

Vanishing Cities: How the City of Bangkok is Sinking into the Sea

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I. Thesis

The city of Bangkok is sinking into the ocean at an alarming rate. Some parts of Bangkok are facing sinkage rates of between one to two centimeters a year, and the sea level rises up to four millimeters each year¹. A combination of climate and infrastructure crises is causing families to be displaced and entire villages destroyed. Extreme measures must be taken to preserve what is left of the Thai capital. If not, the city is sure to vanish.

II. Introduction

Even before settlement and development, Bangkok was set up for environmental risk due to its geographical location and local environmental trends. The timeline of this risk has been expedited further by climate change and rapid urban development. Factors such as dried-up aquifers, the over-extraction of groundwater, an unsuitable foundation upon which the city, and rising sea levels all lead to the problem Bangkok is currently facing: each year, pieces of coastal land and buildings are consumed by the sea.

A. Soil Layers and Foundation

The layers of many cities and towns consist of sand and gravel, aquifers, followed by more sand and gravel, and eventually a sturdy rock layer. The sturdier the substance of the layers, the more suitable the ground becomes for development. Bangkok and other cities

¹ CNA, [Asia's Sinking Cities: Bangkok](https://youtu.be/aRkam9DiRRE), YouTube, (March 11, 2020), <https://youtu.be/aRkam9DiRRE>

threatened with sinkage instead consist of a soft layer of sand and clay. When pressure is added to soft material like clay, it begins to mold and warp, causing the land to compress, break, and shift. The sheer weight of rapid urban development occurring in Bangkok has caused the city to sink in slow motion (up to two centimeters a year) due to the pressure being placed on the land². This, in combination with rising sea levels, presents a major risk. Bangkok's mostly clay foundation requires moisture to remain somewhat sturdy. Steel and concrete - materials used for urban development that are not known for being porous - prevent rainwater from soaking into the ground. Once clay dries out, it becomes more prone to subsidence.

B. Aquifers

Aquifers can be described as similar to an underground well; a body of permeable rock which contains groundwater that can be extracted for use and are an extremely valuable source of water for those not living along the coastline. Due to the increase in floodwaters leading to salinity in their surface water, Bangkok has had to rely heavily on these aquifers³. Citizens of Bangkok have quickly found themselves depleting the groundwater supply and having to bring in drinking water from outside sources due to the high population⁴. The rapid expansion of the city has caused increasing numbers of these aquifers to dry up and create pockets of air and gaps in the layers. Drained aquifers can begin to collapse leading to sinking ground that further lead to gaping fissures in the land⁵. These conditions, combined with soft layers of sand and clay, create the exact issue that Bangkok and other cities face.

² *Id.*

³ Rina Chandran, [Salty water in Bangkok is new 'reality' as sea pushes farther inland](https://www.reuters.com/article/us-thailand-water-bangkok/salty-water-in-bangkok-is-new-reality-as-sea-pushes-farther-inland-idUSKBN1Z90V3), Thomson Reuters, (Jan. 10, 2020) <https://www.reuters.com/article/us-thailand-water-bangkok/salty-water-in-bangkok-is-new-reality-as-sea-pushes-farther-inland-idUSKBN1Z90V3>.

⁴ *Id.*

⁵ Ian James, [A 'hidden crisis': Millions of groundwater wells are at risk of running dry, scientists find](https://www.azcentral.com/story/news/local/arizona-environment/2021/04/28/scientists-find-many-groundwater-wells-risk-running-dry/7347312002/), AZ Central (April 28, 2021), <https://www.azcentral.com/story/news/local/arizona-environment/2021/04/28/scientists-find-many-groundwater-wells-risk-running-dry/7347312002/>.

C. Flood Waters

In 2011, Bangkok experienced its worst flooding in history, which devastated most of the community for over three months. Many took up residency on bridges for up to a year. The severity of the disaster caught many authorities and residents off guard⁶. The flood had occurred during the rainy season, and the dams used to hold back these floods were already overwhelmed with water. To take pressure off the dams before they broke, the dam waters were released south into the Chao Phraya river. However, the water overflowed the river bank⁷. Due to poor water management and poor drainage systems, the river then flooded many of the surrounding areas.

D. Rising Sea Levels

Bangkok is built at below sea level, rendering the city extremely susceptible to sea-level rise. At high tide, the sea level is already higher than coastal Bangkok, although city dwellers have some protections from better water management such as the floods wall built in 2011 and reinforced in 2019; those outside the wall are less protected. Scientists from Climate Central predict that in the next 30 years, at least 40% of Bangkok will be underwater due to the disproportional rate at which sea levels are rising and the city is sinking⁸.

III. Protective Measures and Action

A. Relocation

The ability to get up and relocate seems like an obvious response. However, many of the families that are stuck in these flooded coastal villages are reliant upon fishing and agriculture as their only source of income. The fields once used for farming are now flooded and inoperative⁹.

⁶ CNA, Asia's Sinking Cities: Bangkok, YouTube, (March 11, 2020), <https://youtu.be/aRkam9DiRRE>.

⁷ *Id.*

⁸ New study shows Bangkok will be under water in 30 years, The Nation (Oct. 31, 2019), <https://www.nationthailand.com/in-focus/30377946>.

⁹ Jon Fernquest, Floods: Damage to farms & crops, Bangkok Post (Nov. 16, 2011), <https://www.bangkokpost.com/learning/advanced/266566/floods-damage-to-farms-crops>.

The lands are too flooded to grow anything, and the areas once used for fishing are now overrun with debris and depleted of fish due to over-fishing¹⁰. With no stable income, many families are stranded both literally due to the floodwaters, and financially. If they were to find safety in another city, many would not have the skillsets necessary for employment and survival in a city. Those who are fortunate enough to have family support are often able to relocate. Many others are forced to use materials such as mud and clay to fortify what is left of their homes and to protect themselves against flooding¹¹. As floodwaters rise, the villagers add on more and more mud. Mud is not a stable building material, so this is only a temporary and unconventional fix. This leads to hopelessness within communities as this is one of the only options available to them to combat rising sea levels.

B. Building Walls

To address the problem of flooding, the city of Bangkok attempted to remediate it by building floodwalls along the coast. This tactic has shown some success in preventing flood damage, but not for those that live beyond the walls and closest to the shoreline who remain unprotected and whose homes flooded¹². This means that most of the families that have lived in coastal villages for centuries, along with temples full of history, have been left to their own devices.

To assist those that had essentially been left to fend for themselves outside the wall, the government provided limited resources such as bamboo and rocks to build their own protection¹³. The villagers have used these materials for barriers, but those are only temporary

¹⁰ CNA, [Sink or Swim? Asia's Sinking Villages Engulfed By Rising Seas](https://youtu.be/hA_bCRjqo9o), The Longest Day, (Sept. 19, 2020), https://youtu.be/hA_bCRjqo9o.

¹¹ *Id.*

¹² Thin Lei Win, [Bangkok struggles to protect slum dwellers as flood worsens](https://www.reuters.com/article/us-thailand-floods-bangkok/bangkok-struggles-to-protect-slum-dwellers-as-floods-worsen-idUSKBN19A0KL), Thomson Reuters (June 19, 2017), <https://www.reuters.com/article/us-thailand-floods-bangkok/bangkok-struggles-to-protect-slum-dwellers-as-floods-worsen-idUSKBN19A0KL>.

¹³ CNA, [Asia's Sinking Cities: Bangkok](https://youtu.be/aRkam9DiRRE), YouTube, (March 11, 2020), <https://youtu.be/aRkam9DiRRE>

measures and are no match for the sea's persistent approach. Most of those affected by the flooding issues and rising sea levels are those living in poverty and cannot afford to buy sturdier material. Their only chance is to use 'natural barriers' to help buy them time.

C. Natural Barriers

Many villages have tried to implement natural methods to maintain sea levels. For instance, mangroves have been planted to help create natural barriers to keep high waters at bay and to draw in fish and other species for those relying on them for subsistence¹⁴. In addition, mangrove forests act as a natural defense barrier along the coastlines, protecting them from tides, storm surges, currents, and even tsunamis. They help to reduce soil erosion and act as an effective carbon sink; carbon sinks are anything naturally found in the environment, such as plants and trees, that can accumulate and store carbon dioxide, removing it from the atmosphere¹⁵. However, mangroves are not a foolproof solution: they thrive in areas that aren't quite land and aren't quite ocean¹⁶. They require an exact amount of seawater – too little and they dry out; too much and they drown¹⁷. So, although they are beneficial in combating rising sea levels, they are not a one-size-fits-all prevention method for the impacts of climate change upon this community.

IV. Green Infrastructure

A. Chulalongkorn University Centenary Park

Chulalongkorn University, located in downtown Bangkok, built the Chulalongkorn University Centenary Park. This elevated, linear park is the city's first new park in nearly 30

¹⁴ *Id.*

¹⁵ What is a carbon sink?, ClientEarth, (Dec. 22, 2020), <https://www.clientearth.org/latest/latest-updates/stories/what-is-a-carbon-sink/>.

¹⁶ Andrew Kolb, Six Facts You Need to Know About Mangroves, Conservation International, (July 25, 2016) <https://www.conservation.org/blog/6-things-you-need-to-know-about-mangroves-but-never-thought-to-ask>.

¹⁷ *Id.*

years. Due to the rapid development in Bangkok, much of the city's greenery has been swallowed up by cement and concrete, causing temperatures to rise¹⁸ in what is known as an "urban heat island" effect. This causes an increase in energy costs, and air pollution¹⁹. These factors are then exacerbated by the climate change crisis.

The Park, the very first of its kind as a critical piece of 'green infrastructure', features a specifically designed wetland with a rain garden retention pond and underground water drainage system to allow the ground to retain moisture²⁰. The retention pond absorbs rainfall, which helps to avoid flooding during the rainy season, and stores it within concrete layers that keep it moist and avoid subsidence. The pond can hold up to one million gallons of water. The Park also features detention lawns in case of excess flooding and a green roof. In addition to this green infrastructure, it is still a Park that provides greenery for the citizens of Bangkok. Parks are beneficial in preserving water and air quality, which is crucial for the city. Unfortunately, because of the high cost, little availability of open land, and low-income value for the city, green parks such as this one are rarely ever built.

B. Chao Phraya Sky Park

Built over the large Chao Phraya River, is the very first Sky Park Bridge, which connects Bangkok to the city of Thonburi. The bridge is a pedestrian-only walkway of about 280 meters in length, 8.5 meters in width, and has a 360-degree view of the city. The idea originated from the refurbishment of an old and abandoned electric train track. Plants and greenery were specifically selected for resistance to Bangkok's various weather conditions. Similar to the Park, this Sky

¹⁸ CNA, Asia's Sinking Cities: Bangkok, YouTube, (March 11, 2020), <https://youtu.be/aRkam9DiRRE>.

¹⁹ Reduce Urban Heat Island Effect, U.S. Environmental Protection Agency, (April 15, 2022), <https://www.epa.gov/green-infrastructure/reduce-urban-heat-island-effect>.

²⁰ CNA, Asia's Sinking Cities: Bangkok, YouTube, (March 11, 2020), <https://youtu.be/aRkam9DiRRE>.

Park has allowed for more greenery to be placed back into the city which can reduce the urban heat island effect and welcome more wildlife to the area.

These two pieces of green infrastructure are highly innovative and beneficial for the city's overall ecosystem; a giant step in the right direction and a landmark for paving the way for future infrastructure. Building major projects such as these are beneficial to serve as a long-term initiative to slow the impacts of climate change for future generations. However, there is still a lack of initiative for immediate and acute change. Before updating already existing structures in urban Bangkok, there needs to be a focus on allocating funds to those who desperately need it, and to mitigating immediate problems. It would bode well for the Bangkok government to create infrastructure that provides long-term benefits, such as the parks, but also infrastructure that provides short-term benefits to reduce the destruction that's currently plaguing the coastline.

V. Other Countries Handle the Climate Crisis

A. *City of New York v. Chevron*

On 1 April 2021, the city of New York appealed (and lost) the lower court's dismissal of its case, aiming to hold five of the world's top oil-producing companies liable for the consequences of climate change²¹. The City sued the oil companies under New York tort law seeking to recover damages for the harm caused by global greenhouse gas emissions which contributed to overall warming²².

The court dismissed the case because "[t]o permit this suit to proceed under state law would risk upsetting the careful balance that has been struck between the prevention of global

²¹ Jones Day, *Second Circuit Affirms Dismissal of New York City's Climate Suit*, JD Supra, (April 12, 2021), <https://www.jdsupra.com/legalnews/second-circuit-affirms-dismissal-of-new-4009708/>.

²² *City of New York v. Chevron Corp.*, 993 F.3d 81

warming ... and energy production, economic growth, foreign policy and national security."²³ Meaning that to permit the case would upset the multinational, mega-corporations responsible for a good portion of global warming, for the sake of keeping the economy “stable” and avoiding federal interest conflicts.

Though the city was unsuccessful in its claim, this does lead to a bigger question: who exactly is exacerbating the climate crisis, and in turn contributing to the downfall of cities like Bangkok? An entire city had brought suit to protect the quality of life for its citizens and was told that it could not hold those contributing to the problem accountable. More specifically, what rights are available for the citizens of Bangkok and to those in its surrounding villages?

Perhaps legal and political solutions are the answer. New York was unsuccessful because it chose to file suit against corporations whose production makes up for a large portion of the oil the country relies on. If New York were to be successful, it would disrupt the “careful balance” of the economy and would create a slippery slope of suing corporations because of their green footprint, or lack thereof. If citizens took to their political office and gave cities no choice but to act against their politicians in power, would they find themselves to be more successful?

This leads to the discussion of climate debt: a debt owed to developing countries by developed countries for their large contribution to climate change and the impact it’s had on the developing country. In this case, who should be paying the villagers of Bangkok’s “debt”? Basic tort law says that if one party causes harm to another, the former should be held responsible for the damage caused. If the Thai government harms its citizens by failing to act, they should be held responsible through legal recourse and enacted legislation; a government entity is not immune to the hammer of justice.

²³ Jones Day, [Second Circuit Affirms Dismissal of New York City’s Climate Suit](https://www.jdsupra.com/legalnews/second-circuit-affirms-dismissal-of-new-4009708/), JD Supra, (April 12, 2021), <https://www.jdsupra.com/legalnews/second-circuit-affirms-dismissal-of-new-4009708/>.

B. Australia's New Law

In 2021, the Australian Federal Courts ruled in a landmark climate change case that has marked a crucial moment in history. The class-action case, brought on behalf of Australian children and teenagers against the country's Environment Minister, Sussan Ley, was to prevent Ley from approving a coal mine project that was argued to endanger the children's future because of climate hazards such as health issues, injury, or death²⁴. Although the order to stop the minister was dismissed, this led the Court to an even bigger decision: the environment minister owes a duty of care to Australia's young people not to cause them physical harm in the form of personal injury from climate change²⁵. This was a landmark decision that set a precedent to hold the Australian federal government accountable for the harmful impacts of climate change. Unfortunately, the landmark decision was since overturned because it found that the duty of care was far too big of an imposition to be placed on Ley. Another reason the justices provided was that court processes were unsuitable to determine matters of public policy²⁶. This turnover leads us back to the root question of who is responsible for environmental damage suffered citizens, if not their government?

C. Venice, the City of Canals

Venice, one of the most well-known cities in Italy, is notorious for being "built on water" and using water canals as a major mode of transportation. Similar to Bangkok, Venice experiences rising sea levels as well as flooding, so how is it that one city thrives by being built

²⁴ Laura Schuijers, [In a landmark judgment, the Federal Court found the environment minister has a duty to care to young people](https://theconversation.com/in-a-landmark-judgment-the-federal-court-found-the-environment-minister-has-a-duty-of-care-to-young-people-161650), The Conversation (May 27, 2021), <https://theconversation.com/in-a-landmark-judgment-the-federal-court-found-the-environment-minister-has-a-duty-of-care-to-young-people-161650>.

²⁵ *Id.*

²⁶ Adam Morton and Tamsin Rose, [Sussan Ley does not have a duty of care to protect young from climate crisis, appeal court rules](https://www.theguardian.com/australia-news/2022/mar/15/sussan-ley-does-not-have-duty-of-care-to-protect-young-from-climate-crisis-appeal-court-rules), The Guardian (March 15, 2022), <https://www.theguardian.com/australia-news/2022/mar/15/sussan-ley-does-not-have-duty-of-care-to-protect-young-from-climate-crisis-appeal-court-rules>.

on water, while the other is being destroyed? The main factor: the Italian government built the city of Venice with one thing in mind: to outsmart the floods that have been plaguing the city for centuries²⁷. Knowing that the rising sea levels were going to become a major element, buildings and roadways were constructed to accommodate. Unlike Venice, Thailand's government has very seldom acknowledged the issue of flooding and rising sea levels, let alone make any major infrastructural changes to combat this problem. Some businesses in Venice, such as the Libreria Acqua Alta, translating roughly to "high water" library, have made themselves well-known and infamous simply because it floods²⁸. Although Venice is constantly facing new problems with flooding as climate change is becoming more of a problem than ever, they are more equipped to handle any adjustments because the Italian government has acknowledged and addressed the ever-growing crisis; something Thailand has failed to do.

VI. Conclusion

Despite some efforts, the city of Bangkok is still sinking into the ocean at an alarming rate and unless the government can do more, families will be displaced and villages destroyed. Although the city's foundational layers are made up of soft clay and soil does not mean all is lost. The green infrastructure has allowed wildlife to regain home in an otherwise highly populated urban area, and they also benefit the overall air quality of the city. If the government can work to create specific architecture just like the green infrastructure, to cater to the needs of the land and its soft foundation, instead of trying to combat it all together, similar to Venice and its use of waterways and canals, we can see a major change in the overall well-being and survival of its citizens.

²⁷ Daniel Van Boom, [Venice's desperate 50-year battle against floods](https://www.cnet.com/science/features/venices-desperate-50-year-fight-against-floods/), CNET (Oct. 9, 2020), <https://www.cnet.com/science/features/venices-desperate-50-year-fight-against-floods/>.

²⁸ *Id.*

The Bangkok government has built a wall separating the bustling urban metropolis, from the historical fishing and agricultural villages. If you are not rich enough to relocate yourself to a more populated area, you are receiving no protection from the government. Simply providing bamboo as protection to those outside the wall isn't enough. They need sturdier resources such as concrete and brick to be able to sufficiently protect themselves from the rising sea level.

Thailand's government has even gone so far as to discuss the idea of simply 'changing' the capital, meaning Bangkok would no longer be identified as the capital of Thailand. An attempt to completely dismiss the issue at hand and to relieve themselves of being held, even less accountable for what's happening to their coastal villages. Australia has taken a landmark case in holding the Australian federal government accountable for the harm to its citizens. We need to start implementing this type of responsibility worldwide and realizing that government officials should be elected into their positions because they want to help their citizens, not hinder them.

The conclusion of this paper is the unfortunate reality that there is no perfect solution to both fighting climate change and preventing the destruction of the coastal villages of Bangkok. There are only potential remedies such as building more reinforcing walls, but this time, ensuring the protection of those formerly left exposed to the elements. Or, perhaps, using the same ideas when building green infrastructure, to build suitable homes for those facing displacement. Setting legal precedents such as Australia has, or even New York's attempt to hold those accountable is exactly the type of movement we need to see to make change and improvement. There is no perfect solution as climate change is inevitable, but we as a nation can bring awareness to the problem occurring in Bangkok; with more exposure comes more action. Unless we answer this call to action, Bangkok and all of its history will vanish.

