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RESEARCH ARTICLE

Constrained river, constrained choices: seasonal floods and colonial authority in the Red River Delta[1]

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Abstract

This article examines the problem of flooding in colonial Tonkin through two interrelated lenses: the history of disasters as social and political phenomena, and the history of technology and the constraints that shape its use. With a gradient ten times steeper than the Mekong, the Red River (*Sông Cái* in Vietnamese) is notorious for its huge seasonal fluctuations and violent floods. For centuries, local rulers and cultivators constructed dikes to protect fields and settlements, though breaches and inundations were frequent. French administrators were convinced that they could improve the flooding situation with modern know-how. From the 1890s, colonial engineers carefully studied the river's behavior, examined a range of different schemes to control it, and debated the extent to which the straitjacketing of the river might gradually exacerbate flood risk. Despite their deep-seated misgivings about the problems caused by dikes, they were ultimately forced to work within the parameters of pre-colonial hydraulic works. The result was an intensification of existing dependencies and flood vulnerabilities, which finally came to a head under the combined pressures of extreme weather and war, and which ultimately played an important role in undermining colonial authority in the Red River delta.

Keywords: colonialism; disaster; flooding; France; irrigation; Tonkin; Vietnam

Introduction

Riverine environments are tricky places to live – and equally tricky places to govern. On the one hand, many of their attributes make them a magnet for human settlement. For farming populations, river plains have long been favored due to the agricultural benefits of cultivating moist, fertile bottomland soils. For small manufacturers and entrepreneurs of all stripes, riverine areas provided not only ample supplies of raw materials and goods to trade, but also natural hydraulic highways for transporting merchandise beyond local markets. For state authorities, including colonial rulers, the economic productivity of such regions presented quite literally fertile ground for raising revenue. Yet on the other hand, the inherent changeability of riverine environments, and especially their tendency to flood, also made them innately hazardous. Whenever rivers change course or too much water spills over into floodplains, the results can often be disastrous for agricultural communities, for businesses, and for state and municipal finances.

Although we tend to think of floods as exceptional events, on a non-human time scale they are a normal occurrence. Sooner or later, all rivers burst their banks and submerge surrounding lands.

[1]I would like to thank the Leverhulme Trust (MRF-2017-069) and National Endowment for the Humanities (FEL-257145-18) for generously supporting the research on which this article is based.

Seasonal torrents and floods were a particularly regular occurrence across large parts of colonial South and Southeast Asia, where the pattern of tropical monsoon rains meant that the bulk of annual precipitation – in many places over four-fifths of it – falls over the course of only four to five months. It is important to note that such flooding was not necessarily detrimental to human activities. In most years seasonal inundations were a boon to farmers in the deltas and floodplains, who specifically designed their agricultural systems to maximize the benefits that the floodwaters conferred. As swollen rivers spilled over their banks they not only watered crops at crucial times in the growing cycle; they also brought fertile silt to riparian fields, filled village tanks, replenished wells, and often provided an abundance of fish. But there could, of course, be too much of a good thing. Whereas normal levels of seasonal flooding were generally beneficial, above a certain level the effects were harmful. And every so often – whether ten, fifty, or a hundred years depending on the locality – exceptionally high water levels could be downright disastrous: destroying homes, crops, and livestock; unleashing famine and epidemics; and claiming dozens, hundreds, or thousands of human lives.

It is common to regard such extreme flood events as "natural" phenomena, the products of freak weather incidents over which people have no control. It is an understandable conclusion to reach when confronted with the spectacle of submerged fields, inundated towns, and thousands of refugees stranded on rooftops or paddling their way to safety along submerged roadways. But in order to understand the wider causes and consequences of such events we must also recognize them as social phenomena, as products of human decisions and behaviors.

Over the past couple of decades researchers have increasingly highlighted how we create "disasters" through what we do: living in risky areas, doing risky things (disturbing catchment areas, eliminating buffer zones, ignoring warnings), failing to invest in safeguards, all of which is generally done in the pursuit of material benefits of one sort or another. To borrow the terminology of Ulrich Beck, who perhaps did more than anyone else to highlight the problem, so-called natural disasters are generally the result of both "external risks" and "manufactured risks".[2] Whereas much of the earlier literature focused on particular disasters as key historical moments, more recently scholars have tended instead to emphasize the longer-term temporalities that are involved. From this perspective, disasters appear not so much as singular occasions but rather as continuing processes of decision-making, of learning to cope with and/or recover from unpredictable events. Quite obviously, there are different timescales at work in the history of disasters; perhaps less obviously, these timescales also partly correspond with the interplay between "external" and "manufactured" risks. On an immediate level, natural forces such as cyclones, deluges, droughts or earthquakes can of course cause enormous disruption to human activities, but how societies prepare for and deal with these uncontrollable but not entirely unforeseeable events is very much a reflection of prevailing ideas, economic priorities, and political choices. Fertile, flood-prone bottomlands and coastal deltas can be promoted, allowed, or discouraged as places of settlement. Erratic rivers or flood-prone shorelines can be left to their own devices or "tamed" to various degrees by technological works of different sizes, shapes, and levels of sophistication.[3]

Furthermore, when catastrophic floods occur, the effects are rarely distributed equitably. Susceptibility to natural forces tends to reflect and reproduce inequalities of power and privilege. Social and biophysical vulnerability generally go hand in hand. In the aftermath of such events, the process of dealing with the effects tends to create new forms of knowledge and expertise that empowers some groups more than others. Learning from disasters, like preparing (or not preparing) for them, is thus a consummately political act, and policies of recovery and mitigation are often much more apt to preserve existing social relations than overturn them.[4]

When viewed in this light, the efforts of officials, engineers, and landowners to deal with the threat of flood disasters tell us more about colonial societies and imperial power relations than first meets the

[2]Beck 1992.

[3]See e.g. Walter 2008; van Bavel *et al.* 2020; Mauch and Pfister 2009; Bankoff 2003; Courtney 2018; Ayalov 2017; Barry 1997; Zhang 2015; Sundberg 2015.

[4]Bankoff *et al.* 2004; Steinberg 2000; Beattie and Morgan 2017; for an excellent recent example, see Kingsbury 2019.

eye. For one thing, they furnish insights into state priorities and how they clashed or meshed with competing interests within subject societies. They also demonstrate how human activities in one place could have major consequences for those living elsewhere, and how structures of power and privilege determined who bore most of the risk. Moreover, they show how attempts to put an end to flooding often had the opposite effect of drawing state authorities into an escalating spiral of ever-larger technological interventions, thus highlighting the different timescales at work – creeping geomorphological changes, long-term patterns of settlement, seasonal mitigation measures, and periodic moments of acute crisis – in the history of disasters. Although floods and other calamities may seem to come out of the blue, in many ways their histories begin long before the event and reverberate long after it.[5] In theory, the task of colonial engineers and public works departments was to keep water in its place, to create and maintain a hydrological regime that served the imperial agenda of economic development and revenue collection. In practice, the ability to do so was invariably shaped by local ecologies, topographies, and social contexts – and it was constantly challenged by the sheer force of the waters themselves.

This complex bundle of factors meant that not all rivers were (or indeed are) equally liable to pose major flood risks. Within colonial Asia, particular hotspots for flooding could be found in various parts of eastern India, the Philippines and Indochina. We now have a rich literature on flood-related disasters in India, and especially on the volatile rivers of Bengal, Orissa and Bihar.[6] The work of Greg Bankoff and others on coastal and riverine disasters in the Philippines was a seminal contribution to the literature on the history of disasters more generally, and there is some excellent work on water management in the Mekong Delta in southern Vietnam.[7] But another flood "hotspot" that has attracted far less attention is the Red River Delta in northern Vietnam. Like many of the high-risk areas elsewhere in colonial Asia, Tonkin was home to a large and densely settled population that was heavily reliant on the river and consequently exposed to floods. Before, during, and indeed after the colonial era, destructive inundations were a depressingly regular occurrence, each of which exacted a heavy toll on lives, property, and household and state finances. Whereas there is a sizeable literature on Red River flooding and flood management in more recent decades, only scant attention has been paid to their earlier history, including the colonial era – when the Tonkin Delta's dike system was rapidly expanded, and when many of the associated choices and dilemmas were extensively debated.[8]

This article will analyze the problem of flooding in colonial Tonkin through two interrelated lenses: the history of disasters as social and political phenomena, and the history of technology – or more specifically, the ways in which the technologies that were employed to prevent or cope with destructive floods were constrained by the political, economic, and environmental contexts in which they were embedded. Based on a mixture of contemporary material and a synthesis of the relevant secondary literature, it uses these conceptual lenses to argue that water control played a central role in both the maintenance and undoing of the colonial order. It starts by briefly surveying the nature of the Red River flood regime and the various continuities between pre-colonial and early colonial measures to master it. It then considers the variety of proposals that French engineers offered to deal with seasonal floods as they became more frequent, along with the multiple constraints that eventually locked French officials into a policy of scaling-up existing technologies rather than employing new ones. As these sections demonstrate, colonial-era hydraulic works in Tonkin were not necessarily "high modernist" in either their aims or their execution, and nor did their political implications neatly conform to Karl Wittfogel's theories about the relationship between large-scale water control and socio-political control.[9] The article concludes by examining how exceptional flood events in the 1930s and especially

[5]See e.g. Oliver-Smith 1999.
[6]D'Souza 2006; Hill 1997; Mishra 1997; Ghosh 2018; Sinha 2014; Hill 1990; Kingsbury 2019.
[7]Bankoff 2003; Bankoff *et al.* 2004; Biggs 2010; Brocheux 1995.
[8]For an inroad into recent literature, see McElwee *et al.* 2017. For a long-term view, see Li 2016.
[9]Scott 1998; Wittfogel 1957.

in the closing years of the Second World War not only overwhelmed the Red River's flood defenses but also helped undermine the foundations of colonial rule in the region.

Deluges and dikes in Tonkin

The history of technology has conventionally been a narrative of novelty and innovation, of original ideas and inventions that enhance humans' capacity to control the world around them. In recent years, however, it has also come to be written as a story of continuity, stasis, and persistence. As David Edgerton has argued at length, understanding how existing technologies are used is just as important as studying how new technologies come into being.[10] Indeed, many technologies large and small remain in widespread use long after the cutting edge has moved on, even long after seemingly superior alternatives are available. There are many reasons why this is so. From an economic perspective, the desire to get a return on prior investment tends to gravitate in favor of existing ways of doing things, especially when they involve large and otherwise irrecoverable "sunk" costs. Social and political inertia likewise plays a role in the form of vested interests that try to hold on to the benefits that a prevailing technology gives them. On a more general level there are also the mutually reinforcing interactions between technologies, knowledge, and institutions, which gradually create a mesh of rules, regulations, and ways of thinking that favor incumbent technologies over newcomers. Over time, these dynamics can eventually lead to technological "lock-in": a situation in which a firm, group, or society becomes so reliant on a particular technology as to impede its ability to switch to a different one.[11]

As technologies go, the history of flood control boasts more than its share of examples. Technological and institutional lock-in was a common problem wherever societies sought to keep wayward rivers from bursting their banks. From China to Germany, and from India to the Mississippi Valley, the creation of hydraulic defenses was often a fateful step. By attracting more people and investment into the floodplains, they created a new set of threatened assets and raised the stakes if anything should go wrong. By preventing the spread of floodwaters on to fields and wetlands, they often raised river levels within the restricted channels and thus created a need for further hydraulic interventions in the future. In many countries, the inherent risks of this approach were further reinforced by extensive disaster assistance programs, which created a form of "moral hazard" by allowing policymakers and communities to avoid responsibility for reducing the risks of disaster-related losses because of the compensation that these programs guaranteed.[12] Once this positive feedback loop was established, it was difficult to break the cycle. The more that political elites and local residents depended on flood defenses to safeguard lives, livelihoods, and property, the less capable they were of making a decisive break from prevailing methods.[13]

Perhaps nowhere was this predicament more intractable than in the Tonkin Delta, where French engineers became enmeshed in a decades-long struggle to contain the capricious waters of the Red River. With an overall gradient ten times steeper than the Mekong, the Red River (*Sông Cái* in Vietnamese) is notorious for its powerful current, huge seasonal fluctuations, and violent floods. It rises in the Yunnan province of southwest China and flows in a general south-eastward direction towards Vietnam, entering at the mountainous Lào Cái Province before descending to the delta and emptying into the Gulf of Tonkin. It is fed by a multitude of tributaries (the largest of which are the Black River and Lô River) and acquires its name from the reddish, heavily silt-laden water that it carries. The Red River watershed receives around three-quarters of its rainfall between May and September, much of it in the form of downpours that run swiftly off the sloping upland relief. From July to September the delta itself is regularly lashed by typhoons that dump up to a meter of

[10]Edgerton 2008.

[11]For a general discussion, see Arthur 1989; as applied to water technologies, see Elvin 2004, pp. 123–24, 155–70; Pietz 2015, p. 40, 61.

[12]On the "moral hazard" of disaster relief, see Platt 1999.

[13]Barry 1997; Doyle 2018, pp. 59–111; Zhang 2015; Perdue 1987, pp. 164–96; Cioc 2002.

rainfall in several days and that simultaneously threaten coastal areas with storm surges. The Red River's floodwaters typically rise in June and subside in October, but they do so in a remarkably erratic pattern that makes flood management difficult. Rather than following a single upward and downward curve, water levels often spike on multiple occasions throughout the summer and early autumn in line with heavy rainfalls and variable run-off times from its tributaries. At the peak of the flood season in late July and early August, water levels at Hanoi often rise by eight to nine meters compared to dry months, and occasionally by up to eleven meters. Altogether, the exceptional volatility, frequency, and amplitude of flooding made life in the Tonkin Delta a risky enterprise.[14]

Despite these dangers, the fertile soils of the delta had long supported a dense farming population. Rice cultivation began some 4,000 years ago, and dike construction in certain regions in the second century BCE. State-led hydraulic works reach back a millennium under the Ly and Tran dynasties, most of which were periodically destroyed and either rebuilt or abandoned over the centuries.[15] Subsequent rulers, including the Nguyen dynasty of the nineteenth century, built on this longstanding legacy of embankments and sea walls to protect croplands from inundation and to distribute waters more evenly across the delta. As a general rule, irrigation and flood control works were handled separately. Whereas the former were normally done on a small scale and remained the responsibility of villages and individuals, only state institutions were capable of mobilizing the enormous labor and financial resources required to build and maintain dikes that could contain the river's flow. Over time, the layout of dikes and canals determined the location of towns, villages, and cultivated fields, many of which lay well below the river level (some by as much as six meters) and were therefore wholly reliant on the embankments for their very existence.[16]

The construction and reinforcement of embankments was, then, a constant preoccupation of state authorities and colonizing farmers long before the French colonization of Tonkin in 1885. As Tana Li has emphasized, the long-term history of dike building in the region was by no means a linear, cumulative process of humans gradually conquering nature, but was rather a fluid and cyclical story of expansion, retreat, occasional abandonment, and reconstruction. Indeed, many of the dikes or seawalls that appear in records in the fifteenth and sixteenth centuries no longer existed by the beginning of the nineteenth; and many of those that were documented in the early nineteenth century were gone by the early part of the twentieth.[17] The levees flanking the Red River and its main channels at any given time therefore hardly brought an end to flooding in the region, and in fact they actually exacerbated the problem in some ways. Moreover, many of the pre-colonial dikes were not high enough to contain more than average summer flood levels, and in the late nineteenth century the network as a whole was still riddled with salients and choke points that held up the flow and encouraged the erosion of the embankments themselves. Built of packed earth, they were often too thin and steep-sided to withstand the huge pressures of a sudden surge, and once the waters spilled over the top, the levees were quickly gouged out by the strong current. As a result, breaches of various magnitudes were a common occurrence, the largest of which inundated crops, livestock, and settlements across large swathes of the delta. In the province of Hung Yen, for instance, there were at least twenty-six dike ruptures between 1806 and 1900 that were severe enough to destroy the entire seasonal rice crop.[18]

French administrators, like their British and Dutch counterparts in India and the East Indies, were convinced that they could improve the flooding situation with modern know-how. French engineers were already well versed in the art of flood control along metropolitan rivers, especially in the Alpine and southern parts of France. After the conquest of southern Vietnam in the 1860s, they also commenced large-scale land reclamation and canal-building operations in the Mekong Delta.[19] After a series of military campaigns against Vietnamese and Chinese forces in 1883–1886, motivated largely by a

[14]Gourou 1936, pp. 57–80; Bruzon 1930.
[15]Li 2016, pp. 61–65.
[16]Gourou 1936, pp. 83–88; Tessier 2011, pp. 45–65.
[17]Li 2016, pp. 55–56, 70–71.
[18]Gourou 1936, pp. 83–87.
[19]Biggs 2010, pp. 23–90; Brocheux 1995, pp. 1–50.

desire to open a Red River trade route into China, French forces formally established a protectorate over Tonkin, though it would take another decade before the region was fully "pacified".[20] Like their imperial counterparts elsewhere, the newly established French authorities in Tonkin regarded hydraulic control as a means of both developing the colonial economy and displaying the benefits of their rule. From 1893 onwards the problem of flooding – especially around Hanoi and the lower parts of the delta – was examined by a series of dike commissions whose task was to propose remedies for the various "defects" of the existing system. Engineers noted that although Vietnamese peasants, especially under the Nguyen dynasty, had already built a system of dikes reaching some 1,200 kilometers in length (up from merely 124 kilometers in 1803), its overall layout was uncoordinated and many of the embankments were acutely prone to scouring.[21]

But breaking with this prevailing technology by revamping the entire network was a daunting task: practically, economically, and politically. Just as in India, the sheer scale of the challenge gave rise to serious suggestions that it might be better to remove the dikes altogether. This unorthodox idea, shared by numerous district officials as early as the 1890s (as well as by some British engineers in Bengal and Orissa since the mid-nineteenth century[22]), assumed that the suppression of embankments would allow the floodwaters to dissipate their energies across a larger surface of low-lying land rather than channeling them towards particular points where breaches caused catastrophic flooding. An additional benefit of allowing the floodwaters to flow unhindered would be the delivery of fertile silt to bottomland fields. Engineers studied the proposal for several years and noted some of the benefits that it could offer. Yet in the end, they concluded that such a measure, however sound from a strictly hydraulic perspective, could not be carried out due to the enormous disruption it would cause for agriculture and settlement in the region. As the eminent geographer Paul Vidal de la Blache remarked in his *Principles of Human Geography*, Tonkinese settlements were fundamentally

> circumscribed by the natural *casiers* formed by the banks of the rivers. Between the dikes raised against the floods, small compartments are inscribed where the water accumulates with the summer rains in arroyos, pools, partly artificial ponds. This is where the Annamese of the delta have set up their village; with its adobe houses, its ponds, its vegetable gardens and bamboo enclosure interrupted by doors, which serves as its shelter or defense, it forms a whole.[23]

In this sense, French authorities in Tonkin – like British administrators in India – tended to approach pre-colonial infrastructures as a quasi-"natural" part of the landscape, ones whose shortcomings could only be overcome by the modernizing impulse of the colonial state.[24]

Simply put, it was impossible to execute such a fundamental recasting of the region's hydrography given that the entire way of life in the delta – the layout of fields, the location of villages, and the calendar of agricultural work – had for generations been predicated on the protection afforded by dikes. Just as the Red River dikes confined the seasonal floods, they also tightly restricted the options available to French hydraulic engineers.[25]

Rather than attempting to "unlock" themselves from the existing techniques of flood defense, over the following decades officials in the public works department instead focused on reinforcing and raising the dikes where it was deemed most necessary, much as their Vietnamese predecessors had done. According to contemporary estimates, the overall volume of earth and other material contained in Tonkin's dikes was around 20 million m^3 when the French first arrived. By 1915 the public works department had added another 12 million cubic meters of earth to the structures, an additional

[20] For an overview, see Brocheux and Hémery 2009, pp. 28–64.

[21] Gunn 2014, pp. 37–38; Li 2016, p. 55.

[22] Williams *et al.* 1928, pp. 12–16; Inglis 1911, pp. 44–46; Willcocks 1928; Singh 2008, pp. 244–46; D'Souza 2006, pp. 113–20.

[23] Vidal de la Blache 1922, pp. 192–93.

[24] See e.g. Ahuja 2009, chapters 3, 4.

[25] Pierron 1923, p. 9; Robequain 1944, p. 223; Gunn 2014, pp. 37–38.

13.5 million between 1917 and 1926, and a further twenty-six million by 1931, by which time the main dikes reached fifty meters in width. Much of the added volume reflected the attempt to reinforce existing embankments, but French engineers also supervised the construction of around 840 kilometers of new dikes by the end of the 1920s.[26]

As in centuries past, the bulk of the actual work was carried out by Tonkinese villagers of their own accord as a customary communal duty. In this sense, dikes were both "big technologies" and "everyday technologies"; at once sponsored and supervised by the state, yet also rooted in the patterns and practices of everyday life.[27] Each year thousands of local farmers gathered to dig out millions of clay blocks from nearby land, carry them in shoulder baskets or (for larger blocks) directly on their shoulders to the site, and tamp them in place – though as French officials were quick to point out, at least they paid laborers a few cents a day for their efforts. It was not uncommon for five or six-thousand people to work on a single project for a week or more each year. For Pierre Gourou, the "evocative spectacle" of the dike-building sites was like a "human anthill" of activity, one that recalled "those immense collective works that one could only undertake thanks to abundant and cheap (if not free) labor: the pyramids of Egypt, the temples of Angkor".[28]

Expanding and maintaining the dike network was not, however, merely a long-term project; it had seasonal and more sporadic temporal dimensions as well. For much of the year dike improvement and construction was a habitual routine, one of the many chores that filled the regular work schedule of delta cultivators. Nevertheless, during the summer flood season thousands of villagers occasionally mobilized themselves, or were mobilized by the state, to raise dikes that were under imminent threat of submersion, often working day and night in a frantic effort to shore up or divert waters from failing sections. André Touzet, a French official who witnessed such a scene while on a study-tour of Indochina in 1934, heaped praise on the "genius" and determination of Tonkinese peasants in standing up to "these instances of great danger that leave one speechless at the sudden buildup of the flood […] it is necessary to witness the defense against this invading water, to have participated with these armies of courageous peasants who fight from *casier* to *casier*, desperately, to save life and possessions".[29] The sheer unpredictability of the Red River required constant vigilance from public works officers and farmers alike. Earthen embankments, however large, are inherently fragile structures at high water. During the peak flood season, surveillance was the "primordial" concern, as one official put it. It took little more than "a rat hole, a hollow from a rotten root, a small infiltration in the subsoil" to compromise the structure and cause an unstoppable rupture.[30]

Modernizing the embankment system: options and constraints

Despite all the effort that went into improving the embankment system, floods continued to plague the delta on a regular basis. After the turn of the century there were major ruptures every other year on average: in 1902, 1903, 1904, 1905, 1909, 1911, 1913, 1915, 1917, 1918, 1923, 1924, and 1926. The worst flooding occurred in 1915 when exceptionally high river levels caused 48 breaches in total. Together, these ruptures inundated a quarter of the entire delta, threatened crops and villages across some 3,650 square kilometers, and left the worst affected districts around Hanoi (where many rice paddies lay seven to eight meters beneath the flood level) under as much as six meters of water. At Hanoi itself, whose surrounding dikes were designed to withstand a flood of 11.2 meters, water levels reached an unprecedented 12.92 meters. The only thing that saved the city from severe inundation was the mobilization of huge work crews to build emergency flood defenses. But while Hanoi was successfully rescued, elsewhere in the delta life was disrupted for several months by disease outbreaks, labor

[26]Gauthier 1930, p. 97.

[27]On "everyday technologies" in colonial contexts, see esp. Arnold 2013.

[28]Gourou 1936, pp. 88–89.

[29]Touzet, *L'économie indochinoise et la grand crise universelle* (Paris: Marcel Giard, 1934), pp. 239–41, quoted from Biggs 2010, p. 106.

[30]Normandin 1923, p. 10.

requisitioning, and relief works. Although official statistics registered only 200 deaths from the floodwaters themselves, the ensuing cholera epidemic claimed around 4,000 lives. Even after the disease surge subsided, some of the after-effects of the flooding lasted for years. Whenever dikes broke, the rushing current usually gouged out deep channels, sometimes reaching twenty meters deep. The escaping torrent often carried enormous amounts of sterile sand onto nearby fields, depressing their fertility and reducing their agricultural value. The effects of such ruptures could be so severe as to force some villages to be abandoned. Such was the fate of the highly flood-prone Ha Dong province near Hanoi, where it was estimated that the 1915 flood dumped around sixty-nine million tons of alluvium, the equivalent of a one-meter layer covering an area of sixty-six square kilometers.[31]

As the scale of the 1915 disaster became clear, it reportedly "made a powerful impact on public opinion, both European and indigenous". Many of those who lost their crops and homes blamed the authorities for failing to prevent it, though the official inquiry that followed a year later insisted that it was beyond human control, the "inevitable consequence of an irresistible cataclysm against which all human efforts were powerless".[32] It was an entirely typical governmental response to extreme events, but even within French officialdom not everyone accepted that such catastrophic inundations were a mere "act of God". Although early dike commissions rejected the notion of suppressing embankments to allow the floodwaters to spread, the idea never entirely went away. Doubts about the wisdom of expanding the dike system were based on the so-called "siltation hypothesis," which held that the construction of earthen embankments caused silt to accumulate in the riverbed and thereby raise the level of floodwaters above their crest. It was similar to various criticisms that were circulating in India at the time (and which informed river management in Europe since the early nineteenth century), though in Tonkin the main cause of silt accumulation was thought to be the gradual erosion of the dikes themselves rather than the disruption of natural flooding patterns through the initial construction of embankments, which was by then a centuries-old memory in many parts of the Delta.[33] The idea was partly rooted in local wisdom and historical memory. Many Tonkinese farmers believed that flood levels had gradually risen over the long term, and this view was absorbed by district officials and regularly echoed in French reports ever since the 1880s. For those who subscribed to the theory, the elevation of dikes was a Sisyphean task. The bigger and more extensive the embankments became, the more they raised the floodwaters; and the more the floodwaters rose, the higher the dikes had to become. The result would be a never-ending contest with the river that would ultimately make the surrounding countryside more rather than less prone to cataclysmic flooding.[34] In this sense, "lock in" not only impeded the switch to potentially superior flood defense technologies, it also locked colonial authorities into a self-defeating spiral of ever-increasing expenditure and intervention in order to make the prevailing technology work (and, according to this logic, poorly at that).

To avoid this scenario, skeptics put forward a variety of alternative solutions, yet for a variety of reasons none of them withstood sustained scrutiny. One suggestion was to re-forest the upland sections of the river's watershed in order to reduce run-off in the rainy season and increase flows during the rest of the year (a common practice in Europe). Although it was generally acknowledged that woodland was more absorbent than cleared land, and that highland forest loss therefore exacerbated the flooding problem, studies suggested that re-forestation in the upper Red River's watershed would have only a marginal effect on extreme flood levels since the excessive rainfall that caused them would quickly saturate the ground and run off quickly regardless of whether the surface was wooded. Another suggestion was to create reservoirs far above the delta to regulate the river flow at source. The problem was that such a move would be prohibitively expensive and would only make matters worse unless the water releases were timed perfectly (which would be extremely difficult given the

[31]Peytavin 1916, pp. 18–20, 29, 35–36; Gauthier 1930; Dumont 1935, pp. 21–22; Gourou 1940, pp. 217–21; Gourou 1936, p. 87.

[32]Peytavin 1916, p. 18.

[33]Li 2016, pp. 61–65.

[34]Gunn 2014, pp. 36–37.

irregular pattern of Red River flooding). Moreover, there were serious political obstacles to consider: previous experiments with using parts of the upriver Vinh-Yen province as an emergency flood reservoir met with fierce opposition from locals, which prompted the administration to abandon the practice after 1918. A third proposal, and the one deemed most sound from a technical point of view, was to create reservoirs or collection basins within the delta itself. But the social and political barriers to doing so were deemed completely insurmountable, mainly because, as one report succinctly put it, "one will never manage to convince the populations of the provinces in question that their well-being would be served by intentionally inundating them".[35]

A final suggestion was to build new canals and/or augment the capacity of existing rivers, especially the Day River and the Canal des Rapides, two of the main defluent waterways besides the Red River itself. But such a measure, which was seriously considered in the 1910s, entailed too many negative side-effects. The Day was too slow and winding to allow a significant increase in flow, and although the Canal des Rapides was capable of substantial enlargement, it would seriously threaten the already shallow port of Haiphong with the huge silt load it would carry there. As ever, the fundamental interconnectedness of the hydrosphere ensured that tampering in one area would have serious consequences in others. Moreover, enlarging the Canal des Rapides posed the additional risk that the Red River might "choose" this shorter and more direct path to the sea as its main channel, thus depriving other areas of water "with consequences that are difficult to imagine but that […] would probably be disastrous". Humans were by no means the only actors in the equation. Engineers were well aware that the river could have a mind of its own.[36]

This left colonial authorities with little alternative other than the improvement and expansion of existing dikes. All in all, it was a textbook example of path dependence. Superior technologies were not readily available, and the heavy reliance of delta residents on the existing flood defenses meant that it was extremely difficult to escape the dynamics of "lock-in". The range of available choices about how to control flooding was tightly circumscribed by the decisions and developments of the past, as well as by the interests of the hundreds of thousands of Delta residents whose property or livelihoods depended on the existing dikes.

To what extent did these historical legacies render French-controlled Tonkin a so-called "hydraulic society" – one that was fundamentally based on the large-scale control of water and was therefore characterized by centralized bureaucracies that promoted markedly absolutist forms of government? As various observers have pointed out, nineteenth-century Vietnam under the Nguyen certainly conformed in some ways to Wittfogel's famous thesis about the political implications of large-scale hydraulic infrastructures in view of the critical importance of flood control and irrigation for both stabilizing food production and maintaining political authority. Yet it nonetheless differed from Wittfogel's archetypal "hydraulic societies" in Egypt, China, Mesopotamia, and India in two important ways: first, a relatively high degree of local, non-state initiative in constructing smaller secondary flood defenses; and second, the relative lack of attention paid by state authorities to irrigation, which was dealt with mainly at the village level. By and large, this basic division of responsibilities – communal irrigation and state-led flood defense – continued to shape water control in Tonkin for most of the colonial period. Given the overriding importance of rice cultivation in the region (which the French immediately recognized as vital for economic development, livelihoods, and political stability), as well as the vulnerability of Tonkin's rice economy to floods, demographic pressures, and occasional droughts, the French, like their predecessors, had little choice but to enter some kind of agrarian hydraulic pact with the Tonkinese peasantry in order to maintain civil control. As we will see in a moment, where it eventually diverged somewhat from pre-colonial hydraulic arrangements was in the increasing involvement of central authorities in irrigation as well as flood protection.[37]

[35]Normandin 1923, pp. 3–6 (quote p. 6); Peytavin 1916, pp. 42–43; Pouyanne 1931, p. 22.
[36]Normandin 1923, pp. 7–8.
[37]Woodside 1971, pp. 137–38; Gunn 2014, pp. 25–26, 35–42; Wittfogel 1957.

Since it appeared to be both hydrologically and politically impossible to turn back the clock, the only apparent solution to the shortcomings of the existing dike network was an "escape forwards". As seasonal torrents periodically breached embankments to find new (or former) channels, the task of flood control demanded ever higher levels of intervention and expenditure. Over time, the ensuing spiral of embankment construction drew the colonial state and its taxpayers into a kind of "arms race against nature".[38] With each new engineering measure the main river and its distributaries became yet more volatile, raising local flood risks even further. And as the floodwaters became increasingly dangerous, people in the floodplains – and the revenues they paid to the state – became more and more dependent on the embankments to protect them. Despite the rising financial and environmental costs of flood control, and despite the growing risks, officials saw little alternative but to raise the ante yet further. "The dikes are a necessary evil," remarked the official report on the 1915 inundations. "It is too late today to find another remedy".[39]

Rising dikes, rising vulnerabilities

Flood control measures in colonial Tonkin were shaped not only by such long-term hydrological and political constraints, but also by more immediate pressures. In many respects it was the trauma of extreme flood events such as 1915 that spurred the state into action. It was no coincidence that the public works department launched an unprecedented program of dike construction in 1916–1917. In 1926 – in the wake of another series of unusually bad flood seasons – it embarked on an even bigger series of projects that received generous government funding well into the 1930s.[40]

Yet the decision to double-down on the existing system of defenses was more than just a knee-jerk response to recent crises. Another important factor was the gradual rejection of the long-lived "siltation hypothesis". Although some farmers and district officials still held the view that diked riverbeds would inevitably rise, by the early 1920s hydrographic studies had accumulated a sufficient amount of data to conclude that it was not a major problem for the Red River. While the studies confirmed the long-surmised correlation between dike expansion and higher flood levels, measurements showed that the riverbed itself was not rising. Instead, the higher floodwaters were due to the lack of flooding elsewhere as dikes were improved and ruptures were reduced, thus forcing all the water down the main river channel. This finding led engineers to conclude that the most practical way to control high water levels was not to get rid of embankments or to convert large areas into emergency reservoirs, but rather to ensure that the dikes themselves were sufficiently high and sturdy to withstand all but the most exceptional flood events.[41]

In this sense, the French-built flood-works in the Tonkin Delta were a far cry from the "high modernist" infrastructure schemes that engineers elsewhere in the colonial world (and beyond) were so fond of pursuing in the twentieth century.[42] To be sure, they shared many characteristics with such grandiose projects. They offered a technological solution to what was in reality a complex social and environmental problem, and they were designed and directed by a trained cadre of professional experts whose authority was based on their scientific credentials. To a significant extent, however, the French dike-building program drew on local precedent and indigenous knowledge rather than overriding it entirely. Instead of a story of diffusion, imposition, and local appropriation of Western technology, in many respects it was a hybrid solution, an attempt to improve what was already in place.[43]

Moreover, unlike some of the more grandiose water projects of the era, it never promised to deliver a "total fix" to the volatility of the Red River. On the contrary, officials openly acknowledged that the

[38]On this theme more generally, see Beattie and Morgan 2017, p. 56.

[39]Peytavin 1916, p. 70.

[40]Pouyanne 1931, pp. 28–30.

[41]Normandin 1923, p. 12; Gunn 2014, p. 36.

[42]Scott 1998.

[43]On the complexities of technology appropriation, see Green 2014; cf. the more conventional "diffusionist" model portrayed in Headrick 1988.

problem of flooding in the Tonkin Delta was "not very easy to resolve in an absolute fashion".[44] By the early 1920s French hydraulic engineers were under no illusions that their flood-works could entirely tame the river or make the delta completely safe. Although many voices understandably called for a definitive form of protection, the more realistic aim, in their view, was not to vanquish flooding altogether but to manage it in such a way as to minimize the risks of serious damage. Reducing the frequency of major flood events to every ten or twelve years rather than every two or three (as was previously the case) was hardly a utopian aim, but it nonetheless represented significant progress. For officials who were forced to make tricky cost-benefit analyses and juggle competing sets of interests between farmers or landowners in different districts who would be variably affected by new hydraulic works, progress seemed a more realizable goal than perfection. As the director of public works himself put it in 1923, the dike improvement program was "not a very original" solution and "possesses no miraculous character". What it did have, however, was "the merit of being effective," which in the circumstances seemed as much as one could hope for.[45]

And effective it was, at least up to a point. After the acceleration of the dike improvement program in 1926, the frequency of severe inundations declined markedly. Although heavy summer rains continued to pose risks, from 1927 to 1935 the levees along the Red River managed to retain its floodwaters without a single rupture.[46] Even if definitive protection remained out of reach, officials became increasingly confident that cataclysmic flood incidents were a thing of the past. For the time being, at least, the vulnerability of both farmers and state revenues to environmental shocks appeared to be rapidly decreasing, even if it was not eradicated altogether. Yet the more general social vulnerability of millions of delta residents to acute hardship remained as severe as ever, and if anything was on the rise in the 1930s as the effects of the global economic downturn on incomes and prices intersected with steadily rising population pressures.

By the early 1930s this newfound sense of flood security – along with a spate of violent "rice rebellions" in northern Annam in 1930–1931 – prompted the colonial government to direct its attention towards harnessing the river's waters for irrigation in order to boost food production, mitigate the risks of drought, and thereby reduce the scope for widespread social discontent in the delta as economic conditions deteriorated. Although this was not the first time that Tonkin's rulers had sought to combine "protective" flood works and "productive" irrigation works (the Nguyen court made limited efforts to do so in the 1820s–1830s, and the French had carried out small-scale projects mainly in the upper part of the delta since the 1900s), the scope of the French "agricultural modernization" program of the 1930s nonetheless marked a new departure in the involvement of central state authorities (which had hitherto focused their attention overwhelmingly on flood protection) in the realm of irrigation, a kind of colonial-era upgrading of the hydraulic bargain between rulers and ruled that consciously built on and further cemented the existing flood defense system.[47]

As the menace of floods appeared to recede, the stated aim was nothing less than "the complete hydraulic management" of the deltaic plain, where erratic river levels and typhoon-induced storm surges "often render the cultivation of rice too precarious".[48] From 1931 onwards – and especially under the left-wing Popular Front government in Paris from 1936–1938 – French authorities embarked on a program to improve the checkerboard of dike-bordered partitions (which the French called *cloisonné*) that covered the delta. The immediate goal was to integrate the water flows of these hitherto isolated pieces of jigsaw to improve irrigation without raising the risk of flooding. The means to achieve it was a series of canals and dams designed to carry irrigation water from openings in the secondary dikes, to facilitate drainage from low-lying fields, and to prevent sea water from moving upstream with the tides. Few of these hydraulic works were designed for the purpose of

[44]Peytavin 1916, p. 70.
[45]Normandin 1923, p. 3, 10–13.
[46]Gourou 1936, p. 92.
[47]Brocheux and Hémery 2009, pp. 316–20; Gunn 2014, p. 26, 35–37.
[48]Pouyanne 1931, p. 93.

extending the cultivated surface, since nearly all of the delta was already covered in paddy. The principal object, as in other densely settled parts of colonial Asia (notably Java and much of the Gangetic plain, which French engineers had long studied when devising their own hydraulic plans)[49], was rather to control water levels throughout the year and thereby enable farmers to harvest two rice crops annually rather than a single crop. By the early 1940s, such irrigation systems covered around 250,000 hectares of the delta, roughly one-third of its overall surface area.[50]

Moreover, as the irrigation network expanded, agronomists also experimented with different water levels on fields, the timing of water releases and drainage, and the interaction of various irrigation techniques with local cultivation practices.[51] To make the most of these improvements, the *Office Indochinois du Riz* was established in 1930 to develop higher-yield rice strains and distribute seed to farmers. Although the uptake of the new rice varieties among farmers was low, by the 1940s it was estimated that yields had increased by around 500–600 kilograms per hectare for a single crop, and by as much as 2,000 kilograms per hectare where the irrigation system allowed for two annual crops instead of one.[52]

But if better water management and crop breeding made rice cultivation in the delta more productive, it did not directly translate into better living standards or greater food security for the bulk of its residents. The incremental gains that these measures achieved were ultimately of little consequence in relation to the large, densely packed, and swiftly growing population. The problem of "overpopulation" (*surpeuplement*) had long been a matter of concern among French officials in Tonkin, but by the interwar years it was widely regarded as "one of the most serious problems that has ever confronted France in the course of its colonial project".[53] In the mid-1930s the delta was home to over 6.5 million people, with an average population density of around 430 per square kilometer (among the highest in the world). Land was extremely scarce, especially in the most tightly inhabited districts along the lower Red River. In 1937 there were between two to three million day laborers and over one million unemployed, which meant that half or more of the delta's population was virtually landless.[54] Even for those who possessed land, much of the paddy acreage was divided into tiny micro-holdings – in some areas as many as thirty-two per hectare – that were far too small to support a household. Labor was correspondingly abundant, and gave rise to an exceptionally intensive form of cultivation that French observers likened to horticulture rather than agriculture.[55] In many ways, the dynamics in the Red River Delta were not unlike those of densely-populated Java, where, as Clifford Geertz famously showed, the attempt to intensify agriculture through irrigated double- or triple-cropping led to an increase in land productivity (more output per hectare) but not labor productivity (more output per capita), which meant that it did little to raise living standards. The overall result was "agricultural involution," or the intensification of existing cultivation techniques.[56]

In stark contrast to the Mekong Delta in southern Indochina, which became one of the world's great rice-exporting regions, in Tonkin the rural population continued to consume nearly all of the food they produced. The anthropologist Nguyen Van Huyen, who carried out extensive studies of rural conditions at the time, noted in 1939 that rice production in the delta oscillated between 18 and 22 million quintals (1.8 to 2.2 billion kilograms), but that the minimum consumption level was 18.5 million quintals. These figures alone illustrate the precarity of the food supply, but what exacerbated the situation was the fact that 4 million quintals were either exported, used for distilling and

[49]For a contemporary example of this trans-imperial learning process, see Normandin 1913.

[50]Robequain 1944, pp. 222–27; on the Popular Front era in Indochina, see Brocheux and Hémery 2009, pp. 328–35; Gunn 2014, pp. 38–40.

[51]Dumont 1935, pp. 110–12, 298–332; Robequain 1944, pp. 222–25.

[52]Carle 1933; Caty 1936, pp. 34–42, 78–89; Robequain 1944, p. 227; more generally, Brocheux and Hémery 2009, pp. 266–80.

[53]Bouvier 1937, p. 65; see also Bernard 1934.

[54]Gourou 1936, pp. 571–74; Brocheux and Hémery 2009, pp. 262–66.

[55]Bouvier 1937, p. 24; Gourou 1936, pp. 381–94.

[56]Geertz 1963.

seeds, or went into domestic trade. In short, without rice transshipments from Cochin China, there simply was not enough food to go around. Nguyen Van Huyen estimated that around 80% of the population in poor villages had only one meal per day, and that it was only "during a third of the year, in particular during the harvest, that they have enough to eat".[57]

French efforts to encourage an efflux of emigrants from Tonkin to the south of the colony through a mixture of low taxes and promises of land certainly helped to extend the frontier of rice cultivation in the more sparsely populated Mekong Delta, but in the event it did little if anything to alleviate the pressures of population growth and food availability in the north. The organized recruitment of Tonkinese villagers for the coal mines of the region or for European rubber plantations in the center and south of Indochina had even less effect, especially once returnees were factored in.[58] Meanwhile, French efforts at social reform in the delta were even less effective. Although officials recognized that the "rice rebellions" of 1930–31 were driven at least as much by sheer poverty as by revolutionary ideas, they dared not risk the ire of rural elites whose interests were served by the status quo and on whose tacit cooperation the colonial government heavily depended. The powerful landowners and families who dominated the countryside not only blocked poor farmers' access to communal land they sorely needed; they also engaged in ruinous lending practices (with rates sometimes as high as 400%) that ensnared indebted peasants in a state of peonage. As Nguyen Van Huyen remarked,

> the peasant elite, the village notables, are opposed to all true and deep reform. […] If anyone tries to push through any kind of reform whatsoever, he inevitably attracts merciless spite. Someone puts opium under his roof, or some contraband alcohol in his pigsty or his stable. And nine times out of ten, the framed man is condemned.[59]

In effect, this social inertia served to reinforce yet further the dynamics of hydro-technical "lock in". At base, the colonial government was confronted with a difficult dilemma that presented no easy choices: on the one hand, the need to "modernize" the colonial economy in order to break the cycle of poverty and ensure political stability; and on the other, the imperative of upholding the structures and institutions that enabled it to extract profit. Avoiding this dilemma was precisely what the government's "complete hydraulic management" strategy was designed to do, namely by offering a technological solution to the problem of poverty that did not upset existing hierarchies and agrarian structures in the delta countryside. By investing in new hydraulic infrastructure, the colonial administration aimed to "improve" peasant agriculture – that is, achieve more food output per capita – without altering the social foundations on which it rested.[60] Reliable flood defenses constituted the cornerstone of this entire endeavor, for without them it would be impossible to reap the full benefits of new irrigation works.

Yet despite all the effort and investment that went into this hydraulic program, and despite the great skill of Tonkinese farmers – which was frequently praised by French agronomists – living standards remained low and famine continued to be an ever-present threat. Although the improved flood defenses and irrigation works arguably helped avoid what might otherwise have been a decline in peasant consumption, they did little if anything to improve the situation. Among the poorest half of the population a combination of poverty and volatile weather still left them highly vulnerable to social and bio-physical shocks alike. Even in normal years the peasant population "lives on the edge of scarcity

[57]Nguyen Van Huyen, "Le problème de la paysannerie annamite au Tonkin," *Est* (Hanoi), February 1939, quoted from Brocheux and Hémery 2009, p. 274.

[58]On emigration from the delta, see Gourou 1936, pp. 213–20; Gourou 1931, pp. 91–98.

[59]Nguyen Van Huyen, *Recherches sur la commune annamite* (Hanoi, 1939), quoted from Brocheux and Hémery 2009, pp. 274–75.

[60]This broadly echoes the interpretation of Brocheux and Hémery 2009, pp. 276–80.

and misery," noted the eminent geographer Pierre Gourou. It took only "slightly unfavorable circumstances" to cause widespread privation.[61]

Flood, famine, and the erosion of colonial authority

It was only a matter of time before the floodwaters of the Red River once again generated such "unfavorable circumstances". In early August 1937 the delta was struck by a series of typhoons that lashed the Indochinese coast and dumped huge amounts of rainfall across the entire region. As tidal surges pushed up the rivers, torrential rains inundated nearly all of the low-lying paddy land. When the runoff from the highlands arrived over the following days, the floodwaters proved too much even for the improved dike network. Major ruptures occurred along the Canal des Rapides, the Canal du Song Cai, and the Thong Ba Canal. Flooding caused major damage in several provinces, covering as much as three-quarters of the entire surface in the badly hit Bac Ninh and Bac Giang provinces. The losses affected nearly 750,000 people, many of whom had already been suffering from a poor spring harvest due to the unusually dry winter and spring of 1936–1937. Ever-mindful of the "rice rebellions" of the early 1930s, colonial authorities rushed to procure food supplies for the afflicted areas and introduced a range of public works projects to absorb labor and thereby cushion the looming income crisis. In the end, the relief efforts narrowly managed to avert a major famine, but the events of 1937 nonetheless dented confidence in the state's ability to control the river's floodwaters. It was by far the worst flood disaster since the inundations of 1915 and 1926, and it sorely tested the tacit agrarian hydraulic pact that underpinned relations between the colonial state, local elites, and the Tonkinese peasantry.[62]

Eventually, these precarious hydro-political arrangements proved incapable of withstanding the pressures of the Second World War. When the French Third Republic was defeated by Nazi Germany in the summer of 1940, the administration of Indochina was handed to the new Vichy regime in France. Soon thereafter, the Vichy state allowed Japan to use a selection of the colony's railways, ports, and airfields to support its ongoing military operations against China, and in September 1940 it allowed a limited number of Japanese troops to be stationed there as well. In July 1941, the French colonial administration – which was increasingly concerned about the threat posed by the new Chinese-backed Viet Minh movement – signed a joint defense cooperation protocol with the Japanese government, which enabled Japan to expand its use of Indochina's transport infrastructure and increase the number of its troops stationed there. Through this accord, the Vichy regime effectively handed over control of French Indochina to Japan (which used it as a base for military operations elsewhere in Southeast Asia after the attack on Pearl Harbor in December 1941) in exchange for a modicum of lingering administrative autonomy.[63]

All of these changes meant that investment in dike maintenance and expansion works plummeted. The Vichy-backed administration had little financial or political leeway to continue the hydraulic or agricultural improvement efforts of the 1930s. Quite the opposite: it essentially transformed Indochina into a supplier of food and raw materials for Japan. From 1942, a requisitioning system forced farmers to deliver a fixed proportion of the rice harvest according to the amount of land they cultivated. The new levies took little notice of rising production costs or the sharp increase in the cost of living, which trebled between 1940 and 1943 as more and more farmers were forced to buy food on the free market. The overall effect of these additional burdens was a fall in rice production and the further immiseration of a population that already lived on the margins of subsistence. The strict prioritization of Japanese exports and local military needs thus rendered the bulk of the populace even more socially and physically vulnerable than they already were.[64]

[61]Gourou *The Standard of Living in the Delta of the Tonkin (French Indo-China)* (New York, 1945), p. 14, quoted from Huff 2019, p. 290.

[62]Gunn 2014, pp. 117–21.

[63]The most thorough account is Verney 2012; see also Jennings 2001.

[64]Huff 2019, pp. 291–95; Gunn 2014, pp. 140–42; Brocheux and Hémery 2009, pp. 346–48.

The stage was set for disaster, and it eventually came in autumn 1944. After a poor spring harvest across much of northern Vietnam, three successive typhoons dumped water over the delta. From August to October rainfall at Hanoi was around fifty percent higher than normal, exceeding even the deluges of 1937. Although the master dikes were by now capable of withstanding floods of up to thirteen meters, the combination of exceptionally high river levels and bombing damage caused by US airstrikes led to several major ruptures that together devastated around 230,000 hectares of paddy in the coastal provinces of the delta. Local eyewitnesses recounted how the flooding had literally "wiped out" the all-important November rice crop, which was even more crucial than usual since rice reserves were already exhausted following the spring harvest failures. Food shortages quickly became severe; in the worst affected provinces it was reported that people had "absolutely nothing to eat".[65] Tens of thousands of rural refugees streamed into the cities, where many of them died from hunger, disease, or exhaustion soon after arrival. To make matters worse, the flood disaster of autumn 1944 was followed by an unusually cold winter that killed rice seedlings and ruined a large portion of the annual non-rice crop (maize, potatoes, taro). During the winter and spring of 1944–1945, over one million people – more than eight percent of the entire population of Tonkin and North Annam – perished as a result of starvation and disease, most of them landless or land-poor cultivators with little to fall back on apart from their labor.[66]

Like the other wartime famines in Asia – in Bengal, Java, and Henan province, all of which were triggered by flooding or drought – the Great Vietnam Famine was not an entirely "natural" disaster.[67] Although the direct and immediate cause was the severe flooding of 1944, it was also the result of a succession of human actions – above all decades of extractive colonial policies, followed by an even more extractive Japanese military regime – that rendered millions of people highly susceptible to the effects of extreme weather events. Over the longer-term, the dynamics of "lock-in" had made the delta more dependent than ever on dikes for flood protection – dikes that everyone knew were not fool-proof. During the crisis itself, the French administration tried to provide emergency relief, but its efforts were ultimately dwarfed by the scale of the calamity. Indeed, its attempt to manage the rice market to prevent spiking prices probably made the situation worse in some localities by hindering the movement of rice to stricken areas. Meanwhile, the Japanese insistence on continued rice requisitioning likewise amplified the effects of the food shortages. After the Japanese military took what amounted to full political control over the colony in March 1945 (via a transparent puppet regime under Vietnamese emporer Bảo Đại) they proved no better than their French predecessors at responding to the appalling fallout of the flood disaster. To make matters worse, the determination of US military planners to disrupt supply lines for the Japanese army further exacerbated the situation. One of the chief reasons why both French and Japanese authorities were unable to alleviate acute local food shortages was the Allied interdiction on rail and sea traffic and the infrastructural damage caused by US bombing.[68]

The Great Vietnam Famine of 1944–1945 was a profoundly convulsive event. It was the biggest humanitarian disaster in the history of modern Vietnam, and memories of it are still very much alive to this day. Like the devastating famine in Bengal in 1943 – which similarly resulted from a combination of catastrophic flooding and administrative failure – it played an important role in fatally undermining colonial authority in the region.[69] Here too, the experience of mass starvation generated a widespread sense of the need for change. It was a current of thought that the Indochinese Communist movement was determined to augment and turn to its advantage.

As the war drew to a close, the Viet Minh wasted little time filling the power vacuum left by the retreating Japanese occupiers. After seizing power in August 1945, it faced a range of threats from

[65]Huff 2019, p. 291.
[66]See generally Huff 2019.
[67]Huff 2020; Bose 1990; Muscolino 2015; Mukherjee 2015; Greenough 1982.
[68]Long 1991, pp. 122–33; Anh 1998; Huff 2019, pp. 303–08.
[69]Sen 1981; Mukherjee 2015; Greenough 1982.

multiple directions: rival domestic political movements (especially the Nationalist Party of Vietnam or *Việt Nam Quốc dân Đảng*, along with other militia-organizing nationalist movements and religious sects in the south), Chinese territorial designs, as well as exceedingly violent French efforts to reassert control throughout late 1945 and much of 1946 (first in the south of the colony, and later in Tonkin). The complex political fault-lines and brutal civil-war-like conditions that engulfed much of Indochina during this period are the stock-in-trade of most accounts of the gradual decolonization of the Peninsula and the role of the Viet Minh as a key player in the process.[70] Yet one of the biggest immediate challenges that Ho Chi Minh and his followers faced was the erratic nature of the Red River.

In August 1945, the same month in which the Viet Minh declared Vietnamese independence, torrential rains and severe flooding once again raised the prospect of a major famine. During the latter half of August, the river rose to over fourteen meters in Hanoi, the highest level ever recorded. Multiple dike failures inundated some 330,000 hectares of newly planted rice fields across the middle and lower delta, once again destroying much of the November harvest and forcing peasants to eat what little seed rice they had left. As Ho Chi Minh and his deputies were well aware, the key to legitimizing their movement as a governing power was to avoid another famine. Given that the last such calamity had occurred less than a year earlier, preventing a sequel was a matter of the utmost priority, both morally and politically. Viet Minh forces promptly began to seize grain stores and organized a remarkably efficient relief operation. They traveled the countryside urging farmers to plant yams, corn, and beans to carry them through the following spring, which also proved effective. Yet most importantly, perhaps, they enjoyed an element of luck as far as the weather and the river were concerned. In 1946–1947 a combination of favorable rains, good harvests, major dike repairs, and ceaseless Viet Minh propaganda convinced millions that the agro-hydraulic "pact" with France was at an end.[71] It was, of course, only in 1954, after the victory of Viet Minh forces at Dien Bien Phu, that the French government finally reached the same conclusion. Despite the continued presence of French troops in Tonkin (following a 1946 Chinese-brokered agreement between the French and Viet Minh), colonial authority never recovered from the ordeals of war and famine.[72]

It would, of course, be exaggerated to claim that the floods and ensuing food crises of 1944–1945 led directly to the fall of French colonialism in Indochina. Yet for all the well-documented political ferment in the colony, and despite the many French administrative failures during the war, it is no overstatement to say that they helped channel the course of history in a new direction. The colonial officials who took charge of Tonkin insisted that they could deploy superior knowledge and technologies for controlling the errant waters that sporadically surged across the river valley. But their degree of control was far from complete, and was recognized as such throughout the colonial period. As this article has shown, the limitations of French hydraulic management in Tonkin were powerfully molded by the dynamics of technological lock-in, which tightly circumscribed the parameters within which water engineers could work, and which effectively forced them to double-down on existing methods of flood prevention. In this sense, who or what exercised "control" remained an open question. Engineers, officials, and delta farmers were by no means the sole agents in the equation: both the river itself and the hydraulic decisions of previous generations crucially shaped historical outcomes. Moreover, in their quest to tame the Red River, most French officials gave insufficient thought to the ways in which their hydraulic interventions could actually worsen the problem of flooding, and even less thought to how poverty, dislocation, and social discrimination amplified the risks that were involved. When things went wrong, the claim to control translated into the burden of responsibility; and when things went catastrophically wrong, as they did in 1944–1945, responsibility inevitably had political implications.

[70]Marr 2013; Marr 1997; Tønnesson 1991; Brocheux and Hémery 2009, pp. 348–65; Bayly and Harper 2007, pp. 140–57; Thévenet 2001.

[71]Gunn 2014, pp. 239–46; Huff 2019, pp. 310–12.

[72]Brocheux and Hémery 2009, pp. 355–74.

For this reason, the human calamities that were triggered by the Red River's floodwaters could never be entirely blamed on Mother Nature, however much people tried to do so. Rather, they had a way of highlighting problems that lurked under the surface in less extreme circumstances. In colonial Tonkin, the flood disasters that periodically ravaged the Red River Delta laid bare the costs of decades of prioritizing a particular form of economic extraction and state revenue collection over human lives, just as they brutally exposed the gaping inequalities of wealth, status, and vulnerability that structured colonial societies. But if the enduring myth of "natural" disasters diverted attention away from these awkward issues, it could not entirely obscure the fundamental questions that such catastrophes always raised whenever and wherever they struck: about risk and resilience, about social marginalization and disenfranchisement, about the trade-offs of building protective works, about the distribution of their costs and benefits, and about who should have the power to decide. In colonial Indochina, the answers to these questions were largely claimed as the preserve of European officials, and the decisions they made eventually helped undermine their authority in the crisis conditions of war, flooding, and famine. Yet here as elsewhere in Asia, the end of colonial rule did not bring an end to the difficult questions posed by such disasters – or, for that matter, to the naturalizing myths that continued (and in many instances continue) to distract people from them.[73]

Competing interests. None.

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