



## Sewage in Our Seas: *Unmonitored and Unregulated*

### CASE STUDY

# Indonesia

The waters of Indonesia contain some of the most important reef resources in the world and over 60 million people in Indonesia live within 30 kilometers of a coral reef. Coastal development (including sewage) threatens at least 20 percent of Indonesia's reefs. There are no national laws in Indonesia specifically regulating municipal and household sewage treatment. Over 90 percent of households across Indonesia discharge sewage directly into waterways. Although water quality monitoring is mandated by national decree, outside of major urban and tourism areas there is little (if any) coastal water quality monitoring and almost no enforcement of water quality standards by the national government.

### COUNTRY OVERVIEW

Indonesia is part of the Coral Triangle, a region that contains the highest diversity of marine life in the world, including more coral reef species than anywhere else on earth. Most of the reefs in the Coral Triangle are located in the waters of Indonesia and the Philippines, which together possess 77 percent of the region's coral reefs. Over 2,200 reef fish species have been documented in Indonesia's waters. The biodiversity of reefs tends to increase from west to east, with the world's highest concentration of coral species located around the Bird's Head Peninsula (which makes up the northwest portion of West Papua). The Raja Ampat Island just offshore of the Bird's Head Peninsula is considered the "center of the center" of the world's coral reef biodiversity. Southern West



(facing) Jakarta.  
Source: iStock / Yamtono\_Sardi;  
(this page) Satellite map of Raja Ampat Islands.  
Source: Google Earth.  
The main islands: 1. Misool, 2. Salawati, 3. Batanta, 4. Waigeo, 5. Kofiau;  
Fisherman mending lines in Indonesia. Source: Martin Colognoli / Coral Reef Image Bank

Papua contains less abundant reefs but some of the world's most extensive mangrove forests. Indonesia is home to one fifth of the world's mangroves. Nearly 60 million people in Indonesia live within 30 kilometers of a coral reef, the largest reef-associated population of any country in the world. Western Indonesia, where most of the country's population is concentrated, faces the greatest threats to its coral reefs.

## POLLUTION SOURCES

Reefs in Indonesia face significant global and local threats including climate change, overfishing, destructive fishing, and water pollution from coastal development. Based on the World Resources Institute's integrated local threat index,<sup>1</sup> nearly 95 percent of coral reefs in Indonesia are threatened by local human activities. Coastal development, which includes the impacts of sewage from coastal communities threatens about 20 percent of Indonesia's reefs. Watershed-based pollution (sediment and nutrient runoff from deforestation and agriculture) threatens over 40 percent of the country's reefs. Threats to reefs are particularly prominent around Java and the Lesser Sunda Islands, Indonesia's most populated regions. In addition to sewage and sediment and nutrient runoff, heavy metal pollution is becoming more and more recognized in Indonesia, particularly around Jakarta. A number of people in Jakarta have become sick in recent years from consuming green mussels, which absorb the pollutants in Jakarta Bay. Other sources of pollution include chemical pollution from mosquito repellent and antibiotic contamination. Mosquito repellent is sprayed on each night to prevent malaria and then washed off into waterways the following day. In Indonesia, antibiotics are widely available without a doctor's prescription. Antibiotics primarily wind up in waterways via human waste.

Many coral reefs are not located close enough to major municipal areas to study the impacts of large urban populations (and their sewage) on reefs. However, a 2006 study (see Cleary et al.) of Jakarta Bay's coral reefs suggests that the impacts of urban areas can be substantial. The study sampled reefs extending from the northwest coast of Java to reefs 80 kilometers out into the bay. The researchers observed a clear "disturbance gradient," with coral richness, cover, and composition all declining with proximity to Jakarta. Located in Java, Jakarta is one of the largest urban areas in the world with a population of more than 10 million people. Only 5 to 10 percent of households in Jakarta are connected to water treatment infrastructure. The remaining households discharge sewage directly into waterways flowing into Jakarta Bay.

1. WRI's Local Threat Index includes threats to coral reefs from coastal development, watershed-based pollution, marine-based pollution, and overfishing and destructive fishing. For each local threat, an indicator was developed using data reflecting various "stressors," such as human population density and infrastructure features (including the location and size of cities, ports, and hotels), as well as more complex modeled estimates such as sediment input from rivers. Threat diminishes with distance from each stressor. Thresholds for low, medium, and high threats were developed using available information on observed impacts to coral reefs.

## WATER QUALITY MONITORING

Decree Number 51 of 2004 by the State Minister of the Environment delineates water quality standards for "sea water" in Indonesia. Indonesia classifies its coastal areas into three major types of "waters:" port and harbor waters, marine tourism waters, and sea biota waters. Each category is subject to different water quality standards. A port/harbor refers to an area consisting of land and the surrounding waters used as a base for government administrative and economic activities and used as a place for vessels to drop passengers, unload, or load goods. Marine tourism refers to recreational activity or tourism on the sea and on shore. Sea biota simply refers to various types of life forms found in the sea.

Provincial governments must enact water quality standards equivalent to or more stringent than the standards set out by the national decree. Provincial governments must also measure water quality at least two times per year. Even though water quality monitoring is required by decree it is unclear how many of the provincial governments actually monitor water quality regularly. By law, the results of monitoring must be made public, but the results are not published online. For example, the government of Jakarta (Java Province) does regular monitoring of Jakarta Bay but the data can only be accessed by in-person visits to the government office that maintains the data.

## COASTAL WATER QUALITY MANAGEMENT

While the national Ministry of the Environment sets standards for water quality, there is essentially no enforcement of these standards by the national government. Governance responsibility for coastal resources has been the responsibility of the Indonesian Ministry of Marine Affairs and Fisheries since 1999. However, the provincial governments are really left to enforce the standards set at the national level and to take responsibility for mitigating poor water quality.

There is no regulation in Indonesia specifically related to treatment of municipal or household sewage. Essentially all sewage from human settlement goes into rivers or directly into the ocean. Indonesia does have regulations mandating wastewater treatment for certain industries, but these regulations are often not enforced.

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***Only 5–10% of households in Jakarta are connected to water treatment infrastructure. The remaining households discharge sewage directly into waterways flowing into Jakarta Bay.***

In some instances, local tourism authorities have taken it upon themselves to monitor water quality and address wastewater pollution. In partnership with a local NGO called the Wisnu Foundation, Bali's provincial government constructed integrated sewage and drinking water treatment infrastructure that serves the coastal population from the Kuta beach area to the Suluban beach area. Unfortunately, integrated drinking water and sewage infrastructure is expensive and likely only viable in tourism-exclusive areas or areas immediately surrounding major tourism areas. Outside of major tourism areas, there appears to be effectively no enforcement of water quality standards by provincial governments.

While there are a number of international and local NGOs and international development agencies working on Marine Protected Areas, sustainable fishing, and coral reef conservation in Indonesia, there appear to be few organizations working on management of sewage and wastewater.

One local NGOs that does focus on properly treating sewage water is the IDEP Foundation. IDEP is headquartered in Bali and has worked on projects across Java, Sumatra, Kalimantan, West Papua (including Raja Ampat), Sulawesi, and Nusa Tenggara. IDEP has also conducted a project in Timor Leste. For a number of years in Bali, IDEP built community "Wastewater Gardens," developed by the Biosphere Foundation to treat household sewage. IDEP has since shifted the focus of its sewage and wastewater program, and now focuses on working with local communities to minimize sewage disposal into rivers, mangroves, and concentrated cesspools or "dump sites." Most of IDEP's work focuses on developing community awareness and offering training and support for very basic sewage management—i.e., proper construction of septic tanks. IDEP also has a separate (and apparently more developed) program in Bali focused on reducing overuse of groundwater, which Bali depends on for its drinking water supply.

#### SUGGESTED RESOURCES

Burke, L. and Reyntar, K. (2012). *Reefs at Risk Revisited in the Coral Triangle*. World Resources Institute.

Burke, L., E. Selig and M. Spalding. (2002). *Reefs At Risk in Southeast Asia*. World Resources Institute.

Cleary et al (2014). Coral reefs next to a major conurbation: a study of temporal change (1985-2011) in coral cover and composition in the reefs of Jakarta, Indonesia. *Marine Ecology Progress Series* 501:89-98.

*Decree Number 51 of 2004*, State Minister of the Environment, Indonesia

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### Coastal pollution threatens over 40% of Indonesia's reefs.

Komodo, Indonesia. Source: Beth Watson/ Coral Reef Image Bank

