Basin Profile: Chao Phraya River Basin
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Water Scarcity Status

- The Chao Phraya River basin faces three major problems: water scarcity, pollution, and flooding.
- On average, it may seem like the amount of water is suited to the demands of the basin, but in reality this is not the case because of high seasonal variability and inability to manage water effectively.
- The Chao Phraya River Basin has a large network of dams to store water from monsoon season to use during the dry season.

Basin Overview
Thailand
Area: 159,283 square kilometers
Climate: Wet monsoon
Basin population: 24 million

Figure 1. Map of Chao Phraya River Basin (https://en.wikipedia.org/wiki/Chao_Phraya_River)

The Chao Phraya River basin is located entirely in Thailand. It is divided into three regions: the delta, the middle basin, and the upper basin, and is also divided into eight smaller sub-basins. The basin includes several cities that were developed due to their proximity to the river to provide transportation, food and water. The basin covers about 30% of the total area of Thailand.

There is a very pronounced difference between the wet and dry seasons in the basin. The dry season precipitation provides only 16% of total precipitation. Thailand naturally experiences six months of a monsoon season and six months of a dry season, and this only became a problem relatively recently, when the Thai government began controlling the water resources and the economy started growing larger. Today, the two major dams in the basin are the Sirikit and Bhumibol dams, built in 1972 and 1964, respectively. The Sirikit dam is on the Nan River (tributary

to the Chao Phraya) and has a live storage capacity of 6000 Million Cubic Meters, while the Bhumibol dam on the Ping River and has a live storage capacity of 9700 MCM. Combined, these two large dams control 15-22% of the basin's entire runoff. The Thai government has built about 3,000 dams meant to enable use of the monsoon season rains during the dry season. However, this has not been a sufficient way to deal with water scarcity, and something else must be done to mitigate the effects of water shortages on well-being and the economy.

As is common in industrializing nations, Thailand's land use change is classified by rapid urbanization and this is especially pronounced in the outer edges of Chiang Mai. Water is also bound with tradition and religion in Thailand. Most Thai people are Buddhist, and have the tradition of releasing eels, fish, and turtles into the water to seek repentance. There are also Thai festivals surrounding the water, including Loi Krathong and Songkran. The river is also a source of recreation, and long boat races occur that symbolize ancient, heroic, mythical battles in Thai history.

The river basin is controlled by the Royal Irrigation Department. The RID is the agency that is responsible for building and maintaining the dams, diversions, and canals that bring water to the farmers and cities. The distribution of water through these systems and to the people in the Chao Phraya basin is systematic. A certain amount of water is released by the dams and diverted into pipes and irrigation systems. There is no limit on how much of this water may be consumptively used or returned to the river. Part of the mission of the RID is to manage water allocation in equitable and sustainable manners and to encourage participation in water resources management and development. The Thai government realizes the importance of integrated water resource management and is gaining input from all stakeholders, and has set up a River Basin Committee in each of the sub-basins of the Chao Phraya.

In the cities of the Chao Phraya basin, Bangkok contributes 78.2% of the basin's total GDP. The manufacturing industry is strong and includes food processing, textiles, and building materials. As a result of the strong economy of the city of Bangkok, manufacturing accounts for 33% of the basin's total GDP, retail trade for 17%, and agriculture for 5%. The service and tourism industries are also important for Bangkok. The Chao Phraya Basin also contains most of the irrigated area in Thailand and is known as one of Asia's "rice bowls". Rice paddy farmers are increasingly cultivating two or three crops per year to increase profits, rather than just one crop per year. This requires growing during the dry season, which used to be impossible. This has been made possible by using the irrigation systems and can help poor rural farmers by increasing their earnings. However, the increased intensity of cropping requires greater inputs of water, and sometimes those inputs are not available when the year is drier than average.

Water Scarcity Impacts

<u>Environmental Impacts</u>
The land use change in the delta from swamp forest to rice paddy has forced wildlife out, including fish, birds, and probably even tigers and elephants. The original swampy ecosystem no longer exists and probably cannot be recovered. In the river itself, water quality degradation has made the river a stressful place for fish and other organisms to inhabit. Dissolved oxygen levels are much lower than they should be to comfortably support a thriving ecosystem, resulting in a degraded habitat for fish and other aquatic and riparian species. One particular species of fish that has been in serious decline is the striped catfish. It was once an important food source and even considered a staple in Thailand and other areas of Southeast Asia. It is now recognized by the IUCN Red List as endangered.

Social and Economic Impacts

Flooding, pollution, and water scarcity all have negative effects on the economic and social well-being of the citizens of the Chao Phraya basin and of Thailand. One current impact of the combination of flooding and water scarcity on the economy of Thailand is the expected 3.6% decrease in production in 2013-2014 due to drought. After detrimental flooding occurred in 2011 with an associated loss of 1.36 trillion baht, the water held in reservoirs was largely released in order to ensure that the reservoirs could capture future floodwaters and prevent damaging floods. However, this led to a shortage of water during subsequent years as the basin underwent a drought and did not have enough water to release from dams to relieve the dryness. This story highlights the unpredictability of droughts and floods. As climate change continues to get worse, this unpredictability and changes in the rainy season will intensify. Regarding water pollution, it is the people who live in the delta, near Bangkok, who suffer disproportionately. The Chao Phraya is most polluted near Bangkok because that is where pollutants such as heavy metals, carcinogens, are dumped by factories, and pollution from the discharge of agricultural wastes and untreated sewage also make their way downstream to the area, polluting the river with high levels of coliform bacteria

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