Chapter 12

Embanking the Sundarbans

The Obfuscating Discourse of Climate Change

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Bangladesh is often portrayed as a 'climate-change victim' in popular media narratives. The country gained significant international attention following the cyclonic events of Sidr and Aila in 2007 and 2009, respectively. The country's low-lying topography and coastal landscape have been cast as particularly vulnerable to the effects of global warming, as the frequency of tropical storms and tidal surges are expected to increase along with rises in sea level. Alarming images like that given in Figure 12.1 have been pivotal in attracting hundreds of millions of dollars in development funding towards climate-change adaptation and mitigation (Global Climate Change Alliance+ 2012).

However, as Zaman points out, the complete elimination of flooding in Bangladesh is undesirable 'for flood is intricately linked with the very survival of the people in this delta country' (1993: 987). Despite well-meaning intentions, images like that in Figure 12.1 conflate regular beneficial monsoon floods with sea-level rise, portraying floods as solely caused by climate change. Such a narrative of climate vulnerability ignores the fact that there are three types of floods in Bangladesh: *borsha* (annual monsoon rains), *bonna* (irregular destructive floods in the wake of cyclones and storms) and *jalabaddho* (waterlogging).[1] Figure 12.1 is a typical image of *jalabaddho*, when during the monsoon the water is unable to drain out through the embankment back into the river. In a state of nature without any humanmade infrastructure, the *borsha* rainwater merges with the silt-laden river water to deposit silt on the floodplains. The silt raises the land levels and promotes processes of organic decomposition that make the deltaic lands fertile. These inundated

wetlands provide breeding grounds for hundreds of spawning fish species, while irrigating *aman dhan* (rice planted during monsoon season). In light of this, the narrative that all floods must be prevented is highly problematic. Indeed, the complexity of the local ecology and the distinctions between *borsha*, *bonna* and *jalabaddho* floods are lost in portrayals of Bangladesh as a 'climate-change victim' where floods are solely caused by climate change.

Mike Hulme (2015: 297) suggests that climate change has acquired powerful agency as an explanation of change and causation in the contemporary world. He suggests that this has resulted in a new variant of climate determinism that reduces the complexity of interactions between these spheres to produce what he terms 'climate reductionism'. Climate reductionism, he argues, is the increasing trend to ascribe all changes in environment and society to climate change (Hulme 2011: 255–56). This chapter combines long-term ethnographic fieldwork and archival research to complicate current discussions of floods to show that embankments were built long before climatic change was identified as a problem. It shows the ways in which climate reductionism works alongside a long history of development interventions that ignore local context by means of simplification (see Scott 1998), and illustrates how the colonial state simplifies local ecology in order to expand land-based infrastructure such as embankments, railways and roads, replacing waterways as the main mode of transport. I argue that narratives of improvement, whether through railways, flood protection or climate-change adaptation, have the potential to enable simplification in ways that increase the financial interests of particular actors, both within state

Figure 12.1. Screenshot of *Huffington Post* article on 'climate change refugees' in Bangladesh (Nikitas 2016) (© Probal Rashid)

administrations and international organizations, at the cost of environmental concerns.

I first discuss anthropology's role in deconstructing the knowledge production of climate change in development projects, and the importance of historically grounded ethnographies to counter simplified narratives. Climatic change involves changing temperatures and variabilities in precipitation and humidity – effects that are already becoming known in Bangladesh as monsoon patterns are shifting. However, in a deltaic region known for its heavy sedimentation, attributing all floods to rising sea levels due to melting ice caps caused by climate change is problematic. I use archival research and oral histories to trace the environmental history of embankments (sea walls) and to highlight the ways in which embankments changed from 'salinity-protection' infrastructure during the East India Company deforestation of the Sundarbans to 'flood-protection' infrastructure from the 1850s onwards, and the ways in which they have contributed to damaging floods in the coastal zone.

I conclude that the current reading of coastal Bangladesh as a 'victim of climate change' requiring higher and wider embankments is unsustainable, as it ignores the way in which these very embankments exacerbate siltation and increase the risk of damaging flood. Climate change in Bangladesh, so far as many international experts are concerned, is about rising sea levels causing floods, but as this chapter demonstrates, floods in Bangladesh are not just about rising sea levels (cf. Barnes 2015: 143).

Ethnographically Exploring Climate-Change Knowledge Production

Anthropogenic global warming is a real material phenomenon and constitutes a key global challenge of our time. It is inextricably linked to the advent of capitalism, which reduced both human beings and the natural environment to pure commodities (Polanyi 1957). Capitalist land use and industrial practices have not only contributed to long-term climatic change through greenhouse-gas emissions, they have also resulted in significant localized environmental degradation. In the *Annual Review of Anthropology*, Crate (2011: 185) suggests that anthropologists in the era of contemporary climate change ought to replace 'environmental ethnography' with 'climate ethnography' to denote the urgency of localized experiences of weakened livelihood capacities and to advocate climate justice at global policy levels.

However, as anthropologists, we must also pay attention to detail and complexities. Although Crate acknowledges multiple stressors and other environmental factors affecting livelihoods, 'climate ethnography' assumes that climate change causes all the problems local people are experiencing. In order to holistically understand climate risks in Bangladesh, we must engage with the fact that the country is situated in a hydrologically active delta with constant processes of erosion as the Ganges, Brahmaputra and Meghna Rivers meander, while a billion tonnes of sediment flow from the Himalayas to the Bay of Bengal each year (Islam et al. 1999). In a state of nature, the silt deposits through accretion during annual monsoon floods and creates new land. In the 1960s, funding from the World Bank and the United States Agency for International Development (USAID) was used to construct 136 'flood-protection' embankments. These were based on Dutch polders and obstructed monsoon flooding, and thereby contributed to the silting up of the delta that results in the *jalabaddho* seen in Figure 12.1. Thus, an anthropological approach that replaces 'environmental ethnography' with 'climate ethnography' may risk losing a holistic understanding of localized processes tied to context-specific anthropogenic land-use practices, environmental degradation and social issues that affect livelihoods. The use of 'climate ethnography' may thus play a reductive role in describing human–environment interactions and increase the risk of 'climate reductionism', i.e. the ascribing of all changes in environments and societies to the climate (Hulme 2011).

Mike Hulme has researched climate-society relations since the 1980s: he worked on the United Nations Intergovernmental Panel on Climate Change (IPCC) and founded the Tyndall Centre for Climate Change Research. He points out that until the 1990s, global warming was often associated with 'climatic change', an index of change in the climate system to which interannual variations in weather would contribute. He argues (Hulme 2015: 290) that during the 1990s, the term 'climatic change' was increasingly replaced by 'climate change', a discursive shift from an adjective to a noun that denotes the role of climate as the main causative agent of interannual weather variation. Hulme's concept of climate reductionism is an important tool for understanding that although climatic change is indeed happening, the discursive power of climate change can be used to deflect closer, local examinations of causality.

Recent ethnographies increasingly deconstruct climate-change-knowledge production, pointing to the importance of understanding climate change as a depoliticizing discursive phenomenon. For example, Zink's (2013) ethnography of environmental policy and the social

embeddedness of knowledge production in Vietnam highlights how real climatic change coincides with 'discursively and socially constructed climate changes'. In addition, the ethnographies in Barnes and Dove's (2015) *Climate Cultures: Anthropological Perspectives on Climate Change* go beyond climate reductionism and unpack the complex relationships between society and climate. Orlove et al. (2015) take a historical approach to human perceptions of climatic change and deconstruct the production of knowledge (and ignorance) and discourses of climate change at both the local and global levels. By pointing to the dramatic images of melting ice caps and the associated rising sea levels that will drown small-island nations, they consider how certain climate-change impacts come to be prioritized over others. They argue that sea-level rise due to climate change is presented more as a pressing climate-change issue than those affecting mountains and deserts, and deflects responsibility for the latter (Orlove et al. 2015: 77). Similarly, in her ethnography of climate change and water in Egypt, Barnes (2015) finds that though climate change is not the only factor that will shape water availability in Egypt in the coming years, the political decisions about water allocation and access are neglected when Egypt's water future is discussed through the lens of climate change. She shows how variously positioned actors attach different weight to climate change as an explanatory variable. By doing so, she demonstrates how anthropologists can engage with climate change by deconstructing the production of knowledge about it.

The remaining sections of this chapter apply the concept of climate reductionism to the development industry in Bangladesh by using historical material to illustrate the complex causal processes behind 'floods' and how they have, ironically, become exacerbated by 'flood-protection' embankments. Such an account, historically grounded and deconstructing dominant narratives of climate change, is increasingly important as considerable development funding continues to be directed towards 'climate-change adaptation' (Barnes and Dove 2015). Anthropologists have an important role to play, not only in relating local community experiences of adaptation to climate change to global policy levels, such as that of the IPCC (Crate 2011), but also in analysing particular discourses of climate change in development projects as sites of a power struggle, of competing interests, conflicting agendas and divergent conceptions of the very notion of climate change. By doing so, we can appreciate how policy discourses may work as instruments of governance to 'identify the mobilising metaphors and linguistic devices that cloak policy with the symbols and trappings of political legitimacy' (Shore and Wright 1997: 3).

The Environmental History of Sundarbans' Embankments

Deforestation and Embankments as 'Salinity Protection': Before the 1850s

In their historically grounded ethnography of deforestation and environmental degradation in southern Guinea, Fairhead and Leach look at different 'readings' of the forest landscape by policy-makers, scientists and local inhabitants, and argue that '[p]olicy-makers may have been misreading the landscape by looking at history backwards' (1996: 3). The common reading of Bangladesh as a 'victim' of climate change assumes that as global warming increases, ice caps will melt, sea levels will rise, low-lying Bangladesh will drown and people will have to flee due to floods and increasingly frequent disasters (cyclones and tidal surges), thereby becoming climate-change refugees. Based on such a narrative, the World Bank is justifying the expansion of embankments along coastal Bangladesh through the discourse of 'climate-change adaptation'. However, as mentioned earlier, floods in Bangladesh are not solely caused by climate change and the portrayal of embankments as 'climate-change adaptation' constitutes a misreading of the coastal Bangladeshi landscape and the processes behind floods.

Embankments were constructed long before climatic change was identified as a problem for Bangladesh, and they were not originally intended to prevent floods. Instead, the earliest recorded forms of embankments in Bengal were built to protect newly created arable land – made from deforested coastal mangroves – against seasonal salt tide-water incursion. This, in turn, highlights how floods in Bangladesh are not solely about sea-level rise caused by climatic change (Auerbach et al. 2015; Brammer 2014). In order to comprehend the complexities of different types of flood in Bangladesh, it is important to understand the history of embanking the Sundarbans forest in Bengal and how it was interlinked with the deforestation of mangrove wetlands to convert them into arable land.

Deforestation of the Sundarbans dates back to the thirteenth century, during Turkic Sultanate rule, and later took place in the Mughal rule, from the sixteenth to eighteenth centuries, before continuing during the British regime. When the East India Company first seized the right to collect revenue in Bengal and Bihar in 1765, the unpopulated Sundarbans mangrove forest was used for profitable salt production, in which the Company's Salt Department upheld a monopoly (Phillimore 1945: 50–51). Its headquarters were in Culna, a small port situated at the northern boundary of the Sundarbans forest, as illustrated in Rennell's (1779) *A Map of the Sunderbund and Ballagot Passages* from 1779 (Figure 12.2).

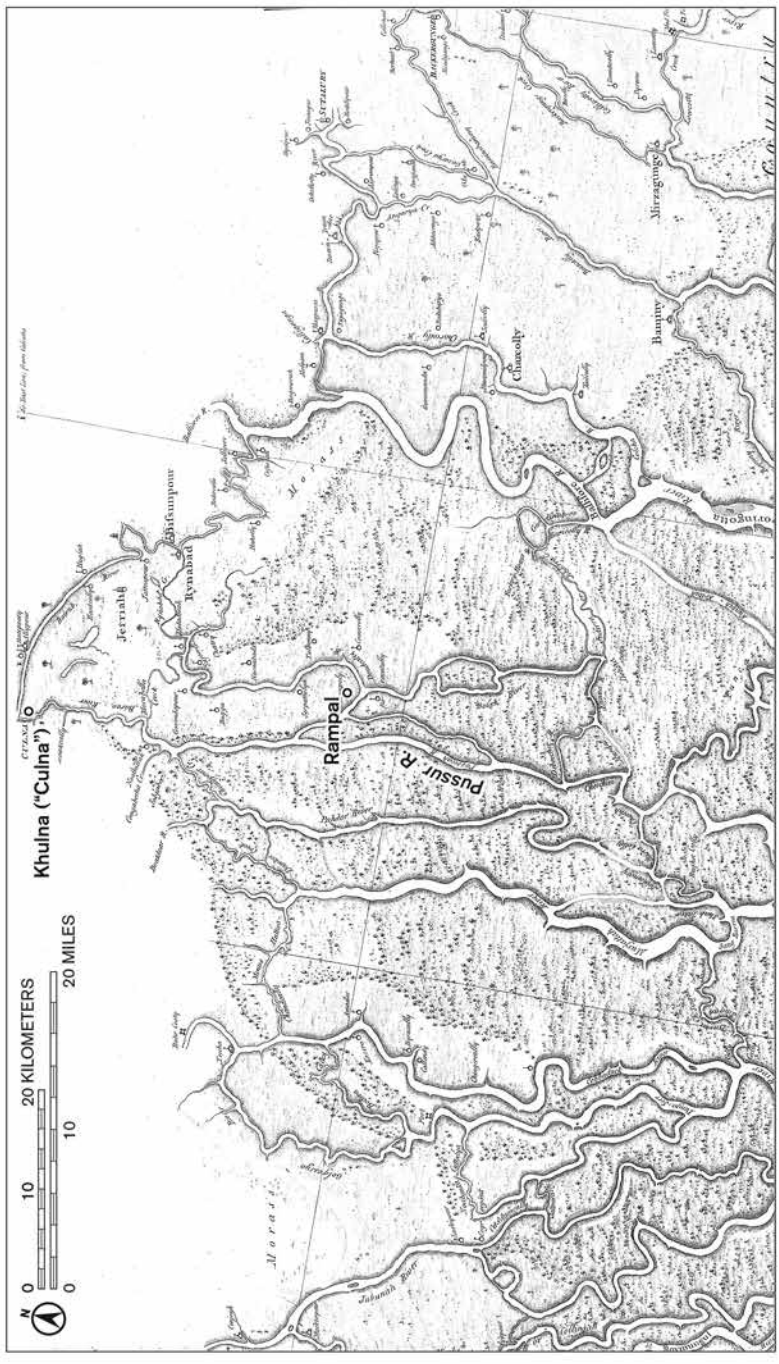

Figure 12.2. Map of the Sunderbund Passages (© The British Library Board. Source: Rennell 1781, Maps 25.b.8)

However, the Company's salt production was increasingly replaced by the 'reclamation' (deforestation) of mangrove wetlands into arable, revenue-generating crop lands. British deforestation entailed the most rapid destruction of the Sundarbans that Bengal had experienced to that point (Gadgil and Guha 1992; Richards and Flint 1990; Sivaramakrishnan 1999) and was therefore different from the slower-paced conversion of forest into arable land during the Turkic Sultanate and Mughal rules (Eaton 1990). Two thousand square kilometres of land, i.e. 70 per cent of the Sundarbans, was cleared between 1830 and 1873 (Richards and Flint 1990).

Figure 12.3, the 1874 Maps of Jessore District (Thuillier 1874), shows how Culna/Koolna is no longer at the frontier of the Sundarbans, while the many named locations on the map illustrate how vast deforestation has resulted in both cultivation and habitation in the southernmost populated boundary. Gastrell (1868) notes how the swamps from Rennell's *A Bengal Atlas* (1779) are now dotted with villages and converted into 'first-rate rice lands'. The rapid pace of deforestation under the British colonization of Bengal (1765–1947) entailed the establishment of new arable lands and settlements into increasingly low-lying parts of the southern Sundarbans that were subject the salt tides from the Bay of Bengal, necessitating embankments or 'bunds' (*bandhs*), small earthen dykes raised above the land that is adjacent to rivers so as to protect agricultural rice fields from saline tidewater during the dry season (Lahiri 1936: 39). The early and low Sundarbans *bandhs* were purposefully breached by cultivators each year to enable monsoon *borsha* floods, for irrigation and the deposition of silt from the rivers; they were not built to prevent floods. The early colonial administration in Bengal lauded *borsha* floods as a 'blessing of fertility'. Rennell (1764, cited in La Touche 1910: 27) and Gastrell (1856) describe how 'inundations' during the monsoon were a natural part of the landscape and how they deposited nutrient-laden silt from the rivers that were key to the fertile lands of Bengal.

After the monsoon, cultivators repaired the *bandhs* to prevent brackish tidal water from spilling into arable land when freshwater recedes upstream in the dry season, starting in January. Such 'salt protection' *bandhs* enabled colonial civil servants like Henckell and the Morrells to convert the 'salty marshes' of the Sundarbans into arable paddy land (Hunter 1875a, 1875b; Lahiri 1936; Westland 1871). Without annual repairs of the *bandhs*, the salinity could ruin crops and thereby risk the reversion of the deforested lands back into mangroves (Hunter 1875b: 183). The necessity of salt-water-prevention embankments made the British deforestation of Sundarbans mangroves in the Bay of Bengal different from any of the other deforestations in British India (Cederlöf 2008; Guha 1991; Sivaramakrishnan 1999).

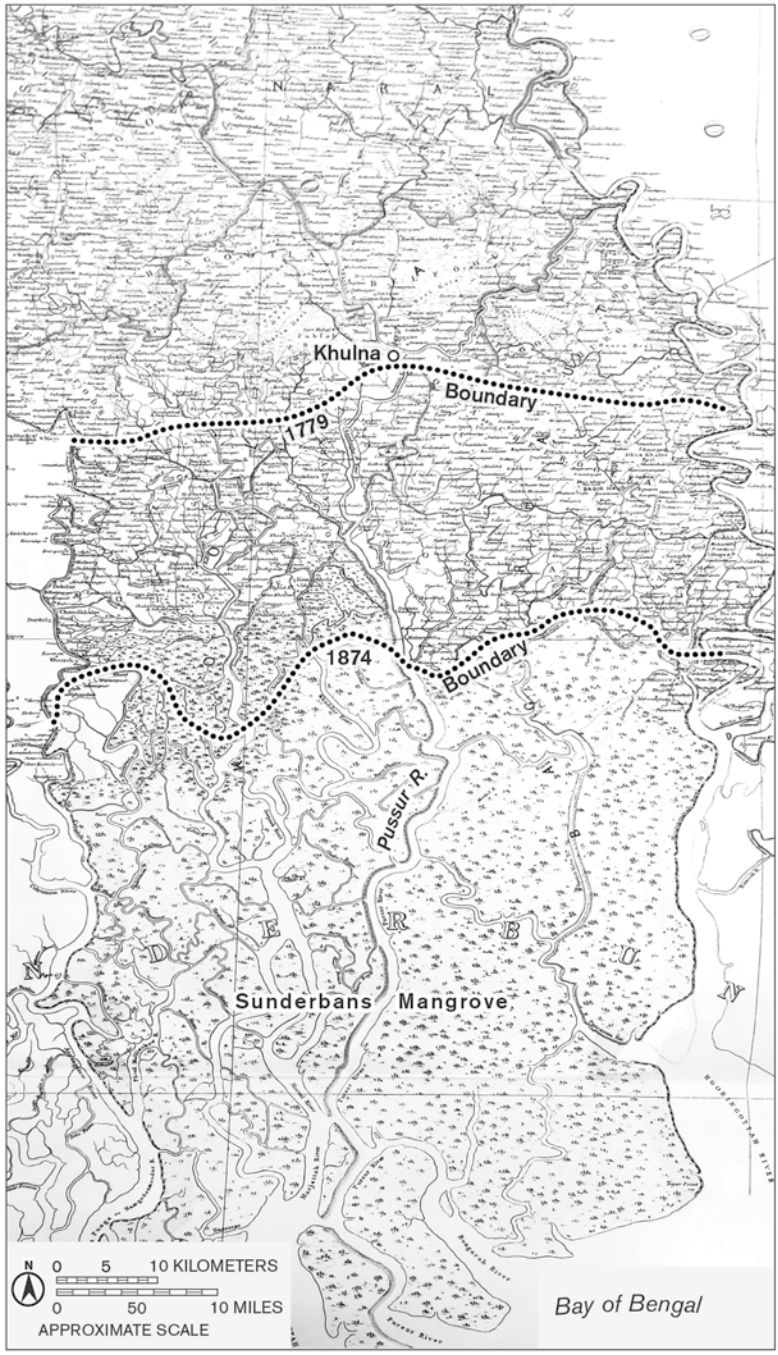

Figure 12.3. Map of Jessore District (© The British Library Board. Source: Thuillier 1874, IOR/X/1176)

The British Raj (1850s–1947): Centralizing Administration, Simplifying Nature

The 'raising of *bandhs*' was essential for the deforestation and cultivation of the Sundarbans. During the East India Company rule of India from the 1770s to the 1860s, the responsibility to erect and maintain them belonged to the holder of the grant to 'reclaim' forest into land. Ingles (1911: 46–7) in his review of embankment policy and legislation in Bengal suggests that the laws under the Company 'were so elaborate that they were unworkable – and were thus often uncompensated': the decentralized construction and repair of embankments resulted in little to no state compensation to the cultivator. Indeed, irrigation and its maintenance were predominantly neglected under Company rule (Mosse 2003; Washbrook 1988; Willcocks 1930).

The British Crown gained control of the subcontinent from the Company in 1858. In contrast to the decentralized approach of the Company, the British Raj sought to take more responsibility towards its subjects through centralizing policies and regulation, and created the Indian Civil Service (Mosse 2003: 246). In terms of embankments, the state increasingly took responsibility for them under the justification that this was to protect 'life and property' from damaging floods (Ingles 1911). This shift away from lauding *borsha* inundations as a blessing of fertility for Bengal in the Company period (Gastrell 1856) to seeing floods as damaging to life and property under the British Raj was connected with the replacement of temporary earthen *bandhs* with permanent 'watertight' embankments (Willcocks 1930: 23–24). Centralized management entailed that the colonial state took charge of the costs of annual repairs of *bandhs*, which were breached each year. The Indian civil servant Westland (1871) lamented that 'much money continued to be spent upon the [maintenance of] embankments'. Casting monsoon *borsha* inundation as destructive was a way to justify the colonial administration's endeavours to prevent and/or repair breaches to the embankments. As *bandhs* broke easily and required considerable repair, this period saw the introduction of 'watertight' embankments that prevented 'wholesale breaches' and thus reduced annual repair costs (Willcocks 1930).

However, in contrast to *bandhs*, 'watertight' embankments obstructed flooding during the monsoon, thereby hampering irrigation required for paddy cultivation. Willcocks (1930: 22–23), in his study of the earliest 'watertight' embankments in the north-central and western parts of Bengal since the 1840s, points out that *zamindars* (responsible landowners) and their tenants secretly cut and made breaches (*kanwaz*) to the Damodar embankment northwest of the Sundarbans to facilitate flooding

as it would have during earlier periods of earthen embankments: 'It never seems to have struck anybody that the breaches were made secretly by the peasantry for irrigation' (Willcocks 1930: 22–23). The way in which *zamindars* and their tenants resisted the centrally planned 'watertight' embankments highlights how the colonial intervention did not consider the complex hydrological and ecological processes of a deltaic flood plain, with its many meandering rivers and the seasonal variation of tidal inundation filled with salt and silt, or the importance of monsoon floods for rice irrigation.

Instead, 'watertight' embankments were cast as 'better' than local earthen *bandhs* (Willcocks 1930). This new type of embankment, easier to control and requiring fewer repairs, was promoted as a scientific technology that would modernize Bengal. The centralized expansion of 'watertight' embankments' was interlinked with the expansion of colonial railways, which were similarly portrayed as a colonial exemplar of 'progress' and 'modernity' in contrast to the 'traditional' waterways of Bengal. 'Watertight' embankments and railway bridges were built across the many criss-crossing rivers of Bengal, and facilitated the construction of colonial railways and roads atop them, simultaneously enabling considerable capitalist interests to extract resources from its colonized territories. This infrastructure divided the delta into 'innumerable compartments' as a means to control nature and floods (Iqbal 2010: 15). However, this was to have wide-ranging ramifications that we still see today: worsening siltation and drainage congestion upstream, as the fluid routes of waterways were increasingly replaced by roads.

The creation of 'watertight' embankments under a centralized colonial state gives credence to James Scott's (1998: 4) theory of why many well-intended schemes to improve the human condition have failed due to the combination of four factors: state simplification as part of administrative ordering to make both society and nature legible; high-modernist ideology based on the belief of the superiority of Western science and technologies; the collusion of the state with capitalist interests legitimized through high-modernist ideology; and a weak civil society unable to resist these plans. This new type of embankment simplified the dynamics of floods and monsoons. The British Raj promoted 'watertight' embankments as a scientific technology that would modernize Bengal, highlighting how state simplification and high-modernist ideology are entwined. Furthermore, this new infrastructure was tied to considerable capitalist interests working together with the colonial administration to expand profitable roads and railways in Bengal, which were used for colonial extraction. While we can certainly see how embankments correspond with the first three elements of Scott's theory – simplification,

modernization and promotion of capitalism through collusion with state-cum-colonial administration – the archival resources provide little information on the extent or form of civil-society resistance in this period.

Many of the archival documents highlight logistics and matters related to revenue and communications. Prior to 1850, there were no railways and few roads in Bengal, and water transport was preferred to land carriage (Bentley 1925). In 1875, riverine traffic was extensive in the coastal areas, with boat routes connecting the entirety of Bengal (Hunter 1875a). Traditional waterways were affordable and accessible to local people; it was the main mode of transport. Boats and river traffic were so well developed that there were a considerable number of people living on boats in the rivers, making it difficult for census enumerators to estimate the size of the boat population (Census of India 1883). Sir Arthur Cotton was a famous British irrigation engineer with five decades of experience of India's irrigation systems, including restoring Mughal irrigation works such as the Godavari Canal System. In 1872, he proposed a scheme for navigable canals that was submitted to a Parliamentary Committee in London. He argued that India 'demanded water carriage', which was considerably more cost-effective than railways, and suggested that the preference for railways comes from 'utter ignorance of India and her needs' (Majumdar and Datta 1970: 863). However, Cotton's scheme was rejected due to the opposition of vested railway interests (Majumdar and Datta 1970: 863), who were involved in considerable financial malpractice in the expansion of colonial railways (Sweeney 2015). This illustrates how capitalist interests in London worked together with the colonial administration to harness 'high-modernist ideology' to expand railways in a way that undermined the strong objections of colonial officials with local knowledge, such as Cotton.

The ideology of railways as bringers of modernity was powerful. It left a postcolonial legacy in which the British Raj is perceived to have 'modernized' India and in which the sites of the railway became nodes for the expansion of 'modern institutions, including law, bureaucracy, police, schools, the military, science, industrial technologies and nationalism' (Ludden 1999: 180). Railways not only connected ports to interior centres along lines of commercial investment and resource extraction, enabling the transportation of export goods (Ludden 1999: 180), but also played an important role in transporting landless wage labourers (former peasants adversely affected by the over-extraction of agricultural surplus by elites) to wherever there was a labour shortage in the colonial economy (van Schendel 1981: 288).

Railways also served a military purpose. In 1853, the British Governor-General Lord Dalhousie argued that building further railways 'would

enable the Government to bring the main bulk of its military strength to bear upon any given point, in as many days as it now requires months, and to an extent which is at present physically impossible' (Headrick 1988: 63, cited in Kaijser, van der Vleuten and Högselius 2016: 189). After the Indian Rebellion against British rule in 1857, building railways became a high priority for the Raj. By 1872, Britain had built more than 8,000 km of railroads in India (Headrick 1988: 65). A significant quantity of resources was shifted towards the expansion of the railways to replace waterways as the main mode of transport. Between 1872 and 1881, 525 miles (845 km) of railways were constructed in Bengal and Bihar alone. Railway construction commenced in the deltas of East Bengal in the 1890s, and by 1925 there were 3,000 miles (4,828 km) of railways in Bengal (Bentley 1925: 27–33).

The expansion of railways in India may have supported colonial economies and military power, but it had several negative consequences for the ecology of the Bengal Delta. First, the prioritization of funds towards railways resulted in the neglect of inland navigation, as Cotton had warned. Second, embankments that were secure against breaching stopped the annual monsoon *borsha* floods from depositing their fertile silt on the flood plains:

> and in consequence flood water was shut out from the country, the natural system of deltaic irrigation was interrupted, drainage was impeded and the network channels which used to be formerly fed by the silt water from the great rivers became silted up and in many cases entirely destroyed, rendering boat traffic difficult and in many cases impossible. (Bentley 1925: 20)

Unlike the breakable earthen *bandhs* used during early Sundarbans reclamation, the permanent 'watertight' embankments used for roads and railways resulted in a total disruption of free-flowing water systems (Bentley 1925: 20). Furthermore, as environmental historian Iftekar Iqbal (2010: 131–40) points out, the colonial development of railways in the fluvial landscape of the Bengal delta was ecologically unsustainable and led to disastrous consequences for agrarian Bengal.

By 1921, the delta is described as thoroughly embanked and suffering from siltation. Due to vast amounts of silt in the rivers, many water bodies were rapidly filling up, with some turning completely dry during the summer (Census of India 1923). The once great Kabadak River no longer received fresh water from the Ganges, as its tributary had silted up. In embanked areas, the silt-laden river water, once able to inundate, and deposit on, the vast floodplains, was now confined to the rivers. This had the result that the silt was instead depositing on the riverbeds and in the canals (Census of India 1923). A decade later, the Presidency

Division, which encompassed what is today the southwest coastal zone of Bangladesh, was described as a region of dead or dying rivers (Census of India 1933: 10). As the water bodies were filling up with silt, they could no longer retain the same amount of monsoon rain. Instead, the rainwater would become trapped inside the embanked floodplains, unable to flow out to the rivers due to the elevation difference between land and the raised, silted riverbeds outside. This came to be known as *jalabaddho* floods (waterlogging). By the 1920s, embankments contributed to longer lasting *jalabaddho* floods that spoiled *aman* paddy and disrupted natural fisheries (Bentley 1925: 33).

The accounts of the state of the delta as described in the Census of India reports (1923, 1933) mention 'floods' as increasingly damaging to 'life and property'. While early colonial accounts such as those of Rennell and Gastrell in the eighteenth and nineteenth centuries mention monsoon 'inundations', these later reports do not distinguish between beneficial *borsha* floods and damaging *jalabaddho* floods caused by the disruption of drainage in the delta. The shift from perceiving the annual inundation of silt as a blessing to flooding as a damaging event is interlinked with the colonial government's objective of centralizing its control over rivers and embankments so as to expand railways, while reducing annual maintenance costs.

Despite dissenting voices warning of the negative ecological effects of compartmentalizing a hydrologically active delta, the construction and expansion of 'watertight' embankments continued and may serve as an example of how an 'armchair' imperial science tended to prefer to maintain its ignorance of local knowledge and needs (Mosse 2003: 246). The centralized colonial administration imposed such infrastructure despite its inappropriateness for a delta best suited for waterways. These colonial 'watertight' embankments were predecessors to current technological interventions, which repeat past mistakes and exacerbate environmental damage.

The 1960s Coastal Embankment Project and 'Development'

The Sundarbans region south of Khulna did not form part of any railway route that was essential for the colonial state. Despite several legislative attempts to include the region's embankments within centralized management since the 1880s (Government of Bengal 1914), they were mostly left alone during the British Raj (Ingles 1911: 46–47). Indeed, contemporary accounts suggest that government embankments did not exist in the Sundarbans until the Coastal Embankment Project (CEP) of the 1960s (Brammer 2004; Elahi and Rogge 1991; Zaman 1993). Due to neglect by

the state, the responsibility of annual repairs continued to fall on various constellations of *zamindars*, tenure holders, subtenure holders and tenant farmers (Das Gupta 1935; Ingles 1911; Lahiri 1936).

Sadhu Kaka, an 85-year-old farmer, describes the *aushtomashi bandhs* (eight-month embankments) of his childhood as small temporary earthen dykes made with the excavated soil on the side of the floodplain. After the harvest of *aman* rice in mid-January (*magh* in the Bengali calendar), the *zamindar* coordinated the villagers (four to five people from each household working together) in the construction of these *bandhs* on the sides of the river to protect against saline incursion from the Bay of Bengal during the dry season. In mid-August, they breached the *bandhs* along the various canals connected to the river so as to facilitate monsoon *borsha* floods of rain mixed with sediment-laden river water to irrigate paddy fields. This system prevented saltwater intrusion in the dry season, while allowing for the fertile silt inundation in the monsoon season. Sadhu Kaka and many of my interlocutors depicted this as a dynamic system adapted to the active flows of the delta. The continuation of *aushtomashi bandhs* in this area highlights how local ways of organization continued in some places, despite attempts at colonial centralization.

However, the partition of 1947 separated Bengal and the Sundarbans into India and East Pakistan. Many Hindu landlords in Khulna migrated to West Bengal, and the *zamindari* system was formally dismantled through the 1948 East Bengal State Acquisition and Tenancy Act (Lewis 2011: 60–61). In addition, the colonial irrigation office and its revenue funds all but disintegrated. The combined gap left behind by *zamindars* and colonial irrigation officers coincided, or resulted in, the neglect of *bandhs* that by the 1950s were in a severe state of disrepair (Huq 1957). Huq lamented how this vacuum resulted in extensively broken embankments causing saltwater intrusion during the dry season and reduced crop yields. He suggested that the Irrigation Department should take responsibility for the embankments to prevent salinity intrusion and to ensure the agricultural productivity of the land. The publication of Huq's report overlapped with the floods of 1954, 1955 and 1956 that led a US-funded United Nations study (by the name of the Krug Mission) to recommend government intervention in flood protection. This resulted in the creation of a state engineering agency to overtake water management responsibilities in Bangladesh (United Nations 1957). The Krug Mission advised that large-scale embankments based on Dutch dykes be constructed to 'control damaging floods'. In 1961, USAID (Chadwick and Datta 2003) and the World Bank (Islam 2006) funded the CEP, which commissioned the newly created irrigation agency – now known as

the Bangladesh Water Development Board (BWDB) – to construct 4,000 km of embankments, that resulted in 136 enclosed polders, across the entire coastal belt of Bangladesh (FAO 1985). Through this international development project, 1,566 km of permanent embankments and 282 sluice gates to regulate the flow of river water were constructed in the southwest region alone.

Hanlon et al. (2016) highlight how the Krug Mission was promoted by US interests and they suggest that technical assistance to (East) Pakistan was politically motivated because of its importance to the United States in the Cold War.[2] These geopolitical motivations were entwined with an ideology of 'development', the latest form of ideas of 'progress' and 'modernity' imposed on Bangladesh since the colonial era to justify interventions in environment and society. As Gupta (1998) suggests, many formerly colonized states sought to 'catch up' with the 'developed' world after the Second World War. The Bretton Woods Institutions, such as the World Bank and the International Monetary Fund, were officially created to facilitate the 'development' of 'underdeveloped' postcolonial societies, an ideology that helped secure strategic alliances through 'technical assistance'. As part of this paradigm, Western donors cast 'modern' technology and engineering works, agricultural productivity, urbanization and industrialization as essential components in the road towards 'development'. The 1960s CEP was thus part of a global process of promoting state-led 'development' through large-scale infrastructure projects in newly independent Third World countries. The ideology of essentially Eurocentric 'development' entailed 'technical assistance' for capital-intensive projects that employed mainly foreign engineering consultants unfamiliar with Bangladesh. Dutch-style 'polders', embankments, were a technical solution detached from local ecology and the active hydrology of a dynamic delta.

As with the 'watertight' railway embankments of the British Raj, the CEP embankments extended the obstruction of floods to the coastal region. Annually, over a billion tonnes of sediment, carried from the Himalayas in the river water, was unable to be deposited across the delta by the monsoon *borsha* inundation. The embankments thus confined the sediment to the rivers, silting up water bodies, raising riverbed levels and reducing water-retention capacity in the coastal rivers and canals. Furthermore, the CEP embankments were built in such a way that they only had a few sluices connecting canals to the rivers, resulting in many of the canals being cut off from their water sources and disappearing (Hossain et al. 1987; Iqbal 2010). Sadhu Kaka recollects the changes since the construction of the CEP embankments:

> This area was once filled with rivers and canals. If we wanted to go anywhere, we went by *nouka* [a small, wooden rowing boat]. It took only an hour get to Chalna and everyone had their own *nouka*. Due to these government roads/ embankments, our canals have silted up and there is no longer any water transport between the villages and towns. This was better than road transport – they are useless during the monsoon as we are stuck to our knees in mud. (During fieldwork in 2014–15)

By the 1970s, the rivers were increasingly silted and less navigable. Forty-five miles of the Gorai – a main freshwater tributary of the Ganges – silted up to the extent that they were unfit for navigation, while many reaches of the distributary rivers were no longer navigable by waterways (Government of Bangladesh 1976: 3–4).[3] The once great Bhadra River, where steam boats could once pass, is now a mere silted canal referred to as the 'Mora Bhadra' (dead Bhadra) (Dewan et al. 2015).

Not only did the obstructed floods cause siltation of water bodies, but by depositing on the riverbeds outside the embanked floodplain, they raised the water level outside the polder to higher than that inside, trapping water inside the embankments and leading to impeded drainage and waterlogging (FAO 1985; Iqbal 2010: 133). The problems of the northern tracts of previously embanked Bengal in the 1880s onwards had finally reached the coastal Sundarbans (see Figure 12.1). The CEP embankments extended the problem of *jalabaddho* floods to the south-west coastal region, as water was unable to drain out from inside the embanked floodplain out to the river. It was perhaps unsurprising that local people in some places continued the practice described by Willcocks (1930) of intentionally breaching parts of the embankments through what Sklar and Dulu (1994) refer to as 'public cuts', which are used to drain the fields of stagnant water. Nevertheless, by the 1980s and 1990s, *jalabaddho* caused more than 100,000 hectares to be permanently flooded,[4] and became much more dangerous than monsoon *borsha* floods (Iqbal 2010) in their inhibition of cultivation, damage of crops and prevention of crop rotation (Adnan 1994).

The problems of *jalabaddho* floods in the 1980s were further exacerbated by low-frequency damaging *bonna* floods caused by tidal surges and cyclones. These brought international attention and significant funds for flood protection in Bangladesh (Adnan 1994), in a similar way to the 1950s floods in East Pakistan (Hanlon et al. 2016). While the technical assistance of the Krug Mission had helped gain the support of the Pakistan government of General Ayub Khan, the technical assistance of the Flood Action Plan (FAP) now helped donors gain the support of the autocratic regime of General Ershad in Bangladesh. The FAP consisted of several donor-funded studies on how Bangladesh could best manage floods.

Figure 12.4. The silted Bhadra 'river' outside Polder 31 (photograph taken by Camelia Dewan, December 2014)

Figure 12.5. Embankment with agricultural land to the left, and river to the right (photograph taken by Camelia Dewan, December 2014)

Note:

Figure 12.4 shows how the Bhadra 'river' has silted up to no more than a canal, while Figure 12.5 shows how the land inside the CEP embankment built in the 1960s–1970s is lower than the bank outside the embankment, which has been raised through annual silt deposits. This difference in elevation results in poor drainage during the monsoon period, when the rainwater inside the embankment is unable to drain out into the river, causing *jalabaddho* (waterlogging).

Like climate change today, 'flood protection' was at the receiving end of a significant portion of Bangladesh's development funding in the 1990s. Shaw (1992) argues that large-scale and high-tech 'flood-protection' projects, supported by donors like the World Bank and the relevant state agencies, favour capital-intensive and technical solutions. She suggests that the Ershad regime was enthusiastic over the prospect of expanding large-scale flood control and irrigation embankments as it provided a 'lucrative' opportunity. However, as I have described, the existing CEP embankments had proven ineffective in controlling floods, while worsening sedimentation and *jalabaddho*. This motivated Bangladeshi civil society to come together to protest against the FAP and express doubts that any similar investments would prove more effective (Adnan 1994; Boyce 1990; Clayton 1994; Elahi and Rogge 1991; Hofer and Messerli 2006; Hossain et al. 1987, 1992; Hughes et al. 1994; Rahman 1992; Shaw 1992; Sklar and Dulu 1994; Zaman 1993). Strong civil-society protests ensured that the FAP was not implemented. Shaw's (1992) paper on floods in Bangladesh in the 1990s reappeared in an identical version in the *Anthropology of Climate Change: An Historical Reader* (Shaw 2014). She criticized donors for harnessing 'flood protection' as a means of promoting capital-intensive development interventions. Her paper was written decades before climate change became a development priority and it is rather ironic the way this paper reflecting on 'flood protection' as a development buzzword has been repackaged as relevant to climate change.

Such repackaging is arguably what the World Bank is currently engaged in. It was one of the main actors behind the 1960s CEP, the 1990s FAP and now a 'climate-change adaptation' project entitled the Coastal Embankment Improvement Project (CEIP). The aim of this last project is to make existing embankments higher and wider, with the motivation that this will protect against the rising sea levels and increased frequency of cyclones as a result of climate change. The existing embankments are cast as ill-equipped to help Bangladesh adapt against climatic change and therefore as necessitating new infrastructure (World Bank 2012). By promoting capital-intensive technical solutions that mimic those of the problematic 1990s FAP, the project does not engage with over a century of experience on the problem caused by permanent 'watertight' embankments and the way in which they obstruct beneficial monsoon *borsha* floods.[5]

The resulting increase of siltation in the delta due to permanent embankments has reduced water-retention capacity in the water bodies, while raising the riverbeds outside the embanked floodplains. In fact, a recent study found that the areas in southwest Bangladesh enclosed by the CEP embankments in the 1960s have lost 1.0–1.5 m of elevation,

compared to the neighbouring unembanked Sundarbans mangrove (Auerbach et al. 2015). Researchers attribute this elevation loss to the interruption of sedimentation inside the embankments, combined with accelerated compaction, removal of forest biomass and a regionally increased tidal range. They conclude that riverbed sedimentation in Bangladesh caused by direct human modification of the environment through the construction of 'flood-protection embankments' poses a greater threat of coastal flooding than does the predicted sea-level rise in the future (Auerbach et al. 2015). A narrative that promotes the expansion of flood-protection embankments as a form of climate-change adaptation can therefore arguably be seen as 'climate reductionist' (Hulme 2011), as its formal project rationale casts floods as caused solely by climate change, without reference to the environmental processes that are exacerbating coastal vulnerabilities, including siltation, waterlogging and riverbed rise.

The CEP, the FAP and now the CEIP highlight the ways in which donors such as the World Bank engage in similar 'simplifications' to those of the colonial state of the British Raj: both maintain ignorance of complex socioecological contexts and the ways in which embankments exacerbate siltation. The CEP, the FAP and the CEIP are internationally funded and capital-intensive projects using 'modern' technologies and highly paid Western experts. Scott (1998) argues that state officials collude with capitalist interests to bring high-modernist ideas into being. From railways to the CEIP, these large-scale, capital-intensive infrastructure projects provide lucrative opportunities (Shaw 1992) and bring various coalitions of capitalist interests and state officials together to implement these designs.

Although Scott's (1998) ideas of 'state simplification', 'high-modernist ideology', state collusion and a weak civil society may fit the examples in this chapter, there are limits to his theory. Cotton's critique of railway expansion in India and Bengal[6] highlights how there are often competing knowledges in the field of 'development', where some narratives are better at harnessing support than others, while furthering economic, (geo)political or administrative agendas. Narratives of improvement, whether through railways, flood protection or climate-change adaptation, have the potential to enable simplification in ways that increase the financial interests of particular actors, both within state administrations and within international organizations. Development schemes not only fail due to 'the state' and 'capitalist interests' colluding to use high-modernist ideologies to promote their interventions; rather, the 'state' as well as the World Bank are composed of actors with diverging agendas and beliefs who ally themselves with capitalist actors with specific interests.

Thus, the prevailing dominant narrative represents the outcome of internal organizational struggles regarding what is accepted as knowledge or science.[7] This is particularly relevant today because of the way in which 'state' simplification can be combined with climate reductionism to put forward particular interventions that might be at odds with local experience and knowledge. Although using climate change as an explanation for change allows for connections between ideas and events to justify project funding, it creates expectations of causality that do not match with current physical realities, as this chapter has demonstrated.

Conclusion: How Simplification Exacerbates Climatic Vulnerability

This chapter has problematized current narratives of Bangladesh as a 'climate-change victim' by pointing out that embankments were built long before climatic change was identified as a development problem for Bangladesh. The deforestation in the Sundarbans was different from that elsewhere in British India, as the lands cleared to be used for rice cultivation required temporary earthen embankments. These were constructed in the dry season to stop saline tidewater from the Bay of Bengal from ruining crops. Cultivators then breached these embankments each monsoon to facilitate *borsha* floods that inundated the land with silt-laden river water mixed with rain. The silt fertilized the soil and naturally raised land levels, while the flood irrigated the rice fields and provided a breeding ground for fish.

However, the annual cost of repairing these breaches before the start of each dry season was high. The British Raj's push for a centralized administration and reduction in annual maintenance costs saw a shift towards 'watertight' embankments that stopped the *borsha* floods. Over time, such embankments paved the way for roads and railways to replace the water carriage that was once so characteristic of the Bengal Delta. These 'watertight' embankments based on 'imperial science' prevented floods and thereby confined the silt to the rivers and raised riverbed levels, so that the rainwater during the monsoon could no longer drain out the river, causing damaging *jalabaddho* floods (waterlogging). Over the years, such silt filled many rivers and canals, and caused them to disappear.

The East India Company's view of silt and monsoon floods as a blessing of fertility was superseded by *jalabaddho* floods being seen as a curse by the British Raj. However, despite continuous dissent at the expansion of embankments and their negative ecological consequences for Bengal –

from Sir Arthur Cotton to Bentley, Willcocks, Lahiri and White, amongst others – colonial embankments progressed from being protection against floods to their current status of protection against climate change.

Capital-intensive embankment infrastructure helped simplify administration with little formal acknowledgement of the complexities of local history and ecology; from colonial railway embankments to the World Bank-funded CEP post-independence and the FAP amidst Structural Adjustment Policies. This is currently also the problem with projects funding climate-change adaptation in Bangladesh. The recent World Bank-funded CEIP seeks to build higher and wider embankments to protect Bangladesh against future rises in sea levels due to global warming, but it does not explicitly engage with the historical experience of how 'flood protection' exacerbates siltation, waterlogging and rising riverbeds (see World Bank 2012). A project narrative built around the idea that only climate change causes floods – while not acknowledging the ecological complexities of different types of flood and how embankments exacerbate them – is arguably an example of 'climate reductionism' (Hulme 2011). This illustrates how climate change as an idea rearranges events to create expectations of causality that legitimize particular development interventions (Mosse 2005). Thus, climate reductionism can be harnessed in ways that enable narratives suited to particular economic, political or administrative goals – in this case, building more embankments.

Bangladesh is at risk of climatic changes in terms of variable precipitation and temperature patterns, increased frequency and intensity of natural disasters, and long-term rising sea levels. Therefore, I do not set out to deny the existence of climatic change, but rather to challenge the popular conception of its impacts and its subsequent interpretations in specific projects promoted by the development aid industry. By creating mismatched causal explanations, these interventions may ultimately increase Bangladesh's future climatic vulnerability by exacerbating flood risks through higher and silted riverbeds, and by removing funding from other development activities. As Hossain et al. (1987: xii–xiii) pointed out almost thirty years ago, 'there is a fixed sum of money available for aid, and an emphasis on flood protection would automatically mean giving less priority to other types of activities'. Similarly, too great a focus on climate change means less attention to other problems prioritized by coastal populations, such as that of siltation and dying rivers. Historically grounded anthropology thus has an important role to play in deconstructing the knowledge produced about climate change.

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Notes

1. All non-English words in italics are in Bangla unless otherwise specified.
2. Pakistan was the main bulwark of land separating socialist India from its neighbouring communist states of the Soviet Union and China (Cohen 2004: 34, 302).
3. In the report, the main cause for this siltation was attributed to India's unilateral construction of the Farakka barrage and the consequential reduced inflow of freshwater into Bangladesh, and a billion tonnes of sediment unable to flood the plains. The historical evidence of sedimentation and embankments suggest that this transboundary issue is one of several causes of sedimentation.
4. In Jessore District, the largest problem is permanent *jalabaddho*. Experiments using local solutions to break the embankment in certain places have been used to remove

inundations and are currently referred to in development projects as 'Tidal River Management'.

5. The CEIP does not explicitly address the connection between 'flood protection' and the silting-up of important water bodies in its formal project documentation and technical reports (World Bank 2012).
6. See Majumdar and Datta (1970: 863).
7. Scott further suggests that interventions fail when there is a weak civil society. It is unclear what role civil society played during the colonial period, when voices like those of Sir Arthur Cotton were silenced. During the CEP, East Pakistan was ruled by West Pakistani and its people frequently protested top-down West Pakistani policies, culminating in the 1952 Bengali Language Movement and the 1971 Independence War. Despite the fact that the Ershad regime was a military autocracy, Bangladeshi civil society mobilized and strongly protested the FAP in the early 1990s to the extent that it was never implemented, showing the important role civil society played in protesting against top-down plans with significant environmental consequences.

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