

# Natural Capital Accounting: Informing Water Policies

Water security is at the core of several national development plans and sustainable development goals (SDGs): access to clean water and sanitation (SDG 6), and as an input to food security (SDG 2) and energy (SDG 7).

Increasing demand and competition for water requires better information to direct investments and maximize benefits for all. Natural capital accounting can provide indicators to help policy design, monitoring, and cost-recovery strategies.

- **Card 1** Water in the Economy in Colombia
- **Card 2** Water Security and Flood Prevention in the Philippines
- **Card 3** Evidence on Sources of Water Pollutants
- **Card 4** Inefficiencies in Water Distribution in Costa Rica
- **Card 5** Water Ecosystems for Food Security in the Philippines
- **Card 6** Evolution of the Water Sector in Botswana

Water security is a top priority in international and national agendas—including several United Nations Sustainable Development Goals



## Card 1 Water in the Economy in Colombia

### What Do the Accounts Show?

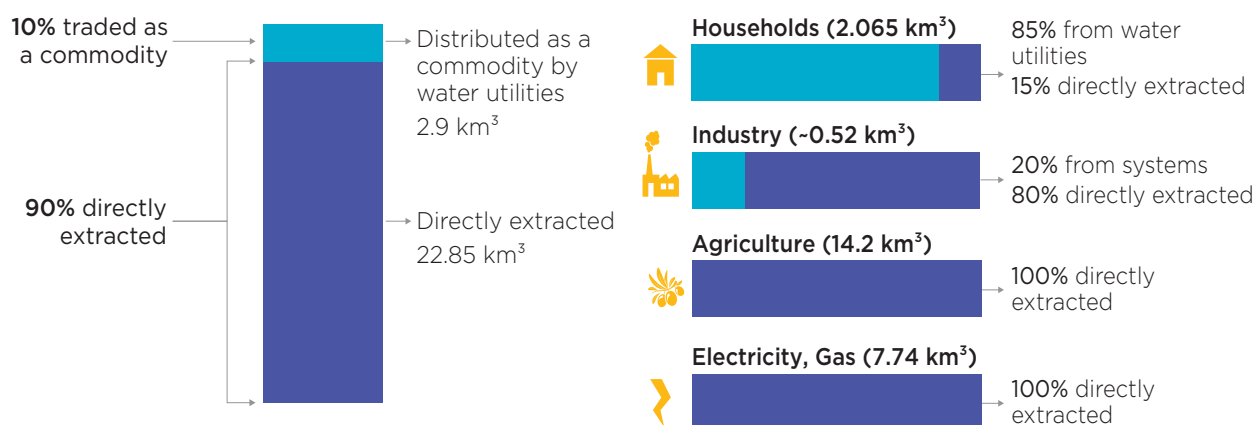
- **Most water in Colombia is not traded as a commodity.** Only 10 percent of total abstractions were through water utilities, with users directly extracting the remaining 90 percent.
- **Households are relatively well serviced,** receiving 85 percent of their water through distribution systems.
- **Industry and manufacturing extract most of their water directly.** The main users of water in manufacturing are paper, petroleum/chemicals, sugar, and beverages. The vast majority of wastewater (97 percent) is discharged directly and untreated into bodies of water.
- **The agriculture sector directly extracts 100 percent of the water it uses.** About 10 percent of agricultural use is by the coffee industry.

### Why Is This Important?

Water accounts link the environmental and economic elements of water resources and provide input to Colombia's Integrated Water Resource Management Policy.

The accounts' clear and robust framework highlights main water uses and users. This information helps water authorities design operational strategies and more effective and efficient water policies.

Total Annual Water Extractions: 2014  
25.75 cubic kilometers (km<sup>3</sup>)



## Card 2 Water Security and Flood Prevention in the Philippines

### What Do the Accounts Show?

The destruction and conversion of forests and natural grasslands in the upper parts of the watershed surrounding Laguna de Bay—the country’s largest lake—can have big impacts on the generation of sediment flows. This can be seen when data from land and water accounts are combined with spatial sediment modeling.

Changes between 2010 and 2014 increased sediments into the lake by 20 percent. An erosion model that was developed found that an extreme change of all forests to bare land could make the sedimentation rate increase by more than 240 percent.

Using geographic information systems, the accounts also show the largest potential contributors of sediments. This can help focus protection and regeneration efforts.

### Why Is This Important?

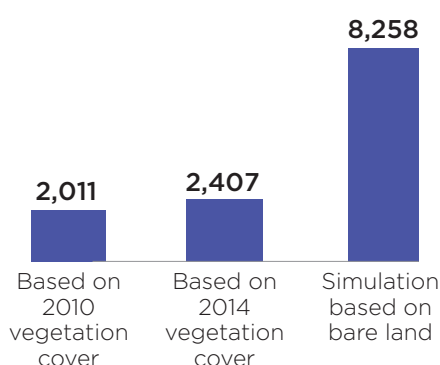
The accumulating sediments are changing the overall volume of the lake and its ability to contain increased inflow and rainwater, with potential impacts on flood control—a situation aggravated by the large number of people moving into the area.

The effects go beyond the areas adjacent to Laguna de Bay, as this ecosystem buffers flooding threats to the nearby capital city of Manila. This is of particular importance given recurrent hurricanes in the area.

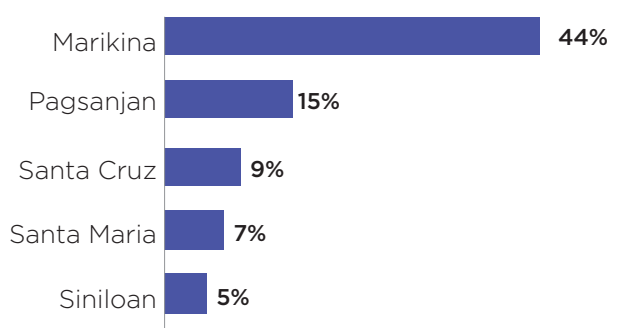
Floods and other water-related disasters account for 70 percent of all deaths related to natural disasters in the world. SDG 6 aims to see integrated water resources management implemented at all levels by 2030.<sup>1</sup>

### Watershed Erosion

#### Sediment production in Laguna Lake watershed (kilotons/year)



#### Watersheds expected to generate most sediments (simulated scenario)



(Watersheds generating 80% of total sediments)

Sources: WAVES. *Philippines Country Report 2016*. World Bank: Washington, DC.

## Card 3 Evidence on Sources of Water Pollutants

### What Do the Accounts Show?

Ecosystem and water accounts for Laguna de Bay, the Philippines, show that household sewage is by far the biggest pollutant in the lake. Targeted actions—for example connecting people to a sewer system—could reduce lake pollution by as much as 80 percent.

In Colombia, water accounts reveal the significance of water pollution. In the Magdalena-Cauca watershed—the area with the highest demand for water—agriculture, industry, and households generated 660,000 tons of organic contaminants each year. In Lake Tota, which provides drinking water to 160,000 households in that watershed, the vast majority of the pollution comes from local onion farmers, according to detailed water accounts about the lake.

Local authorities responsible for the Watershed Management Plan are using this information to design and monitor policies.

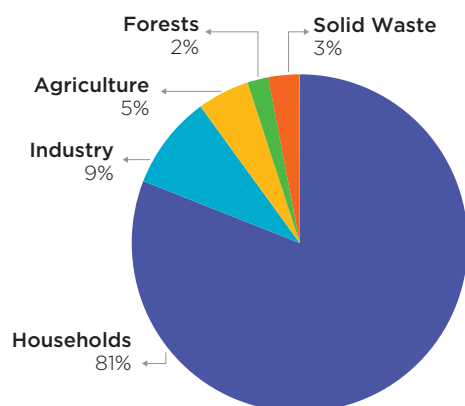
### Why Is This Important?

Water pollution from industry, agriculture, and poor urban sanitation is a growing global problem. Many rivers in the Asia-Pacific region hold up to three times the world average for human waste-derived bacteria.<sup>2</sup> About 20 million hectares of agricultural land worldwide is irrigated with wastewater (treated or untreated).<sup>3</sup>

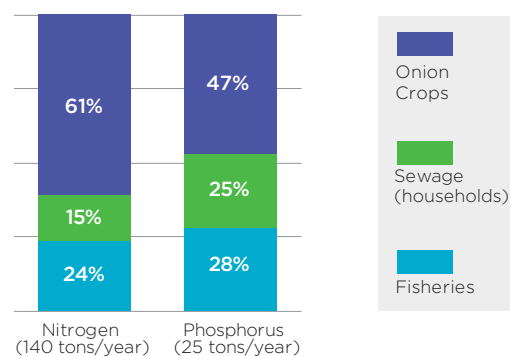
In low-income countries, irrigation is the most prominent and rapidly expanding use of wastewater. If not properly managed or implemented, it can bring not only risks to human health, but also agricultural and environmental hazards. Data from water accounts in Colombia show that nearly all water extractions are from surface sources, hugely exposed to water pollution.

Understanding the type of pollutants in the water is as important as knowing their sources. This can help policy makers fine-tune their policies to individual stakeholders.

Sources of Organic Pollutants into Laguna de Bay, the Philippines (2014)



Sources of Emissions into Lake Tota, Colombia



Sources: WAVES. 2016. *Philippines Country Report 2016*. World Bank: Washington, DC; WAVES. 2016. *Colombia Country Report 2016*. World Bank: Washington, DC.

## Card 4 Inefficiencies in Water Distribution in Costa Rica

### What Do the Accounts Show?

Costa Rica's experience with water efficiency has been mixed. Hydroelectricity is a big success, generating more than 90 percent of electricity.<sup>4</sup> The country has invested in irrigation canals, with expansion plans<sup>5</sup> to support a new climate-smart agriculture strategy. But existing water management for irrigation and water utilities is inefficient because of illegal connections, leaks, and ineffective billing.

Poor management of resources has direct implications for cost recovery strategies, as it means that only a portion of infrastructure investments can be recouped. Water rates are already low,<sup>6</sup> resulting in inefficient use and waste. Unless illegal connections are

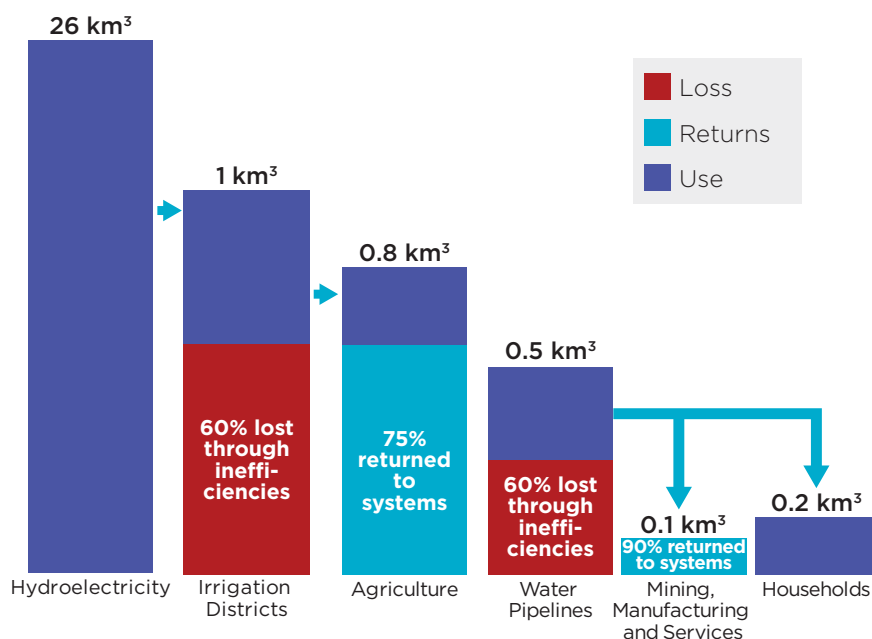
tackled, any increase in rates would probably lead to more free riding.

### Why Is This Important?

Water accounts can be used to understand the levels of efficiency in extraction and distribution of water in Costa Rica. This information will be valuable in designing step-by-step, viable strategies to ensure cost recovery of investments.

The ability to generate revenue from water investments is crucial. Meeting the SDG 6 targets for water supply and sanitation worldwide is expected to cost US\$114 billion per year between now and 2030. Natural capital accounting can provide information on ability to pay but also on bottlenecks in the system and the effectiveness of efficiency strategies.

The Water Picture in Costa Rica: 2012  
(in cubic kilometers, km<sup>3</sup>)



Sources: WAVES. 2016. *Preliminary Results from Costa Rica's Natural Capital Accounts*. World Bank: Washington, DC ([www.wavespartnership.org/en/node/3233](http://www.wavespartnership.org/en/node/3233)).

# Card 5 Water Ecosystems for Food Security in the Philippines

## What Do the Accounts Show?

Ecosystem accounts for Laguna de Bay show the importance of the lake as a source of food, jobs, and revenue. The accounts provide data on fishing strategies: more profitable aquaculture operations are encroaching on open-water capture fisheries, which create jobs for small-scale fishermen.

This tension around access to the lake is exacerbated by deterioration of the ecosystem. The accounts show how sediments and pollution discharges threaten the ecosystem's ability to support this food chain. Resource-rent information can be used to set fair fees for operators of fish pens and fish cages.

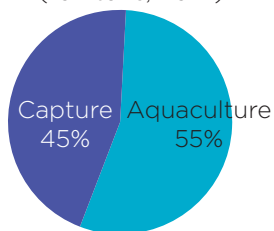
## Why is This important?

Freshwater systems—the network of rivers, wetlands, and lakes—provide benefits to millions of people. In Asia, for example, the Mekong River basin alone provides 2.1 million tons of freshwater fish every year, worth US\$2.1–\$3.8 billion and sustaining 22 million people in Cambodia and the Lao People's Democratic Republic.<sup>7</sup>

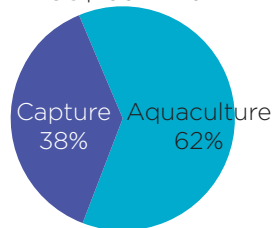
Understanding how water ecosystems contribute to food and job security is an important step toward designing strategies for water access. This may include examining how investments in dams or groundwater abstractions will affect flows for cities downstream, or looking at how best to allocate rights for open-water fishing or aquaculture in lakes and coastal ecosystems.

## Fisheries and the Economy: Policy Implications

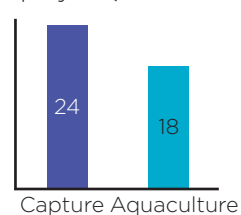
Total Fish Capture (107 tons, 2014)



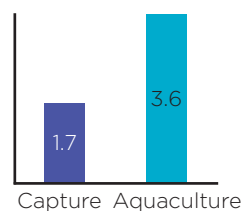
Total Income in 2014: US\$105 Million



Number of People Employed (thousands)



Thousands of US\$ Per Person Employed



### Impact on Local Economy:

- How do fisheries (open-water, aquaculture) contribute in terms of money and jobs?

### Zoning:

- Where are the main sources of pollution, and what are the impacts on food safety in harvested fish?
- What is the distribution between aquaculture and open-water capture?
- Where should aquaculture permits be allocated?

### Monitoring:

- What is the impact of access policies on jobs and revenues?
- Where is the best place to allocate aquaculture permits?
- What is the impact across the economy from redistribution policies?

Source: *Asia Protected Planet Report 2014: Tracking progress towards targets for protected areas in Asia*. World Conservation Monitoring Centre of the United Nations Environment Programme.

## Card 6 Evolution of the Water Sector in Botswana

### What Do the Accounts Show?

Water accounts for Botswana show biophysical and monetary information on sources of water, consumption, and the location of users.

Total water abstractions declined by 5 percent between 2010 and 2015, reflecting a period of drought. Groundwater abstractions rose, but less water was taken from rivers and reservoirs.

Consumption, meanwhile, increased between 2010 and 2013 by 3.4 percent, due to higher use by the mining and government sectors. Water use began to drop after that (2013-15), reflecting a decline by government and “other” productive sectors.

Agriculture was the main user of water throughout the period, with very low added value per cubic meter. But much of this

water is rainfed to subsistence agriculture, providing uncounted added value for millions of people.

### Why is This important?

Having detailed information about water supply and demand can help drive policy and planning. For example, the accounts show the extent to which water contributes to the productivity of different sectors, information that can feed into potential rate reform.

Water accounts show the need for more efficient use of water resources, including the reuse of wastewater. The accounts are being used in the National Water Master Plan, as well as the Master Plan for Wastewater and Sanitation, the 2013 Integrated Water Resources Management Plan, the National Development Plan (2017-22), and Vision 2036.

### Water Account Results

Supply (millions of cubic meters, Mm <sup>3</sup> )		2010/11	2014/15
Abstractions by form of distribution	Own use	99.5	89.8
	Distribution	97.7	98.1
By source	Groundwater	99.3	108.8
	Surface water	97.9	79.1
Total water abstraction		197.2	187.9
Consumption (Mm <sup>3</sup> )		2010/11	2014/15
Agriculture		74.6	70.2
Households		37.2	41.2
Mining		32.4	39
Government		15.7	10.3
Other productive sectors		12.6	6.1
Total water consumption		172.5	166.8

Source: WAVES. *Botswana Country Report 2016*. Washington, DC.

## Notes

<sup>1</sup> United Nations in India. SDG 6: Clean Water and Sanitation ([in.one.un.org/page/sdg-6-clean-water-and-sanitation](http://in.one.un.org/page/sdg-6-clean-water-and-sanitation)).

<sup>2</sup> Evans, AEV, Hanjra, MA, Jiang, Y, Qadir, M, and Drechsel, P. 2012. *Water pollution in Asia: The urgent need for prevention and monitoring*. Global Water Forum.

<sup>3</sup> World Bank. 2010. *Improving Wastewater Use in Agriculture: An Emerging Priority*. World Bank: Washington, DC.

<sup>4</sup> Presidency of the Republic of Costa Rica. *Costa Rica llega a 150 días con electricidad 100% renovable en 2016*.

Available at: [presidencia.go.cr/comunicados/2016/09/costa-rica-llega-a-150-dias-con-electricidad-100-renovable-en-2016/](http://presidencia.go.cr/comunicados/2016/09/costa-rica-llega-a-150-dias-con-electricidad-100-renovable-en-2016/) (accessed May 29, 2017).

<sup>5</sup> World Bank, CIAT, CATIE. 2014. *Climate-Smart Agriculture in Costa Rica*. CSA Country Profiles for Latin America Series. World Bank: Washington, DC.

<sup>6</sup> UNA. 2013. *Ambientales 45. Revista Semestral de la Escuela de Ciencias Ambientales* ([www.ambientico.una.ac.cr/pdfs/ambientales/45.pdf](http://www.ambientico.una.ac.cr/pdfs/ambientales/45.pdf)). Universidad Nacional Costa Rica.

<sup>7</sup> Dugan, P., Delaporte, A., Andrew, N., O'Keefe, M., Welcomme, R. *Blue Harvest: Inland Fisheries as an Ecosystem Service*. United Nations Environment Programme (UNEP). 2010. The WorldFish Center: Penang, Malaysia.

## 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](http://www.wavespartnership.org)

Credit: written by Ina Porras and Rosalind Goodrich, IIED, with contributions from Juan-Pablo Castañeda, WAVES Secretariat.



MIX  
Paper from  
responsible sources  
FSC® C068104



**WORLD BANK GROUP**

1818 H Street, NW, Washington, DC 20433 USA