

Strategic Analysis Paper

18 July 2019

The Mekong Delta: Land Subsidence Threatens Vietnam's "Food Basket"

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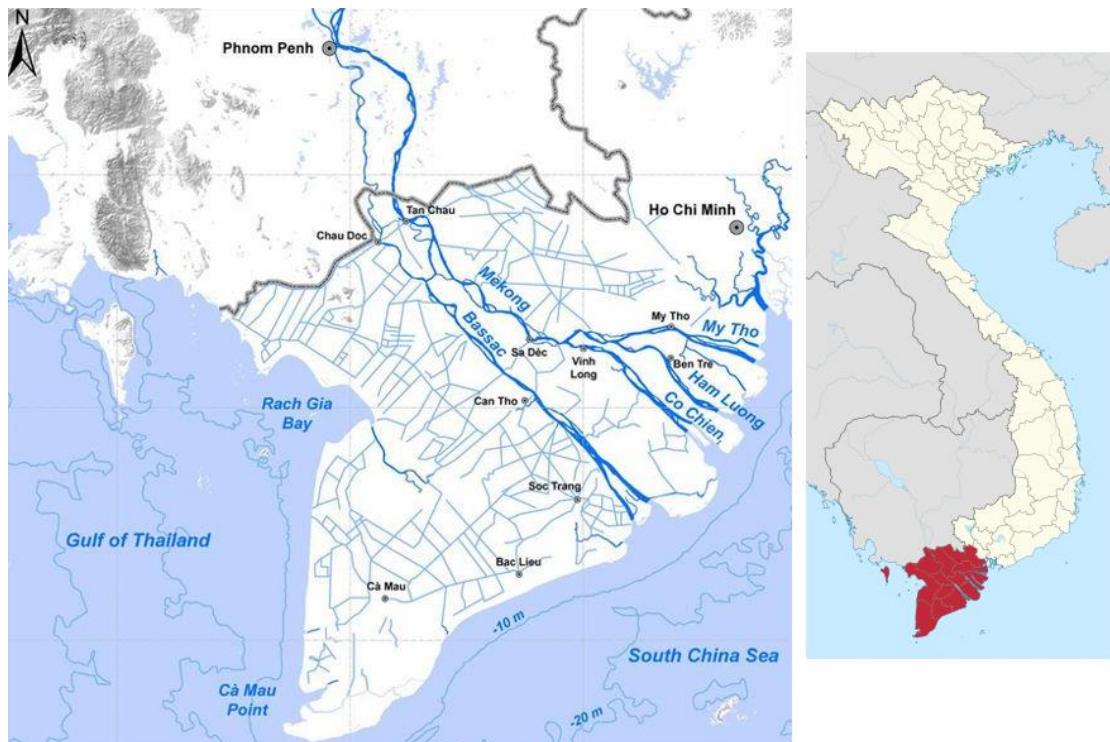
Global Food and Water Crises Research Programme

Key Points

- The Mekong Delta is the most agriculturally productive region of Vietnam. Most of the country's rice, aquaculture and fruit production is located there.
- Vietnam is the second-largest rice exporter in the world. The Mekong Delta produces enough food for almost 200 million people and any significant reduction in agricultural output would have consequences for global food security.
- Unsustainable agricultural practices, rising sea levels, land subsidence, the construction of dams on the Mekong River and increased soil and water salinisation threaten to reduce the productivity of the region's agricultural sector.
- The causes of most of those challenges are beyond Vietnam's control. Reducing the use of groundwater in the delta is the best option available to it.

Summary

The Mekong Delta, which is located in southern Vietnam, is one of the most important food-producing regions in South-East Asia. It is under growing threat from a combination of: rising water demand from other sectors of the economy; land subsidence; sea level rise; and rising levels of salinity. As the delta produces enough food for [almost 200 million people](#), any significant reduction in agricultural production would reduce global food security.



Analysis

Over the past two decades, Vietnam has transitioned from a low- to middle-income country. Its gross domestic product has increased by an average rate of 6.4% over that time. Abundant water resources have helped to fuel that economic development – water diverted from rivers irrigates more than four million hectares of farmland and hydropower plants provide almost 40 per cent of its electricity. Vietnam has ambitions to become a high-income country by 2035, but that goal will be difficult to achieve unless it becomes more resource efficient and adapts to the changes that are expected to occur in the Mekong River.

The Mekong Delta is expected to continue to play an important role in that economic development. Despite it comprising only 12 per cent of the country's land mass, and about 20 per cent of its population, it is the most productive agricultural region of Vietnam. About half of the country's rice, 65 per cent of its aquaculture and 70 per cent of its fruit are grown there. Most of those products are exported and in 2017 agricultural exports earned Vietnam US\$37 billion (\$52.8 billion), almost 20 per cent of its GDP. As Vietnam is the world's second-largest rice exporter, it is one of the most important food-growing regions in South-East Asia. The delta faces four main challenges, however, that threaten to weaken its agricultural sector: unsustainable agricultural practices; rising sea levels and land subsidence; the construction of dams on the Mekong; and increased soil and water salinisation.

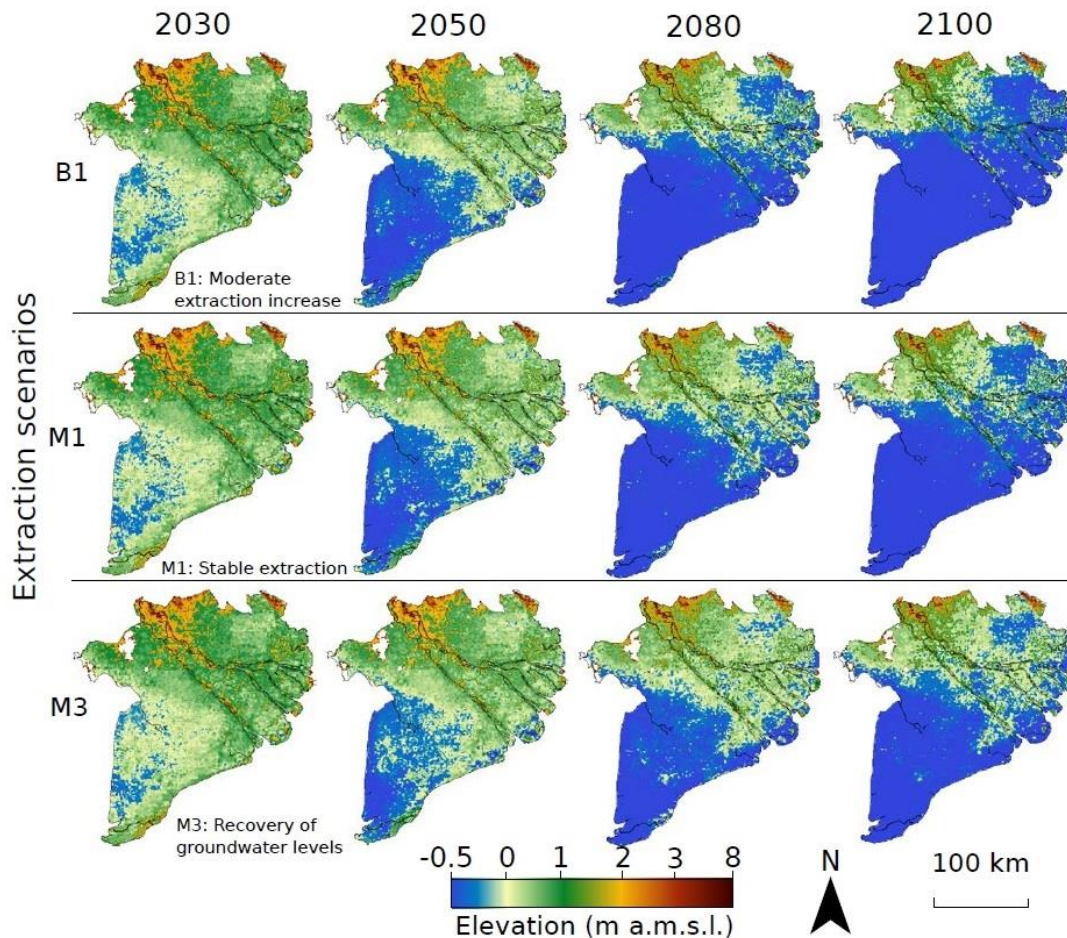
Some of those challenges are more immediate than others. Salinisation and unsustainable farming practices, for instance, are beginning to have observable effects on the region. Rising sea levels and a reduction in water and sediment flow - which are most likely to be caused by the construction of dams and sand mining upriver – are more likely to occur at a gradual rate.

Vietnam has long practiced a “rice first” agricultural policy in the Mekong Delta, which has helped it to transform the delta into the country’s main rice cultivation region. Farmers grow three rice crops a year, instead of the traditional one or two. Paddy fields in the delta consistently produce about 25 million tonnes of rice, with at least half of that exported. Exports from the region account for about [15 per cent](#) of the rice that is traded globally. That fixation on rice production, however, increases the risk of [pests and disease](#), depletes the soil of nutrients and increases the indirect export of water (“[virtual water](#)”). The nutrients that are taken from the soil are increasingly being replaced with fertilisers and other soil amendments, but that is likely to only be a temporary fix. Vietnamese farmers use almost [twice as much fertiliser](#) as comparable countries in South-East Asia. According to some projections, it is thought that if rice cultivation continues at current levels, and with the same application of fertilisers, severe land degradation could occur within the next 20-25 years. That would likely result in rising costs for rice producers and possibly a decline in production.

Water demand is also increasing across the country. It is [projected](#) that if nothing changes, all but five of the 16 Vietnamese river basins are likely to experience water stress during the dry season by 2030. The agricultural sector will need to adopt water conservation measures to ensure that it can guard against increased water demand from the industrial and municipal sectors. There are plenty of opportunities to achieve those water savings, as the country’s water productivity is [low compared to the global average](#). Vietnam generates only US\$2.37 (\$3.38) of GDP from every 1,000 litres that it uses, compared to a global average of US\$19.42 (\$27.70).

Sea level rise could pose another problem to rice production in the region, but it is doubtful that it will cause significant reductions in the near term. The sea is rising by less than a centimetre each year (it should be noted, however, that most of the delta is one to two metres above sea level). That rate is expected to increase over time, however, and it is likely that the deposition of sediment will also continue to decline. If that were to happen, it is conceivable that a 30 centimetre rise in sea levels could occur by mid-century. That is likely to result in the loss of almost [200,000 hectares of land used for rice cultivation](#). As Vietnam produces rice on eight million hectares of land, with 2.5 million hectares located in the delta region, such a loss might be considered inconsequential. Those 200,000 hectares are highly fertile, however, and are more productive than other parts of the country. It would be a mistake to think that their loss would only affect the food security of individual families or communities. Almost 40 per cent of the delta is at risk of being underwater by the end of this century. If that were to occur, tens of millions of people would have to be relocated and the loss of agricultural land will have far reaching implications that extend to the countries that rely on Vietnamese rice exports.

Extraction-induced subsidence + absolute SLR + natural compaction



Source: Utrecht University

About two-thirds of the water that flows into Vietnam originates from outside its borders. Most of that water is therefore beyond the country's direct management and is vulnerable to the actions of upstream states. China has built 11 hydropower dams on its section of the Mekong, and has plans to build another nine by 2030. Two have been built in Laos, and China is financing another nine with plans to purchase most of the electricity that they produce. At least 160 dams have either been built, are under construction or are planned on the tributaries of the river. Together those dams, if they are built, will damage fisheries and block sediment from flowing downstream. It is expected that by 2040 as much as [97 per cent](#) of the sediment that would normally flow along the length of the river could be trapped behind dam walls. An official report into the potential effects of upstream dam construction on Vietnamese agriculture argued that if all of the planned dams were constructed, it is conservatively estimated that annual losses to the Vietnamese fishing and agricultural sector would exceed [US\\$760 million](#) per year.

The Mekong Delta lost more than [500 hectares](#) of coastal land between 2003 and 2012. The rate of erosion has since increased, and the region reportedly loses [300 hectares of land each year](#). Dams and reservoirs built along the course of the river prevent sediment from flowing downstream, while the extraction of sand from the riverbed for construction purposes also reduces the sediment load. Sediment consolidates the delta by replacing the material that is eroded during periods of high water flow and replenishes the soil nutrients

that are used in rice production. The continuous delivery of sediment is vital to protect against coastal erosion and supports the region's agricultural production.

Under normal conditions, mangroves mitigate the effects of sea-level rise by trapping the sediment that flows out to sea. Large tracts of mangroves have been removed from the Mekong Delta since the 1970s to provide timber for charcoal and the construction industry; some were also cleared to make space for shrimp farms and aquaculture. Mangroves help to reduce coastal erosion caused by waves and floods, but due to the reduction in the flow of sediment it is [doubtful](#) that the re-establishment of mangroves will help to offset the loss of coastal land.

Severe droughts in 1998, 2010 and 2015 reduced water flows in the Mekong River. The reduction in water availability drives regional water users to [withdraw greater amounts of water](#) from the river than usual. That, in turn, reduces the volume of water flowing to the mouth of the river and causes seawater to intrude further inland (during the most recent drought it intruded up to 90 kilometres inland). The salinisation of the delta's water is [reportedly](#) occurring to such an extent - even during years with relatively normal water availability - that some farmers now speak of a "salty season". The construction and operation of a series of dams upriver could eventually come to create similar conditions.

The causal factors of land subsidence are not clear, but it is probably due to the increased use of groundwater in the Mekong Delta over the last 25 years. Over the past 20 years groundwater extraction has [increased four-fold](#). That rate of extraction has caused the water table to fall by up to 20 metres in some places, leading to the land sinking by up to 18cm. The ground continues to sink across the delta at a rate of one to three centimetres per year. The increased use of groundwater is, in turn, partly due to lower surface water availability and saltwater intrusion.

As the decline in sediment is most likely caused by the construction of dams in the upper reaches of the Mekong, in China and Laos, there is little that Vietnam can do to restore those flows. Most of the dams close to the source of the river are designed to impound sediment and prevent it from accumulating in dams further downstream. Reducing the use of groundwater, to slow the rate at which the delta sinks, would address the most pressing threat to it and its agricultural production.

Any opinions or views expressed in this paper are those of the individual author, unless stated to be those of Future Directions International.

Published by Future Directions International Pty Ltd.
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