

Climate Change and Flooding

Dhaka, Bangladesh

Large Banner (1 for each city ~ 300 words) – 318 words

Known for its Mosques and shrines, Dhaka once the provincial capital and a center of world-wide muslim trade, is the capital city of Bangladesh. It is one of the most rapidly growing megacities in the world and recently being considered as an **urban hotspot for climate change**.

Because of its location in the lower reaches of the Ganges-Brahmaputra Delta, Dhaka naturally experiences recurring flooding and waterlogging, following intense rainfall, nearly every year ((much of Bangladesh is less than 16 feet above sea level). However, **sea level rise due to climate change has accentuated** the already existing concern. **climate change** has compounded the rate and intensity of cyclones and large storms have increased.

Apart from climate change, **human interventions** in the natural river systems, and the changes in the land-use pattern of their catchment areas, is creating steep slopes, causing rivers to carry large amounts of sediments leading to frequent and destructive floods.

It has been estimated by the UN IPCC's reports and analysis that a one-meter sea level rise in the south of the country will entail a 17-20% loss of territory to the sea, meaning that Bangladesh will lose up to 20% of its current landmass, which is going to create a very large climate refugee population. The internal capacity of the state, given its size and resources, to absorb such a large displacement of the human population and large number of climate refugees, certainly does not exist in the country. This may lead to internal destabilization (Muniruzzaman).

It is estimated that around 6 million people were either seriously affected or displaced by the climate-induced disasters in Bangladesh in recent years (UNU-EHS, 2015). The displaced population from the disaster hit areas or the climate refugees were forced to leave their homes, migrate to urban areas and end up living in slums that are highly exposed to other hazards like flooding and water pollution (Martin et al., 2012).

Photos

Small-Scale map

1. Information Display 17x11 (~290 words) – 310 words

In recent years, Bangladesh has become the poster child for climate change for various reasons.

- Bangladesh is an extremely low-lying country and most of the land lies only a few meters above sea level. Much of the country is less than 16 feet above sea level.
- Bangladesh also lies squarely in the pathway of massive cyclones that form in the Bay of Bengal and hit make landfall almost every year. However, in recent years, **climate change** has compounded the rate and intensity of cyclones and large storms have increased.
- Bangladesh also experiences the monsoon rains and in recent years, it has been erratic
- Climate change is boosting silt-heavy runoff from glaciers in the Himalaya Mountains upstream, leading to an increase in flooding and riverbank erosion. **Every year, an area larger than Manhattan washes away.**
- The **Bay of Bengal is rising twice as fast as the global average**. At the present rate of sea level rise, it could take just 25 years for encroaching saltwater to waterlog the farmland and poison fresh drinking water for as many as

10-million people. The forecasted rise of one meter before the end of the century could permanently displace more than 30-million people. **Every year, an area larger than Manhattan washes away.**

- Sea-level rise is pushing saltwater into coastal agricultural areas and permanently submerging large swaths of land and poisoning ground water supplies for entire towns and villages.

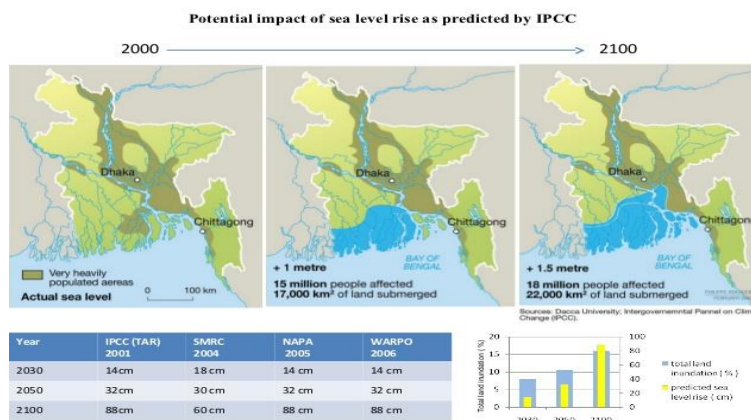
Stories

Ruma Begum (80 years), from Mehendiganj, was forced to move to Dhaka with her family and now lives in Mirpur. “We lost everything to river erosion. We escaped with just our lives,” says Renu who is now living in a slum in the Mirpur district of Dhaka. “Today, boats pass over the place where our land was. We lost everything,” she says.



Renu Bibi (left) and Ruma Begum (Right), both lost their homes to river erosion

Photos



2. Information Display 17x11 (~290 words) – 288 words

Many Bangladeshis affected by climate disruption migrate to **Dhaka** and other bigger cities. The influx of large number of people in these regions is causing **unplanned urbanization, degrading the natural vegetation and water bodies.**

Of the one hundred and forty cities surveyed across the world by the Economists Intelligence Unit (EIU) for its **Global Livability Index, 2019** (which is scored over 30 parameters under five categories: healthcare, infrastructure, culture and environment, stability, and education), **Dhaka was ranked as the world’s third least livable cities in the world.** Forty percent of the Dhaka’s population live in slum areas where people’s security, health, utilities, basic living conditions are highly compromised.

According to Ahmed and Dewan, 2017, **rapid urbanization** in Dhaka is contributing to the problem of flooding in the following ways:

- ✓ waterlogging
- ✓ flash flooding
- ✓ generating more runoff
- ✓ encroachment of the wetlands, floodplain areas and embankments
- ✓ confining flood water inside the river channel, which resultantly raises the flood peak, and bed level and further accentuating the flood conditions
- ✓ development of informal settlements
- ✓ urban heat islands
- ✓ urban landslides
- ✓ traffic jams
- ✓ air and water pollution
- ✓ scarcity of drinking water

Stories

“I jumped into the water to try to save the cattle, but I could not,” says Komola Begum, recalling the floods that forced her family to flee their home



Mossammat Akhter from Charilmabad, southern Bangladesh, and his family. “All the land is under water ... we had to move very quickly. We were left with nothing. I feel like a refugee.”



“One night the water came in ... It was so high it almost reached the ceiling. Our house and all our land were washed away,” said Shoripa Bibi from Kalikabari, southern Bangladesh



3. Information Display 17x11 (3 for each city ~290 words) – 270 words

Due to the torrential downpours, thousands of schools across Bangladesh are flooded and closed for 3-4 months a year, causing an impediment to young children’s education and adversely affecting the availability of resources like, libraries, health clinics, and community centers.

In order to combat the situation and provide continuing education to young children even during the floods, an architect named Mohammed Rezwan, in 1998 invented the, “**Solar Powered Floating Schools**” - a genius invention. He founded the non-profit Shidhulai Swanirvar Sangstha to bring education and improve livelihoods to rural communities in northwestern Bangladesh.



The boat has one classroom that holds about 30 kids. The walls are made of reeds. The lone computer runs off solar panels (*Mahmud Hossain Opu for NPR*)

Each boat accommodates 30 students and is equipped with an internet-linked laptop, library and electronic resources, providing basic education up-to the grade IV level. Shidhulai currently operates a fleet of 111 floating schools, libraries, health clinics and floating training centers, serving close to 500,000 people.

Students at BRAC University in Dhaka is also working towards developing a model for a **floating bamboo home**, one that could survive a flood, or be easily relocated elsewhere in case of inundation

Stories

Seven-year-old Mosammat says, “We can attend classes even during the rainy season, when our homes are barely above water,” the seven-year-old told AFP aboard the vessel in Chalan Beel, some 175 kilometres (around 110 miles) northwest of Dhaka.

Mosammat Jharna, a mother of two says, “My dream of educating my children, including my daughter, has come true,” she told AFP. “I don't want to see them end up illiterate like me.”

Jakarta, Indonesia

Large Banner (300 words) – 299 words

Indonesia is a southeast Asian, archipelagic country located between the Indian and the Pacific Oceans. Its capital, **Jakarta**, is the biggest metropolis in Indonesia and one of the fastest growing economies of the world.

Geographically, Jakarta lies on a low-lying alluvial plain (some parts of Jakarta lie below the sea level) and is prone to frequent flooding. Jakarta experiences a tropical climate and has two seasons – the wet and the dry. During the wet season (October to April), Jakarta receives up to 73 inches of rainfall.

Climate change has caused the Java Sea to rise and is responsible for the weather patterns to become more extreme. According to some scientists, “Jakarta is sinking faster than any other big city on the planet — so surreally fast that rivers sometimes flow upstream, ordinary rains regularly swamp neighborhoods, and buildings slowly disappear underground, swallowed by the earth.”

The **coastal areas** near Jakarta is sinking at a much greater average of six inches a year – and in some places as much as 11 inches - according to a 10-year study by a team of geodynamics experts from the Institute of Technology Bandung. Every year the tide gets about 5cm higher. Coastal districts, like Muara Baru, have already sunk as much as 14 feet in recent years. **Currently, 40 percent of the city is below sea level.**

But climate change is not the only culprit at work in Jakarta. **The city itself is sinking.** The problem is exacerbated by the fact that Jakarta's land is sinking up to 6.7 inches per year. In recent years, floods have devastated homes, vehicles, and local businesses, particularly in Jakarta's poorer neighborhoods.

Jakarta is sinking at an average rate of 3 inches a year, far outpacing the one-third inch annual rise in mean sea level in the area.

Photos

Small-Scale map

1. Information Display 17x11 (~290 words) – 309 words

Jakarta being the economic center of Indonesia, houses more than 10 million people. The country's road coverage is much lower than that of other big cities, creating a **near-permanent traffic jam**. According to the British lubricant producer Castrol's Stop -Start Index, Jakarta had the worst traffic in the world in 2015.

High rates of **urbanization and industrialization** have caused the rivers, channels, canals, and artificial reservoirs to become highly **polluted**. Population growth and intensive farming added to the cause by draining fertilizers, and animal and household waste into the river system. Factories also dump tons of waste and chemicals into waterways, contaminating the city's drinking water supply.

There are serious **health risks** attached to the polluted rivers and canals. The World Health Organization estimates that nationwide, more than 20,000 children die every year from diarrhea.

Only a quarter of Jakarta's residents have access to piped water, which leave the rest to depend on drilling underground for water. **The constant drilling of new wells for fresh water is causing the city to sink at an alarming rate (~ 10 inches per year. "If this goes unchecked, parts of the megacity could be entirely submerged by 2050" (Asian Development Bank).**

Stories

Ibu Sutria, 53, lives in a wooden shack on the banks of West Java's Krukut River, which runs approximately 20 kilometers south from the capital, Jakarta, to the city of Depok. Sutria suffers from regular bouts of stomach-ache and diarrhea, and says the river is constantly flooded. "People use the river for a toilet and children play in it because they have nowhere else to swim." She and others in her community use nearby ground water to wash themselves because they think it is cleaner than river water.



Ibu Sutria along West Java's Krukut River in Indonesia, along which millions live and depend on the polluted river (Photo: Mark Wilson/IRIN).

photos

2. Information Display 17x11 (~290 words) – 252 words

The **sea level rise** in Java sea and **high sedimentation rates in 13 rivers** that flow through Jakarta have compounded the phenomenon of coastal flooding in Jakarta. Coastal flooding has caused enormous economic losses, because besides **causing coastal erosion, it is deteriorating the function of building and infrastructures and decreasing the quality of living environment and life (e.g. health and sanitation condition) in the affected areas.**

The political and ethnic differences existent in the region has added another dimension to Jakarta's issue. Jakarta's former governor, Basuki Tjahaja Purnama, (an ethnic Chinese) ordered the eviction of several Kampung dwellers when he assembled a sanitation crew, called the **Orange Army, to remove sediment and garbage from rivers and canals.** In the process, some of the kampungs that obstructed waterways also had to be cleared. Consequently, many people lost their homes. Several amongst them resisted the move and were convinced that the evictions were really intended to enrich developers, not improve drainage.

Stories

Topaz a 31-year-old event organizer is a third-generation resident of informal neighborhood (Kampung), named Aquarium. He got evicted and his house bulldozed to the ground. "The government said the eviction was about cleaning the river, but I believe it was about politics and development," noted Topaz. He now lives in a tattered, windswept tent which he shares with a dozen other squatters not far from where his family home used to be.

The relation between groundwater extraction, massive urbanization and land subsidence has been explained with the help of the following connectors:



3. Information Display 17x11 (~290 words) - 304

ADAPTATION:

- **Relocation of Capital:** The Indonesian President, Joko Widodo, in August 2019, announced the relocation of the country's capital from Jakarta to the province of east Kalimantan city in Borneo.
- **Sea Wall:** In 2014, the National Capital Integrated Coastal Development (NCICD) in Jakarta, had undertaken the construction of a fifteen-mile sea wall from the city of Tangerang in the west of Jakarta to Jakarta's Tanjung Priok harbor, as a measure of protecting the capital city against flooding. The estimated cost of the project is going to be \$40 million USD and is estimated to take 10 to 15 years, before construction of this wall is realized.
- Attempts are being made to use the process of **desalination**. However, the scale of water use in Jakarta is immense, and the cost of the infrastructure and the cost of the energy to desalinate the ocean water would be massive.
- **Clean the canals and rivers.** This can be achieved by regulating the factories and households that dump chemicals and garbage. However, the cleaning effort could potentially create a secondary problem of resettling the informal communities (who would get displaced) into new land and building homes for the internally displaced people. In 2018 the President Joko Widodo **initiated a seven-year clean-up campaign**. As part of Widodo's anti-pollution campaign, the Indonesian Army was called to assist in the clean-up process, who were allowed to seal off factory pipelines they suspect of funneling contaminated water into streams and rivers without first gathering evidence and issuing warnings.
- **Recycle plastic products:** A small first step towards achieving this goal was witnessed in the Bandung area of Jakarta. In order to encourage recycling, the authorities here are supporting initiatives called, "**Eco-villages**," where residents can bring old plastic items and earn small amounts of money in exchange. The plastics are then divided by type and recycled.