



Examples of places adapting to Climate Change around the World

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Author:

Olivier R i b e r t

Position:

Managing Director



All over the World

From Bangkok to Miami, cities and coastal areas across the globe are already building or planning defenses to protect millions of people and key infrastructure from more powerful storm surges and other effects of global warming. Some are planning cities that will simply adapt to more water. But climate-proofing a city or coastline is expensive, as shown by New York Mayor Michael Bloomberg's \$20 billion plan to build floodwalls, levees and other defenses against rising seas. The most vulnerable places are those with the fewest resources to build such defenses, secure their water supplies or move people to higher ground. How to pay for such measures is a burning issue in U.N. climate talks, which recently wrapped up a session in the German city of Bonn.

Find below a sampling of cities around the world and what they are doing to prepare for the climatic forces that scientists say are being unleashed by global warming:

Rotterdam, Venice, London, Miami, New York, Bangladesh, the Maldives, Bangkok, Cuba, Mbeere.

Rotterdam, Netherlands

In a country where two-thirds of the population lives below sea level, the battle against the sea has been a matter of life and death for centuries.

The Dutch government devotes roughly 1 percent of its annual budget to its intricate system of dikes, dunes and sea walls. Improvements to cope just with the effects of Climate Change have been carried out since 2003 — though planning began well before that.

The focus in the 20th century was on a spectacular series of sea defenses, including massive steel and concrete barriers that can be quickly moved to protect against storm surges.

But current techniques embrace a philosophy of "living with water." Floods are inevitable,



and it's better to prepare for them than to build ever-higher dikes that may fail catastrophically.

Thousands of waterways are being connected so the country can essentially act as one big sponge and absorb sudden influxes of water. Some areas have been designated as flood zones. Houses that can float have been a building sensation.

Along the coast, the country has been spouting huge amounts of sand in strategic locations offshore and allowing the natural motion of waves to strengthen defensive dunes.

Venice, Italy

Sea level rise is a particular concern for this flood-prone city. The city is in the process of realizing an expensive and often delayed system of underwater barriers that would be raised in the event of flooding over 43 inches (110 centimeters), higher than the 31-inch (80-centimeter) level that floods the famed St. Mark's Square. Venice, a system of islands built into a shallow lagoon, is extremely vulnerable to rising seas because the sea floor is also sinking.

The constant flooding puts the city's considerable architectural treasures at risk. Venice has experienced 10 events over 4 feet 7 inches (140 centimeters) since 1950, including a devastating 1966 flood. Plans for the new so-called Moses barriers will cost more than 4 billion Euros. The first of these have been moved into place very recently. Many Venetians remain skeptical of the project due to the high costs and concerns over environmental risks.

London, UK

The low-lying capital of a perpetually soggy country, London has long been vulnerable to flooding — particularly when powerful storms send seawater racing up the River Thames. But Londoners already have a powerful flood defense: the 570-yard-long (half-a-kilometer-long) Thames Barrier, composed of 10 massive steel gates, each five stories high when raised against high water. Some have called for Thames Barrier — in operation since 1982 — to be replaced or supplemented by an even more ambitious flood defense system farther down the river. But Britain's Environment Agency says the defenses should hold until 2070.

Meanwhile, environmentally conscious Londoners have made plans to battle some of the other predicted effects of global warming by promoting better water management, expanding the city's Victorian sewage network, and "urban greening" — the planting of trees and rooftop gardens to help manage the urban heat island effect.

Miami, Florida, USA

It is one of those places that show up as partially under water in many sea level projections for this century. So it's no surprise local leaders are seeking ways to adapt. Four counties of South Florida, including Miami-Dade, have collaborated on a regional plan to respond to



Climate Change. Their overarching goal: keeping fresh water inland and salt water away.

The first action plan calls for more public transportation, stemming the flow of seawater into freshwater, and managing the region's unique ecosystems so they can adapt. Before writing the plan, the counties reviewed regional sea level data and projected a rise of 9 to 24 inches (23 to 61 cm) in the next 50 years along a coastline that already has documented a rise of 9 inches over the last 100 years.

"The rate's doubled. It would be disingenuous and sloppy and irresponsible not to respond to it," said Monroe County Administrator Roman Gastesi, who oversees the Florida Keys.

New York, USA

Mayor Michael Bloomberg recently announced one of the most ambitious plans for defending a major U.S. city from climate change. Recommendations range from installing removable floodwalls in lower Manhattan to restoring marshes in Jamaica Bay in Queens, and from flood-proofing homes to setting repair timeframe standards for phone and Internet service providers.

In lower Manhattan, a removable system of posts and slats could be deployed to form temporary floodwalls. The height would depend on the ground elevation and potential surge. The approach is used along some Midwestern rivers and in the Netherlands, city officials said.

Projects also include a 15-to-20-foot levee to guard part of Staten Island, building dunes in the Rockaways, building barrier systems of levees and gates to bar one creek from carrying floodwaters inland, and possibly creating a levee and a sizeable new "Seaport City" development in lower Manhattan.

Bangladesh

A low-lying delta nation of 153 million people, Bangladesh is one of Asia's poorest countries, and one that faces extreme risks from rising sea levels. Its capital, Dhaka, is at the top of a list of world cities deemed most vulnerable to climate change, according to a recent survey by risk analysis company Maplecroft. The World Bank says a sea level rise of 5 inches (14 centimeters) would affect 20 million people living along the country's 440-mile (710-kilometer) coast. Many of these people would be homeless.

Bangladesh is implementing two major projects worth \$470 million that involve growing forests on the coastal belt and building more multistory shelters to house people after cyclones and tidal surges. Developed nations have so far provided \$170 million to the fund.

"Bangladesh is opting for adapting to the climate change impacts as the world's developed nations are not doing enough to cut down carbon emissions," said Forest and Environment Minister Hasan Mahmud in a recent speech in Dhaka. *"We want the donors to contribute more to our efforts."*



Maldives

Up-market beach paradise for tourists, it has also become a symbol of the dangers of climate change. Made up of hundreds of islands in the Indian Ocean, it's one of the most low-lying nations in the world, and exceptionally vulnerable to rising seas. Some scientists have said the Maldives could disappear within decades, and former President Mohamed Nasheed even proposed relocating all 350,000 inhabitants to other countries.

While other researchers say those fears may have been overblown, the country is taking measures to protect itself. A seawall was built around the capital, Male, after flooding in the 1980s. That wall protected the city from the worst effects of the devastating 2004 tsunami, which temporarily put large swaths of the country under water.

The country's climate adaptation plans call for relocating residents from small vulnerable islands to bigger, better protected ones. It's also creating new land through land reclamation, expanding existing islands or building new ones, to ease overcrowding. The reclaimed land is being elevated to better withstand rising seas.

Bangkok, Thailand

Even before the consequences of climate change became evident, scientists were well aware that Bangkok — whose southern suburbs border the Gulf of Thailand — was under serious threat from land subsidence. Sea level rise projections show Bangkok could be at risk of inundation in 100 years unless preventive measures are taken. But when the capital and its outskirts were affected in 2011 by the worst flooding in half a century, the immediate trigger was water runoff from the north, where dams failed to hold very heavy rains. Industrial areas in the capital's suburbs, housing important businesses, were devastated. So the focus was put on a short-term solution for that area.

The government recently announced winning bids totaling 290.9 billion baht (\$9.38 million) by Chinese, South Korean and Thai firms to run the flood and water management schemes, including the construction of reservoirs, floodways and barriers. Solutions to the problem of rising seas are still being studied.

"Construction alone is not sustainable," says Seree Supratid, director of a climate and disaster center at Rangsit University. "People have to adapt to nature. For example, you know Bangkok will be flooded by the rising seas in the next 100 years, then you have to learn to build your houses in a way the floodwater cannot reach it, putting it up high or something."

Cuba

Officials recently finished a study of the effects of climate change on this island's 3,500 miles (5,630 kilometers) of coastline, and their discoveries were so alarming they didn't immediately share the results with the public to avoid causing panic.



According to the report, which The Associated Press obtained exclusively, rising sea levels would seriously damage 122 Cuban towns or even wipe them off the map by 2100. Scientists found that miles of beaches would be submerged while freshwater sources would be tainted and croplands rendered infertile. In all, seawater would penetrate up to 1.2 miles (2 kilometers) inland in low-lying areas, as oceans rose nearly 3 feet (85 centimeters).

Those frightening calculations have spurred systemic action in Cuba, the largest island in the Caribbean and one that is heavily dependent on beach-loving European and Canadian tourists. In recent months, inspectors and demolition crews have begun fanning out across the island with plans to raze thousands of houses, restaurants, hotels and improvised docks in a race to restore much of the coast to something approaching its natural state.

In the tourist resort of Varadero, the country faces a dilemma: Tearing down seaside restaurants and hotels threatens millions of dollars in yearly tourism revenue, while allowing them to stay puts at risk the very beaches that are the main draw.

Mbeere, Kenya

While sea level rise threatens some coastal communities in Africa, the continent faces even bigger climate-related problems inland. Climate scientists have projected shifts in rainfall patterns leading to extended droughts in some areas and increased flooding in other parts. To small-scale farming communities, these shifts could be disastrous, adding further stress to scarce water supplies. Adaptation therefore is focused on learning to cope with the climatic changes, adjusting farming practices and improving water conservation efforts.

In Kenya's Mbeere district, where people say they're noticing longer dry spells, U.K.-based charity group Christian Aid is teaching farmers to help them predict the seasons and know better what to grow and when to plant. A text messaging system helps farmers get up-to-date weather reports specific to their locations.

"We are supporting them to access and interpret climate information and help them make forward-looking decisions so that their farming is better suited to the predicted changing conditions," said Mohamed Adow, of Christian Aid. "Farmers live off the land and the weather, and small changes to weather patterns can be a big disaster to small-scale farmers in Africa whose entire livelihoods and well-being depend on farming."

Olivier R i b e r t
Managing Director

"If you cannot do great things, do small things in a great way."
Napoleon Hill