Ministry of Minerals, Energy and Water Resources, Botswana. http://siteresources.worldbank.org/INTENERGY/Resources/335544-1232567547944/5755469-1239633250635/Kgomotso_Abi.pdf

Card 2 Targeted Investments to Meet Costa Rica's Goals

What Do the Accounts Show?

In Costa Rica, energy and carbon dioxide emissions accounts were prepared for 2011, 2012, and 2013.

They show that 90 percent of electric power in Costa Rica comes from renewable sources. But electricity makes up only 20 percent of final energy consumption, and 61 percent of the total energy Costa Rica consumes comes from fossil fuels. This demand is mostly driven by transportation and industry. As a result, the country's emissions from fossil fuels increased by 22 percent between 2005 and 2012. Data provided by the accounts make it possible to

calculate input-output ratios, used to assess energy dependence by sector.

Why Is This Important?

The country aims to be carbon-neutral by 2021. Some of the gains will come from forest conservation policies, but energy accounts show the urgent need to improve efficiencies in the energy sector to achieve objectives.

The accounts point to areas where investments should take place. These include implementing new technologies, but also tackling inefficiencies—for example in the transportation system—and strengthening institutions in the energy sector.

90% of electricity
from renewable sources

This is mostly from hydroelectricity. The aim is for 98% by 2030.

Sources of final energy consumption



47% of energy consumption
from transportation

Industry uses 25% and households 14%. Plans include adding clean energy sources and tackling inefficiencies in transportation.

70% of CO₂ emissions
from fossil fuel use (2013)

Policy objectives to become carbon-neutral by 2021 must look beyond forest protection only.

Sources: WAVES. 2016. *Costa Rica Country Report 2016*; Dirección Sectorial de Energía (DSE). 2015. Balance Energético Nacional de Costa Rica, periodos 2012-2014. DSE, MINAE; MINAE. 2015. VII Plan Nacional de Energía 2015-2030.

Card 3 Indonesia's Commitments on Climate Change

What Do the Accounts Show?

Economic models indicate that development in Indonesia is limited by the availability of natural resources, energy, land, and the raw materials needed to support industrial growth.

Because of its limited energy stocks and potential for production, Indonesia might have to import energy under certain scenarios, if national finances permit. If economic growth were to run at 5 percent to 6 percent annually until 2030, with a 1.3 percent annual population increase, reducing greenhouse gas emissions—as the country has committed to do under the Paris climate agreement—would be a challenge.

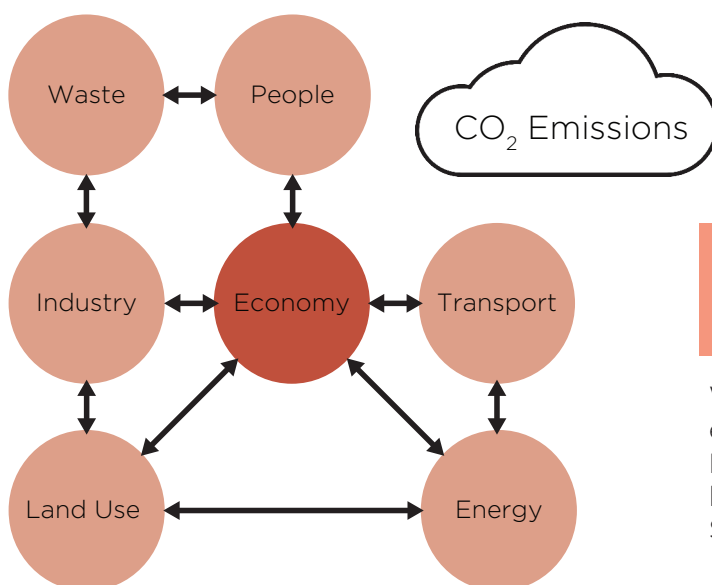
Forests accounts show that between 2009 and 2012, the country lost 1 million hectares of forest cover, with large regional variations. In some provinces, reduced forest cover hampers the ability to regulate water flows and affects other ecosystem services.

Why Is This Important?

Forest and land accounts inform Indonesia's commitments to reducing emissions from deforestation and forest degradation (REDD+). The policies created represent an important change in Indonesian law, which traditionally recognized only the financial value of extractive or provisioning ecosystem services (timber and minerals).

To meet its international commitments, Indonesia needs to understand the full impact different policies have on economic sectors (energy, land use, waste, industry), productivity and consumption, poverty, and contributions to emission-reduction targets.

The data to design, monitor, and evaluate these policies combine local statistics with Indonesia's Integrated System of Environmental and Economic Accounting (SISNERLING), land accounts, and pilot water accounts.



Lost >1 million hectares
of forest between 2009 and 2012

West Sumatra has the largest existing forest cover (47%) and Lampung the lowest (15%). The largest loss of cover took place in South Sumatra (375,000 hectares).

Sources: Medrilzam and Buyung Airlangga, presentation to WAVES Policy Forum, November 2016; Tasriah. 2016.

Card 4 Climate Change and Flooding Vulnerability in the Philippines

What Do the Accounts Show?

Land-use changes between 2010 and 2014 have resulted in an increase in sediments going into Laguna de Bay, the country's largest lake. The impact could increase tenfold if unsustainable practices continue.

Natural capital accounts show how the reservoir properties of Laguna de Bay are increasingly compromised, reducing the overall volume of the lake and its ability to contain increased inflow and rainwater. This increases the risk for flooding, aggravated by the large numbers of people moving into the area.

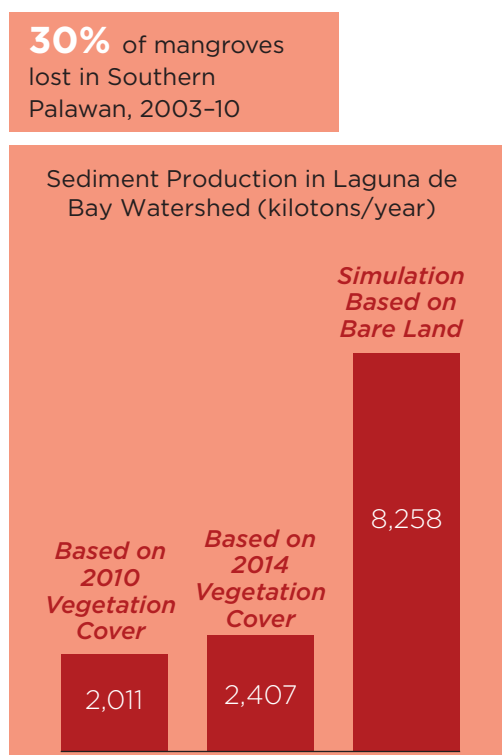
The impacts go beyond the areas adjacent to Laguna de Bay, as this ecosystem buffers flooding threats to the nearby capital city, Manila. Southern Palawan, for its part, lost 30 percent of mangrove cover from 2003 to 2010, despite regulations. Degradation of

the quality of coastal ecosystems reduces their capacity to provide storm protection and buffer tidal impacts, and shrinks the habitats needed to support fisheries.

Why Is This Important?

Flood risks are high and hurricanes are frequent in the area. The accounts provide direct information on where settlements are located in relation to areas at greatest risk of flooding.

Ecosystem accounts also provide georeferenced information for practical policy planning—about areas prone to producing sediments, for example. Floods and other water-related disasters account for 70 percent of all natural disaster-related deaths in the world. Sustainable Development Goal 6 challenges governments to aim toward implementing integrated water resources management at all levels by 2030.



- Declining mangroves and increasing sediments point to a degraded ecosystem.

- This raises the risk of flooding in an already vulnerable area.

- The government places a high priority on climate change mitigation and adaptation strategies.

Wealth Accounting and the Valuation of Ecosystem Services

WAVES is a World Bank-led global partnership that aims to promote sustainable development by ensuring that natural resources are mainstreamed in development planning and national economic accounts.



www.wavespartnership.org

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