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The Waterways of Tangail: Failures to Learn from Flood-Control Efforts in the Brahmaputra Basin of Bangladesh

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ABSTRACT: Traditional non-structural approaches to water management and flood protection in Bengal disappeared almost entirely under colonial and national water planning. The 1950s saw the rise of permanent and centrally regulated infrastructures for flood control, drainage and irrigation (FCD/I). A nationwide Flood Action Plan (FAP) in the 1990s reinforced this structural approach and included as one of its flagships of the FAP-20 component in the Tangail District. While essentially remaining a form of FCD/I, FAP-20 attempted to pay attention to social and ecological concerns. During its implementation (1991-2000), however, FAP-20 became highly controversial on both accounts. Eventually, it was phased out and not replicated elsewhere. Revisiting this particular project is as relevant as ever for several reasons. First, the article shows that its negative impacts are felt long after the project ended. To better understand these impacts, the present article provides a historical and contextual perspective on water governance in Bangladesh. Second, there seems to have been little learning from the FAP-20 experience. The project was not adequately evaluated, and lessons are therefore not assimilated by the design of subsequent water-sector projects (e.g. the Blue Gold plan). The article argues that a thorough evaluation is needed and can provide valuable insights for the development of more adaptive and inclusive approaches to water management.

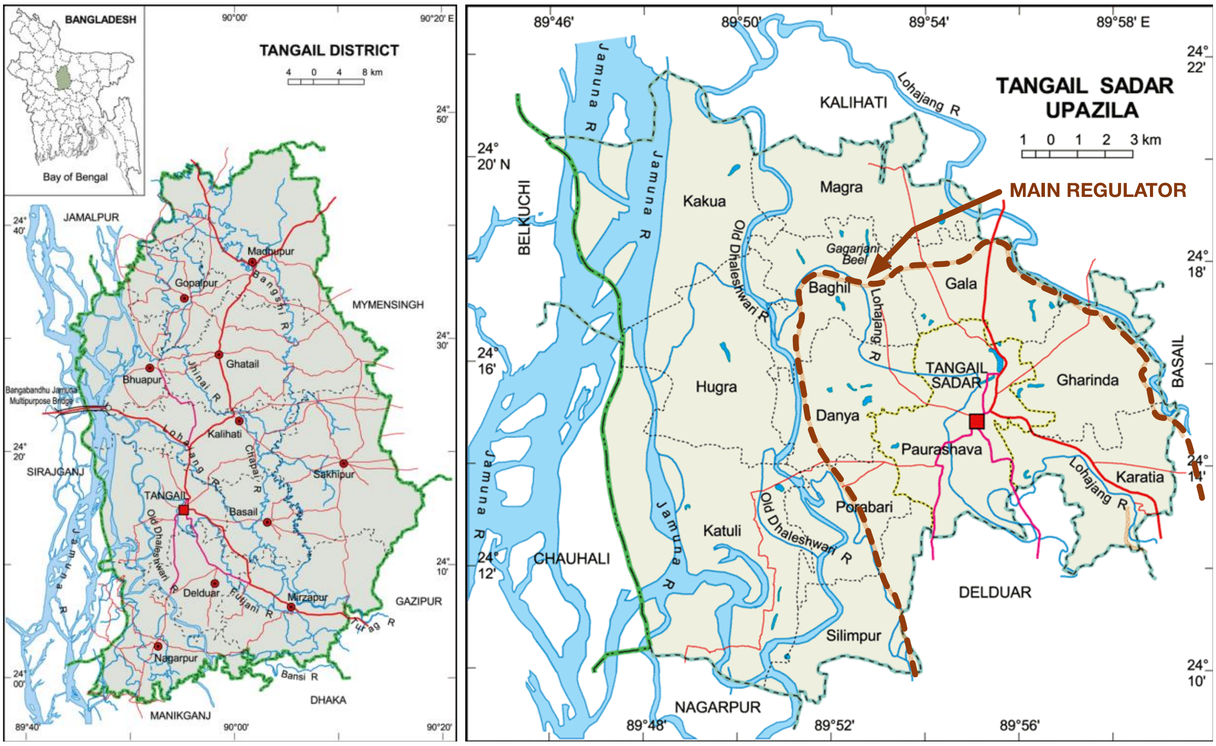
KEYWORDS: Flood control, evaluation, Flood Action Plan, Blue Gold, Tangail, Bangladesh

INTRODUCTION

Historically, water governance in Bangladesh has wavered between two conflicting styles. Traditional systems included self-reliant and non-structural approaches to irrigation and flood protection, such as overflow canals and temporary dams. These systems began to fade under colonial engineering and disappeared almost entirely under national water planning starting in the 1950s. Planners promoted the top-down implementation of engineering infrastructures for Flood Control, Drainage and Irrigation (FCD/I). The practice of 'living with floods' shifted to 'the controlling of floods' through networks of permanent embankments and canals with centrally regulated water inlets and outlets.

The devastating floods of 1988 and 1989 in Bangladesh strengthened once more the emphasis on flood control through the design of a nationwide Flood Action Plan (FAP), which included as one of its flagships the FAP-20 component in the Tangail District (see Figure 1). FAP-20, also known as the Compartmentalisation Pilot Project (CPP), was essentially an FCD/I project, but promised to place more emphasis on addressing social and ecological concerns through enhanced participation.

Figure 1. FAP-20 project area in Tangail District.



Source: Tangail District from http://lib.pmo.gov.bd/maps/ and FAP-20 area adapted from http://en.banglapedia.org/

The FAP-20 project included the construction of a horseshoe shaped embankment that enclosed a 130 km^2 area engineered into a network of canals and embankments (see dotted line, right map, in Figure 1). Regulated inlets and outlets were constructed to enable the controlled flooding and drainage of agricultural plots in compartments. This would not only avert the effects of floods, but would also create a secure environment for agriculture. During its implementation (1991-2000), FAP-20 became highly controversial as the implementation of its infrastructures produced a range of negative social and ecological impacts. This failure is perhaps best illustrated by the fact that it started out as a demonstration project, but was not replicated elsewhere.

Revisiting the case of FAP-20 is relevant for two reasons. First, the project not only failed to address social and environmental concerns, but lasting impacts are still causing social conflicts long after the project has ended. Second, lessons from FAP-20 and earlier similar projects do not appear to have been adequately evaluated or assimilated by planners in the design of subsequent water-sector projects. For example, we shall see this clearly in the EUR 45 million Dutch-Bangladeshi Blue Gold project, which was initiated to rehabilitate and fine-tune existing FCD systems to better cope with new climatic challenges (GoB and GoN, 2012; Ramchurn, 2016). As climate change threatens to increase the impacts of floods and water scarcity in Bangladesh (Hofer and Messerli, 2006; Kundzewicz et al., 2010; Gain and Wada, 2014), the top-down command and control style of water governance seems to be once more reinforced.

In this article, we ask the following questions: What can we learn from the FAP-20 experience in Tangail? What was the nature of the impacts? How was the project evaluated and assimilated in future water-sector plans? The purpose is not to evaluate FAP-20 and the article merely gathers and presents qualitative empirical data about the local perspectives on FAP-20. The data cover a long period of research since 1995, and is supplemented with data from more recent field observations and interviews. This allows us to explore some of the long-term impacts of FAP-20 a decade and a half after its formal completion. The purpose is therefore to identify areas of concern, both past and present. Ignoring these concerns will likely lead to repeated failures in the future. The paper thus recommends a proper evaluation and an incorporation of these lessons in water policy and governance. Before looking at its impacts, the paper begins by contextualising FAP-20. Infrastructural interventions must be understood against the backdrop of particular flood, food, land and livelihood conditions.

METHODOLOGY

The authors have studied FAP-20 in various capacities since 1995. Our paper relies on the authors' experiences during an internship programme initiated by academics at Delft University of Technology (DUT) and NGO practitioners with Unnayan Shahojogy Team (UST). UST was one of several NGOs involved in a critical movement against FAP-20. A particular weakness was a lack of possible alternatives proposed by this campaign, and the collaboration with DUT intended to contribute towards that effort. Between 1995 and 2007, six student teams studied various facets of FAP-20 (see Visser and van Es, 1995; Boogaard et al., 1997; Cox et al., 1998; de Bruijne, 2007). One of the authors participated in this study programme in 1997 (see van der Pol et al., 1997) and later joined it as a supervisor. Another author was also involved in supervision as well as in documenting a wide range of responses from local people (see UST, 1996). Our paper draws from these resources and complements this with findings from several recent field visits as well as a review of other recent empirical research on FAP-20.

In 2013 and 2014, field observations and 20 semi-structured interviews were held in different localities in the FAP-20 area in Tangail, particularly in areas of Shadullapur, Bhatchanda and immediately downstream of the main drainage regulator at Jugini (see Figure 1). To enhance the diversity of responses and minimise possible biases, our sampling was accidental (not random). The variables were: time of the interview (various hours of the day), market and non-market days, different localities, different distances to the main regulator, and different gender and age groups. Interviews included both individual and group discussions. The interviews were semi-structured and revolved around the following discussion points: the successes and failures of FAP-20, the manner in which FAP-20 altered food production, irrigation practices and flood protection, and the management of the FAP-20 structures. The quotes used in this paper have been anonymised as per the wishes of the respondents.

CONTEXTUALISING FAP-20

As we shall see, FAP-20 produced several negative impacts, some of which endure long after the project has ended. These impacts are easier to understand with a historical and contextual perspective on water governance in Bangladesh.

Bangladesh represents a narrow surface water outlet at the end of the world's largest delta made up of the catchment areas of the Ganges (or Padma), Brahmaputra and Meghna (the GBM Basin). The country covers only 7% of the entire basin. With a population size over 160 million and density close to 1250 people per km^2, Bangladesh is one the world's most crowded countries (World Bank, 2018).

Water and floods

For centuries, people in the delta have adapted to yearly climatic extremes. Three-quarters of all rainfall in the GBM Basin occurs during the monsoonal months from June to November, much of which eventually makes its way down into Bangladesh. In combination with substantial rainfall in the country itself and its typically flat terrain, monsoonal floods affect up to a third of the cultivable land in a normal year. During the dry season, surface water bodies dry out and water is only available in some parts of the river system sustained by groundwater outflow (ICID, 2008). Under traditional farming, almost all food production was derived from rain-fed crops during the monsoon. These were adapted to the depth, timing and duration of inundation. During the rest of the year, land would lie fallow and restore itself.

In many ways, the agricultural systems were highly resilient. The seeds of traditional deep-water rice would be planted a few months in advance of upcoming floods. Irrigation was based on small earthen barriers to concentrate rainwater and increase soil moisture. Heavier rains would eventually arrive and river levels would begin to rise. Elaborate networks of canals conveyed river water to inundate the fields, allowing new sediments rich in nutrients to be deposited on the land. Decentralised decision-making allowed farmer groups to respond quickly to fluctuations and distribute floodwater by means of temporary cuts in the banks, which were closed when the floods had passed, or reopened whenever water needed to be drained. Early records of these ancient systems praised them for having ensured prosperity by watering and fertilising fields, for spreading fish over the countryside and for sweeping away malaria-carrying mosquitoes (Willcocks, 1930).

The resilience of both traditional and recent flood-control systems (FCD/I) have their limits. Seasonal oscillations between floods and droughts have always been a normal part of life in Bangladesh, but every now and then this oscillation goes off-balance. In some years, extreme rainfall and river discharge from the entire GBM Basin gush into Bangladesh (Quazi, 2001). This leads to severe, more widely spread and longer-lasting floods that are much more difficult, if not impossible, to control or adapt to. In 1987, for example, a major flood inundated about 40% of the land and affected about 30 million people. Only a year later, new floods inundated up to 60% of the land and affected 45 million people (Wood, 1999). These extreme flood and drought conditions in Bangladesh are compounded by upstream developments in India, e.g. the Farakka Dam and the River Linking project. These developments further reduce river discharge into Bangladesh in the dry season, and further increase it during the monsoon. Cyclones, flash floods and coastal floods also regularly strike Bangladesh and cause incredible hardship. These extreme events have fatal consequences, erode roads, ruin crops, destroy houses and contaminate water supplies.

Food production

Fertility of the alluvial soils has historically attracted settlements in the region despite the risky living conditions. Cultivation now involves 40% of the formal labour force (World Bank, 2018). Informally, e.g. when age is taken out of the equation, 80% is a more accurate estimation of the total population engaged in agriculture (FAO, 2004). At the same time, despite notable improvements, rates of malnutrition in Bangladesh remain among the highest in the world (FAO, 2010). Every now and then, this chronic problem flares up. In 1943, a terrible famine killed between 7 and 10 million people out of a population of 60 million in the region of Bengal, which contained Bangladesh when it was still part of India (Sen, 1983).

For commercial and humanitarian purposes, international and national organisations zeroed in on agricultural productivity and on the introduction of High-Yielding Varieties of rice. These grow faster than traditional species when combined with chemical fertiliser and intensified irrigation. This so-called Green Revolution was so significant that the older farmers almost always mention it first when remembering major events in their lifetime (Visser and van Es, 1995; van der Pol et al., 1997).

Civil engineering works 'cemented' this form of agriculture. The seeds, chemicals and other inputs were no small investment and required structural protection against floods. Starting in the 1950s, national water planning therefore promoted infrastructures for Flood Control, Drainage and Irrigation (FCD/I) consisting of large-scale networks of permanent embankments and canals with centrally controlled sluice gates. FCD/I accounted for about half of the total funds spent on water development in Bangladesh since 1960 (ICID 2008). As a result, the total length of permanent embankments across Bangladesh increased from only 10 km in 1947 to about 8000 km in 1988 (van der Pol et al., 1997) – the equivalent of building two 'great walls' along Bangladesh's border with India. The engineering works were intended to reduce the depth of flooding and keep out untimely floods so as to provide greater security for the Green Revolution.

The intention was not only to control floods, but also to extend irrigation and stretch the length of the cropping season (Quazi, 2001). However, despite the I in the acronym, the contribution of FCD/I to irrigation remained low. Surface water irrigation through major canals covers only 4% of the total irrigated area (ICID, 2008). In the course of the 20^{th} century, the expectation had grown that groundwater could relieve agricultural dependence on irregular surface water resources. This resulted in a major expansion of irrigation through tube wells.

At first glance the focus on food productivity seems justified in a nation growing by several million inhabitants each year. Yields indeed went up and farmers increased their harvests from one to two and sometimes three per year since the late 1960s (Quazi, 2001). In the last three decades, increasing output even surpassed population growth rates (WFP, 2016) and yet, Bangladesh still suffers from under- and mal-nutrition (FAO, 2010; WFP, 2016). The size and growth of the population alone cannot explain persistent hunger; several other factors are involved.

Landownership

Census data reveal an astonishing tenfold increase in the number of landless households in the 1977-1996 period (Ali, 2007). More recently, the combined groups of functionally landless (owning less than 0.2 ha) and marginal farmers (owning 0.2 to 0.6 ha) account for 86% of the agricultural population (65 and 21%, respectively) (FAO, 2004). A small and relatively wealthier rural class has progressively accumulated the available land. Some of the causes for landlessness were the loss of farmland to urban expansion and to riverbank erosion, as well as the fragmentation of agricultural plots as each of the children inherits a portion of his or her parent's land (FAO, 2004). Growing landlessness is also intricately linked to the Green Revolution, for two reasons.

First, the adoption of the new farming practices was much easier for the established rural elite. Compared to traditional crops, the new varieties required intensive protection against disease, weed control, and frequent and precise irrigation and drainage. Schemes were introduced to support farmers with the initial investments through credits and technical assistance (George, 1991; Paul and Steinbrecher, 2003). Only a very small proportion of the landowners – typically those with larger properties – had sufficient political power to draw on the support. This group represented only 3 or 4% of the farmers in India (George, 1991); it would have been very similar in Bangladesh.

Second, many of the smaller farms that still managed to make the switch to the new farming techniques on their own found it increasingly difficult to keep up. In order to maintain productivity, increasing amounts of chemical fertilisers were needed as the soil was slowly depleted of its richness in natural nutrients (Tilman et al., 2002). The chemicals provided only a simplistic substitute for the yearly flood deposits that no longer replenished the soils as a consequence of the FCD/I infrastructures. From the 1960s to the 1990s, fertiliser use increased more than tenfold (FAO, 2004). At the same time, subsidies on the inputs were dropped. Many could not cope with this situation and were forced to sell their holdings to join the growing landless population (George, 1991).

Livelihoods

The Green Revolution may not have been the only cause for landlessness (as mentioned above), but it certainly contributed to further increase the number of landless labourers. As a consequence, agricultural wages dropped. Prior to the green revolution, a shortage of labour in peak seasons meant that wages were high enough for a day-labourer to save enough rice or cash for the rest of the year. In the period 1950-1975, however, labour competition led to a reduction in wages; they fell between 30 and 40% (de Vylder, 1982). It was initially assumed that the growing workforce would benefit from the higher demand for labour in intensive agriculture, but this was (at least partly) offset by mechanisation through irrigation, harvesting and rice husking machines.

By the end of the green revolution, labourers were receiving less money to spend on food, while their reliance on cash to buy food was higher than ever before because they were not producing for themselves any longer. "In the past, we had our own land for our own food production", remembered a 75-year-old interviewee. "Over the last 50 years, we became more dependent on working for landholders and on purchasing their food" (cited in van der Pol et al., 1997).

With rising household expenditures on food, parents tend to have more children, not less. In the 1970s, at the peak of the Green Revolution, children between the ages of six and ten were already put to work. By age 15, he or she would have compensated for his or her cumulative consumption and would become a net producer for the family (Arthur and McNicoll, 1978). There are many other factors involved, but the point here is that having many children often made rational sense to a poor household. It seems to imply that by dispossessing subsistence farmers, i.e. those who produce directly for their own consumption, and by pushing them into wage labour, the Green Revolution may have contributed to population growth.

To be sure, the Green Revolution did boost food production, but an important realisation about agrarian societies in the modern world is that more food does not necessarily translate to improved food security for all. We have already mentioned that production managed to keep up with population. The problem is therefore one of distribution (Sen, 1983; George, 1991)

Food distribution

A particularly useful illumination on the subject of food distribution comes from Amartya Sen's analysis of famines in different parts of the world, including Bangladesh in 1974 (Sen, 1983). It did not quite reach the proportions of the famine of 1943, but the effects were nevertheless severe. Official records indicate 30,000 deaths, although some estimates suggest as many as 500,000 deaths (Arthur and McNicoll, 1978). 1974 was not only a year of widespread starvation, but also a peak year in terms of output of rice. Whatever the cause for hunger, it was not a decline in food availability. While famine was raging, food was actually being transported away from those areas – it was not a problem of overpopulation, and neither one of under-production (Sen, 1983).

Extreme floods hit precisely at the time of peak employment in the paddy fields. This drastically reduced work opportunities in cultivation and, as a result, landless labourers were unable to purchase food. Death rates in landless families were estimated to be three to four times those of families with more than 1.2 ha (Arthur and McNicoll, 1978). Sen came to a similar conclusion for the famine in 1943. Bengal had enough grain to feed itself, but millions were simply too poor to buy it. While his logic is impeccable, it has not had much impact on policy; when people starve, productivity must be stimulated and infrastructure developments are geared towards that aim, as we will see with FAP-20 in the following section.

The plight of the poor becomes blatantly clear against the backdrop of a freak flood, but Sen's analysis also helps to understand the more day-to-day vulnerabilities of marginalised families. Although a famine as severe as that of 1974 has not recurred, a recent study found that one-quarter of the population was still food insecure in 2014, which amounts to 40 million people in absolute number (WFP, 2016).

FAP-20: FLOOD CONTROL, DRAINAGE AND IRRIGATION IN TANGAIL

International attention to the nation's floods and famines was reinforced in the late 1980s. Before the UN General Assembly, French President Mitterrand stated: "Development is achieved via the launching of major projects of world interest, which are capable of mobilising energy to help a nation wounded by nature – for example, stabilising the rivers which flood Bangladesh" (cited in Boyce, 1990: 427). This prompted the design of the Flood Action Plan (FAP) with an estimated investment cost of US$5-10 billion and US$200 million in yearly maintenance (Eerste Kamer,[1] 1995). The plan was to be implemented with the assistance of a number of international consultants, which quickly provoked a bidding war (Warner, 2006).

Its draft plan left little doubt that the central concern of FAP was to control floods through structural works (Adnan, 2006, 2009). Informed observers, however, advised caution in proceeding towards such a megaproject (Boyce, 1990; Adnan, 1992; Pitman, 1996). In 1991, the interim government commissioned a Task Force that even recommended a moratorium on structural works and a thorough review of FAP (IOV,[2] 1993). Despite the opposition, FAP's panel of experts remained in favour of the permanent infrastructures. Perhaps because of the attraction of a massive inflow of funds, the Task Force reports were disregarded by the subsequent government (Eerste Kamer, 1995).

From 1991 to 2000, the Dutch and German governments invested heavily in FAP-20, a particularly important component of FAP in the Tangail District.[3] Inspired by the similarity between Bangladeshi and Dutch landscapes, a professor of Water Engineering in Delft had championed the idea as a member of the FAP panel of experts (Warner, 2010). The main objective of FAP-20 was "to test the concept of compartmentalisation in the field under real operating conditions, addressing all relevant socio-economic, institutional and environmental issues and trying out water-control works and water-management systems" (Euroconsult et al., 1995: 5). While essentially a form of FCD/I, it attempted to pay more attention to social and ecological concerns, as well as improve people's participation in water management (IOV, 1993).

FAP-20 was not without precedent. The 1982 System Rehabilitation Project (SRP), for example, aimed at rehabilitating 80 water resource development sub-projects that had converted large tracts of land into a series of polders. The project ran into implementation problems which led to a series of reductions in the targets. The main causes were "(1) inadequate support systems and wrong infrastructure; (2) failure to appreciate the social and environmental values; (3) administrative problems, including those of the sub-project itself and of the overall sector administration; (4) lack of participation and involvement of farmers in the decision-making process; and (5) inappropriate technology" (Wattage and Soussan, 2003: 438). As we shall see, despite the claimed social and environmental concerns, FAP-20 became highly controversial on both accounts and repeated many of the problems encountered during the implementation of SRP.

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[1] This is a reference to the minutes of a meeting on development cooperation in the Dutch Senate (Eerste Kamer).

[2] Previous name of the Inspectie Ontwikkelingssamenwerking en Beleidsevaluatie (IOB), which independently evaluates the implementation and effects of Dutch foreign policy.

[3] FAP-20 was originally designed for Tangail and Sirjaganj, respectively on the left and right banks of the Brahmaputra-Jamuna. The latter was subsequently discarded.

Impacts of FAP-20 on waterways

Women are the main domestic carers in rural Bangladesh and changes in their localities can have profound consequences on their livelihoods. In an interview in 1997, a woman who had been on the frontline of the protest explained: "Transportation of our jute and pottery products became more difficult. Boats cannot go through, and now we have to pay more for transportation by rickshaw. Fishermen used to come in this area by boat to sell their catches to us directly, now we need to go to the market for this. Also, there is less water in the river, so we need to get water from further away" (cited in van der Pol et al., 1997). Sluice gates were fragmenting the network of canals on which boat transportation relied.

The above quote also reveals that the infrastructure was also blamed for silting up smaller canals. Accounts from local people in Tangail over several years suggest that water flows were slowing down and silt sank to the bottom of the rivers leading to a gradual rise of the riverbeds. Many of the smaller canals were said to have silted up entirely as a result of the permanent embankments (Visser and van Es, 1995; van der Pol et al., 1997; Boogaard et al., 1997; Cox et al., 1998). Decreased water flows within the FAP-20 area were recently confirmed by Islam et al. (2014) and there is also evidence of this elsewhere in the delta (Hofer and Messerli, 2006).

Impacts of FAP-20 on agriculture

Clogged-up waterways affected not only boat transportation but also agriculture. During the implementation of FAP-20, a villager in Shadullapur explained: "The main problem is that floodwater is not coming any more since the construction works. As a consequence, mud from the floods does not cover the land inside the embankment and more chemical fertilisers are needed" (cited in van der Pol et al., 1997). Similar reports were heard in other parts of Tangail (Visser and van Es, 1995; Cox et al., 1998).

Averting the effects of disastrous floods had also barred beneficial annual floods that maintained soil fertility (Adnan, 1992). FCD/Is are therefore said to have increased dependency of farmers on agrochemicals (Hofer and Messerli, 2006). Their use in the FAP-20 area increased by 50% in the 1989-1998 period (Cox et al., 1998). This also increased the reliance on irrigation. By the late 1990s, 70% or total irrigation was covered by groundwater through tube wells; the remainder by surface water gravity canals, low lift pumps and other traditional water lifting methods (Ahmed, 2005). As explained by a villager at the time of the project, "tube wells are now active all year long to irrigate the fields" (cited in van der Pol et al., 1997). During the green revolution, tube wells were initially dispensed to co-operatives. By the 1990s, however, the system had largely been privatised (Akteruzzaman et al., 1998), and only capitalised farmers had the capacity to pay for the investment, maintenance and fuel. By 2004, only one out of 265 irrigation tube wells was public, the rest being private (Rosenboom, 2004). Subsistence farmers and sharecroppers could sometimes rent the tube wells, but only when these were not needed by the owners, which meant that they were never available at the right time and negatively affected the yields of the dependent farms (Rammelt, 2009). As mentioned earlier, not all farmers had the capacity to cope with such rising costs, which exacerbated the process of increasing landlessness.

Impacts of FAP-20 on fisheries

Prior to FAP-20, around 93% of the fishermen in the area depended on access to open water; the rest were (part-time) professional fishermen (CPP, 1993). When the land is submerged by the abundant supply of surface water of the monsoon, fish disperse as part of their annual life cycles of breeding and feeding, benefiting fisherfolk of all classes (Wood, 1999). This was important for the population in Tangail: fish represented the source for 80% of animal protein intake (Pitman, 1996).

Halfway during the project’s implementation, a fisherman in Shadullapur explained the significant decline in open-water fish catches within the flood-protected areas: "Baby fish can no longer go inside because the embankments stop the water. Most fishermen have become rickshaw pullers or day labourers in agriculture or in commercial fish cultivation" (cited in van der Pol et al., 1997). With the silting up of connections between water bodies, natural fish migration and breeding were disrupted. Declining fish stocks in various other parts of Bangladesh were also linked to the building of embankments (Euroconsult et al., 1995; FAO, 2008). The FAP-20 project team attempted to mitigate the issue with the construction of fish-friendly structures, but the peak time for fish migration is never punctual and the intervention failed (CPP, 1993).

Another measure was the introduction of permanent aquaculture. Statistics indicated an overall growth of fish production within the FAP-20 area (CPP, 1993). However, this did not benefit poor fishermen, who typically do not own land or water reservoirs. Private fishponds were protected against floods, but open water fishermen saw their resources dwindle (van der Pol et al., 1997).

Impacts of FAP-20 on land

Interviews held in 1997 on the other side of the outer embankment, near the main water regulator at Jugini revealed severe tensions about the distribution of impacts on land resources. "Last year [1996] was not a year of severe flooding as in 1988, but still, houses and crops were flooded and destroyed because water remained in front of the gate"; "Benefits and disasters should be equally divided over the people of the region"; "If only one group benefits from a construction, it should be broken down" (cited in van der Pol et al., 1997). The implication to sacrifice less valuable land for the benefit of more valuable land was not properly communicated in the case of FAP-20 – unsurprisingly perhaps, as it would create winners and losers and cause much discontent (Wood, 1994).

Sacrifices were also required inside the embankment. Land was acquired for widening embankments and for building canals and other structures. Again, a lack of proper consultation procedures is revealed by the following quote: "The government came to discuss a World Bank project to build ponds, sluice gates and canals with the people in this area", said a woman living within the compartment. "There were rumours about possible losses of land and jobs, and we decided to postpone the discussion in order to think about this. The government didn't wait for any reply and went ahead by collecting signatures from other villagers, even from children" (cited in van der Pol et al., 1997).

Because of their vulnerability to intimidation and unfair compensation, it is not surprising that women's groups took on a major role in anti-FAP rallies (Warner, 2010). In 1993, an estimated 10,000 women demonstrated in Tangail Town shouting, "We don't want embankments, they are a deadly trap" (Murshid, 2000). In the following years, the protest became widespread. The following statements from people in the FAP-20 area reveal the thrust of the protest at the time: "They came and said that there will be a sluice gate in this place. We then objected. They are trying to entice us. We said that we won't give our land; we want water; we don't want embankments"; "We voted the present government. They have been elected with votes; they should listen to us. The government has forces; we have sticks and bricks, we will fight back. The people are with us" (cited in UST, 1996).

Inadequate participation

From the above, it seems that – contrary to Mitterrand's vision – people were not only "wounded by nature", but also by the infrastructures that were supposed to solve the flood problem. Their resentment was directed at the infrastructure, as well as at its top-down implementation process.

People's frustration with their lack of control over their direct surroundings is a recurrent theme in recorded interviews. "Nobody told me anything, I have seen people surveying here, but I did not ask. They also did not tell me"; "This is a sluice gate. I am working here. I don't know what it will do as a whole" (cited in UST, 1996). Several NGOs asserted that initial consultation meetings were dominated by the more powerful voices within the FAP-20 area and that people in adjacent areas were excluded altogether (van der Pol et al., 1997; de Bruijne, 2007).

From documented conversations, it also becomes clear that people were by no means unaware of possible alternatives. Practical considerations aside, their suggestions included using water-lifting devices or removable siphons for irrigation, excavating canals to increase water flows reaching the area, (re)excavating ponds to increase water storage, reintroducing open wells and increasing infiltration capacity to recharge groundwater reservoirs (Boogaard et al., 1997). Many of the ideas seem based on traditional overflow irrigation systems, which have been known to work for farmers without limiting the opportunities for fisheries and boat transportation – even when coping with severe flooding (Duyne, 1998; Royal Haskoning, 2003).

This is not meant as a plea for reviving traditional systems per se: the physical, climatic and institutional conditions have changed. It is, however, a plea to recognise that people were voicing a strong preference for alternatives. "Between the extremes of zero control and zero floods lies a wide range of alternatives" (Boyce, 1990: 421). Quazi (2001), for example, provides a useful overview of options in Bangladesh with different levels of capital intensiveness and scale. Several options were also devised by the Local Government and Engineering Department in the period 1991-1993. One of those options was close to the non-structural nature of past practices (Frans, 2006). However, a document from the Bangladesh Water Development Board (BWDB) stated: "the option of no flood control for Tangail need not be discussed with the people" (cited in Adnan, 1992: 77). Halfway during the implementation of FAP-20, even the Dutch Minister of International Co-operation admitted how little had come out of researching alternatives presented by the local people (Eerste Kamer, 1995).

If not in its conception, the expectation was that people would at least participate in the collective operation of the water inlets and outlets. Modelled after the Dutch regional water management boards, the intention was to establish people's representation in Water Management Committees (WMCs) at the level of compartments, sub-compartments and water users (Warner, 2010). However, the unequal power relation between landholder and day-labourer severely complicated these kinds of arrangements. Many interviewees did not recall the existence of WMCs or having been consulted in their establishment. Some indicated that government officials and influential community members in the compartment members handpicked WMC members (van der Pol et al., 1997; de Bruijne, 2007).

The phasing out of FAP-20

In 1993, the Dutch parliament undertook a preliminary evaluation of FAP-20 at a time when it had become clear that popular opposition was substantial. The study recommended complete withdrawal if Bangladesh chose to proceed with the construction of large-scale water works (IOV, 1993), but the advice went unheeded. In 1995, the UNDP criticised FAP-20 for undervaluing traditional strategies and non-structural measures (Faaland, 1995). Further concerns came from a mission on behalf of the Dutch Government; it acknowledged that people preferred options based on drainage before and after the monsoonal season in order to improve dry season crop production (Schulte Nordholt et al., 1995). By the mid-1990s, the momentum for FAP-20 was gone and many were surprised to see the second five-year phase go ahead. The change in designation from 'demonstration' to 'pilot' project was nevertheless a clear sign of the loss of confidence.

In a total period of nine years, the Dutch had invested over EUR 10 million in FAP-20 and the German over EUR 20 million (KfW, 2004). These means were provided to Bangladesh as a loan (Eerste Kamer, 1995). From 1990 to 1995, an estimated 60% of the funds spent on FAP did not stay in Bangladesh, leading one commentator to describe it as "just another vast income-generating scheme for assorted experts, foreign consultants and commission-seeking bureaucrats" (cited in IFRC, 2001: 37). Through FAP-20, the Dutch and German governments directly sponsored their own consultants: Euroconsult, Lahmeyer and Haskoning.

In 2000, the implementation of FAP-20 came to an end. As the consultants repatriated, responsibility was handed over to the BWDB and the committees that were presumably established in

Tangail. Contrary to the initial intention, the 'pilot' would not be replicated elsewhere. The Government of Bangladesh carried out a review of its water policy, which led to the National Water Management Plan (NWMP). It gave priority to small-scale flood proofing over major flood protection projects. The NWMP draft concluded that compartmentalisation is "not an attractive option because of the high costs as well as the operational and institutional complexities involved" (Water Resources Planning Organisation, 2000: 240 cited in Adnan, 2006). By officially acknowledging the failure of this strategy, the NWMP endorsed nothing less than a policy reversal (Adnan, 2006).

It is common in the history of the water sector of Bangladesh to see shifting dominance between 'closed' management styles (high river or polder embankments and large water-control structures) and 'open' styles (management of floodplains, temporary water retention and lower embankments). van Staveren et al. (2017) speak of a 'policy pendulum'. As we shall see, the Blue Gold Programme fits the current policy tendency back to a more 'closed' style of management.

LEARNING FROM FAP-20

There seems to have been little learning from the FAP-20 experience. First, the project was not adequately evaluated. Below, we will compare our findings with the formal evaluation report of the German Government (KfW, 2004). The Dutch have yet to publish their evaluation. Second, lessons from the experience have not been assimilated by planners designing subsequent water-sector projects, as we shall see in the case of the 2012 Blue Gold Programme. It aims to rehabilitate and fine-tune polders, embankments and other water management works in several coastal districts (GoB and GoN, 2012). The intention of the Blue Gold Programme is to be more participatory and environmentally sound than common top-down projects (Ramchurn, 2016). In our view, its goals hardly differ from those of FAP-20, and there is cause for concern that Blue Gold will repeat the same mistakes.

In 2004, the German Government undertook a post-ex evaluation of FAP-20. It persisted in attributing to the project a satisfactory degree of developmental effectiveness based on the view that the objective was to gather experience with the planning, construction and operation of compartments. "Even though the new national sector strategy does not include plans to build any additional compartments. FAP-20 did, however, make it possible to gain significant knowledge about specific country conditions and about difficulties with collecting contributions for maintenance within the flood compartments" (KfW, 2004: 2). In other words, the evaluation praises the project as a learning experience.

First of all, we have doubts whether this learning experience was indeed successful. Moreover, even if it was, this perception of success has generally not been shared by disadvantaged smallholders, women, fishermen and boatmen in Tangail. People affected by a project commonly lack access to the decision-making processes that drive it, let alone to its evaluation process. The lessons learned can be entirely misleading and will lead to repeated failures if the evaluation remains under the control of funding and implementation agencies. The German evaluation provides a revealing illustration of an assessment conveniently based on externally defined criteria alone.

On the one hand, FAP-20 is said to have resulted in an increase in cultivation intensity from 160% (nationwide average) to over 260% since completion of the compartment; an increase in rice yields to three times more than the national average; and growth in fish production (KfW, 2004). As we have discussed, these increases in productivity are not incompatible with a range of negative impacts, such as: siltation of the waterway system inside the protected area and waterlogging outside the area; shifts in land value inside and outside the protected areas; loss of opportunities for open water fisheries and boat transportation; loss of 'free' surface water irrigation of monsoonal crops and natural fertilisation from annual floods; and increased reliance on motorised groundwater irrigation and use of artificial fertilisers.

The following section aims to show the relevance of a proper evaluation and of the incorporation of lessons learned in subsequent projects, particularly in the Blue Gold Programme. We do so on the basis of two critical issues: the operation and maintenance (O&M) of the infrastructure, as well as possible conflicts over resources. To be sure, Blue Gold is situated in a district with different characteristics to those in Tangail. However, our focus here is not on the exact technical adaptations of the infrastructure in the specific physical conditions, but on institutions and conflict.

O&M of the infrastructures

The establishment of Water Management Committees (WMCs) was the main instrument to engage communities in FAP-20. They would take over O&M responsibilities. The 2004 German evaluation stated that "the users were successfully conducting adjusted water management through the regulating structures, yet they were participating very little in the maintenance of the compartment infrastructure" (KfW, 2004: 2). Based on field visits and interviews with local people, a student research programme in 2007 observed that out of 63 structures, only a few were still operated by an officially employed operator in consultation with the communities. In most cases, government officials or influential water users operated the structures. There had been no re-election of WMC members after the formal ending of FAP-20. Most of the WMCs had disintegrated either because there was no water to be managed, because the structures were in disrepair or because the budget for maintenance was depleted (de Bruijne, 2007). Already in 1997, a Donor Mission found that sluice gates were operated in places by project staff rather than by water user representatives (Warner, 2010). In 2011, 26 of these 63 structures were cross-checked again. Another three had become semi-purposeful, i.e. technically in a proper status, but only in use in very wet monsoons when enough floodwater was entering the involved area, and an additional two went out-of-use several years earlier (de Bruijne et al., 2014).

Our recent respondents in Shadullapur Village refer to the project as a total failure. One of them repeated what was already mentioned regarding the impact on agriculture and land resources: "Due to using embankments the [fertile] silt cannot enter through the gates, which hampers the improvement of the fertility of the land. The siltation only occurs on the other side of the embankment, which cannot be fully utilised as that side remains under water during the greater part of the rainy season". Others confirm the lack of O&M. "They are of no use. These sluice gates have not been used for years". "I do not know about any committee" a farmer adds. Near the main water regulator at Jugini, a respondent mentions how "there is one man stationed for operating the gate. I don’t know about members of a committee". Another villager adds: "It was a failed project. I do not think it helped us even a bit. I do not think there is still a committee".

At the main regulator in Jugini, the chain for operating one of the three sluice gates is broken (Figure 2). Soil and plant growth has accumulated inside the water inlets. The lack of adequate water flow and consequent silting up of the riverbeds was already an emerging problem during the second half of the project’s implementation (Visser and van Es, 1995; van der Pol et al., 1997; Boogaard et al., 1997; Cox et al., 1998). Our own recent observations and interviews confirm that several other canals have since then also silted up and sluice gates have long been abandoned (Figure 3). According to one respondent in Bhatchanda Village: "What would the sluice gate do? There is no water to flow through it".

This evidence may be anecdotal, but it confirms earlier studies and is confirmed by other reports. In our view, this provides sufficient empirical support for recommending further investigations and a proper evaluation of FAP-20. It also disputes the following self-serving assumption from the German evaluation: "In case of a possible reduction or cancellation of the external support… we assume that the users will take the initiative to maintain and ensure their situation" (KfW, 2004: 3).

Figure 2. Images of a regulator rendered useless due to broken embankment.

Figure 3. Images of a broken-down main regulator sluice gate (left) and soil accumulation inside the inlet (right).

Considering the negative impacts of FAP-20, Wood (1999: 739) somewhat cynically stated that "it is thus 'fortunate' that villagers are ignoring management expectations and opening sluice gates as well as cutting dikes. It is also 'fortunate' that so many embankments are in disrepair". However, this state of affairs also brings about social tensions. De Bruijne (2007) observed that in times of water scarcity conflicts flare up within areas between water users involved in open water fish cultivation, commercial fish cultivation and irrigation needs. In times of overabundance of water, the conflicts also occur between areas as can be seen from the many disputes between the sub-compartments regarding the opening and closing of sluice gates to manage water. At times, these conflicts become violent (de Bruijne, 2007)

The sluice gates were already blocking the free movement of fish during the project's implementation. Since then, further siltation seems to have aggravated the situation. According to our more recent interviews in Gala and Jugini villages: "Due to this project there is hardly any water inside the sluice gates… Before the project we used to catch from the rivers with throwing nets and lift nets. Now we cannot do this. Now I buy fish from fish cultivators and sell these at the markets". "Many fishermen have changed their profession to become auto driver, rickshaw puller or barber". "Those who cultivate fish have dug their own *pukur* (small water reservoir)". "Only powerful people cultivate fish in those ponds".

According to our respondents, the only remaining benefits from FAP-20 are the roads on the embankments and the protection they offer during severe flooding. This benefit was also recognised in Tangail during the severe floods of 1998 (Warner, 2010). Commercial fish cultivators and agricultural landholders also benefit from the protection of their investments within the FAP-20 area. As a result, the value of the land is said to have risen about tenfold since the start of the project (KfW, 2004). According to our respondents, land outside the embankment has lost value, which is likely to have led to migration, but this remains to be studied adequately. This can be explained by some evidence that upstream communities still suffer more from yearly flood damage than downstream communities (Islam et al., 2014)

According to the German evaluation, the problems with compensation for land acquisition that emerged during implementation were resolved. "Since all compensation was paid, everyone was satisfied" (KfW, 2004: 3). Even if this were the case, which many of our respondents contest, there are other repercussions that can still be felt today. A villager explains that his land was acquired for the project, but it lies unused alongside an embankment. He could not reclaim it because according to local officials the FAP-20 infrastructure is still in operation. He later found that a well-connected landowner had purchased it illegally. Others in Dainna and Rasulpur villages share similar experiences: "Some portion of my land that were acquired are unused in the project, but my union chairman (local government representative) has forcefully taken it and did not let me take it back". "I am seeing that many original landowners are now using the unused portion of their land of the project, but I also heard some lands were taken forcefully by the powerful people".

The Blue Gold Programme in perspective

Water sector governance systems lack in self-reflection. The Blue Gold Programme is prone to repeat the same mistakes already experienced under FAP-20. We explore this likelihood on the basis of the above two critical issues with FAP-20: the O&M of the infrastructure, as well as possible conflicts over resources.

Blue Gold is a joint initiative of the governments of Bangladesh and the Netherlands, implemented by the Bangladesh Water Development Board (BWDB) and the Department of Agricultural Extension (DAE) with technical advice from Euroconsult Mott MacDonald. It covers an area of 1150 km^2 in Bangladesh's coastal districts of Patuakhali, Khulna, Satkhira, and part of Barguna (roughly 9 times the size of the FAP-20 area). In these districts, most of the infrastructures constructed in the 1960s and 1970s were not properly maintained and canals have since then silted up (GoB and GoN, 2012). In the period 2013-2019, 21 polders will be secured by strengthening perimeter embankments and dykes; rehabilitating sluices, water intakes, and outlets; and clearing of silt from drainage channels (Ramchurn, 2016).

As with FAP-20, Blue Gold intends to give local people more control over the interventions "carried out on their behalf" through the establishment of water management organisations (WMOs) (Ramchurn, 2016: 10). These WMOs are expected to represent communities and to agree on priorities. In 2016, 350 groups – each consisting of about 250 households – were trained with the skills needed to operate and maintain their assets. The WMOs include Water Management Groups (WMGs) at the village level and Water Management Associations (WMAs) at the polder level (Ramchurn, 2016). FAP-20 had equivalent institutions at different hydrological levels (compartment, sub-compartment and 'chawk') (van der Pol et al., 1997). The plan is to withdraw all technical assistance, coordination structures, and external financial assistance by 2020. Management will then be handed over to the WMOs (Ramchurn, 2016).

The observed failures of WMCs in FAP-20 raise significant questions for Blue Gold. Its Programme Document simply states that Water Management Groups (WMGs) "have proven to be effective partners in creating sustainable development and thereby reducing poverty" (GoB and GoN, 2012: 12). The FAP-20 experience has proven otherwise – despite its efforts to institute WMCs. More importantly, even if Blue Gold succeeds in establishing and supporting WMGs, there is another question: whose interests are served by these institutions and who is represented? It has long been understood that local power relations undermine the voices of poor and marginalised groups in consultations and their representation in local institutions. In the case of Blue Gold, as in the case of FAP-20, this can lead to serious conflicts over land and water resources.

The Blue Gold Programme Document recognises different water uses (for different crop and fish production systems) and that care should be taken to make "clear arrangements between the different users… If such clear agreements are not made at the start of the rehabilitation, conflicts between water users will be unavoidable" (GoB and GoN, 2012: 39). Conflicts, however, are occurring despite the "clear arrangements". In 2016, the programme reported serious delays, which it blamed on a lack social coherence: "There are disagreements among the farmers on the trajectory of the internal drainage [canal] in [Water Management Unit] 1, and the communities are not agreeing to the suggested solutions" (Mott MacDonald, 2016: 18). In 2015, an independent research team reports on problems of waterlogging caused by individuals blocking the internal canals in order to get access to roads. It also reports on serious conflicts after wealthy shrimp farmers took control of the sluice gates to allow saline water into the polder for their own business purposes. This generated widespread discontent amongst the more vulnerable rice farmers (Laporte-Bisquit, 2015).

The nature of Blue Gold's "clear agreements" with communities is unclear – especially in view of the plan's priorities. Now that Dutch development cooperation activities fall under the Ministry of Trade, "the development of polders will be seen much more than in the past from a business-like approach with the local producers/farmers as main actors" (GoB and GoN, 2012: 9). The plan therefore promotes in the first place the business interests of surplus producers. The FAP-20 experience clearly reveals that the interests of surplus food producers tend to conflict with those of a much larger landless population that relies on open access fishing, subsistence farming, access to river transportation, and so on.

The Blue Gold Document admits that there are "considerable uncertainties" about the sharing of financial benefits from the proposed interventions (GoB and GoN, 2012: 83). It notes that the boost in food productivity might not be realised by the entire productive sector. Blue Gold therefore envisages employment opportunities for the rural poor for the rehabilitation of water management infrastructure during the programme period and for the maintenance of embankments (GoB and GoN, 2012). Again, mirroring the approach in FAP-20, the landless are offered employment opportunities to engage in earthwork contracts such as clearing silt from drainage channels or strengthening embankments in the Blue Gold project areas (Ramchurn, 2016). While this approach acknowledges inequalities in Bangladeshi society, it also reflects an entirely depoliticised approach focused on poverty alleviation through income-generating activities for the landless, without necessarily including them in either decision-making processes or the operations of water infrastructure (Dewan et al., 2015).

The assumption behind Blue Gold and FAP-20 is that productivity growth by the better-off surplus-producing sector will trickle down or ripple out to the rest of the population. However, as discussed earlier, there is already a tremendous surplus of labour supply in rural Bangladesh. Whether sufficient employment opportunities will arise is therefore another uncertainty that Blue Gold planners fail to recognise. To us, the heart of the matter is less about the rippling out of financial benefits, and much more about the question of displacement of alternative livelihood systems as a result of the infrastructures. As in the case of FAP-20, the Blue Gold Document makes no mention of exploring non-structural flood protection measures that might be emphasised by non-business non-landholder groups.

A related and broader debate concerns the way projects such as these are designed to serve foreign interests (IFRC, 2001). In the words of the Dutch Embassy in Dhaka, Blue Gold "require[s] strong involvement of the private sector and will make good use of the expertise and know-how of Dutch enterprises and Dutch knowledge institutes, a first step in the transition from aid to trade" (EKN, 2014: 7). As long as this emphasis persists, it is hard to imagine how water-sector projects can truly begin to adopt a bottom-up approach to prioritise local 'non-business' interests.

CONCLUSIONS AND RECOMMENDATIONS

In the introduction, we asked what can be learned from the FAP-20 experience, its impacts and its evaluation. The implementation of FAP-20 led to a range of adverse social and environmental impact, including: siltation of the waterway system inside the protected area and waterlogging outside the area; loss of opportunities for open water fisheries and boat transportation; loss of access to surface water irrigation and fertilisation. FAP-20 did, however, increase crop yields and fish production, but this benefited in the first place the better-off population segments with access to land and capital.

A range of alternative water management systems, including upgraded non-structural traditional systems, were available and preferred by the majority of the local population. However, these alternatives were never taken seriously. This paper is not a plea for traditional solutions, but a plea for a more locally embedded and participatory approach to implementation. Such an approach should prioritise – or at the very least properly support – the non-market productive activities of marginalised groups. The problem of course is that this goes against local power relations as well as the interests of private-sector partners in the international aid apparatus.

Another conclusion pertains to the way water-sector programmes learn from mistakes. We advise a thorough independent evaluation on the above-mentioned range of impacts before undertaking similar programmes elsewhere. It is worrying that the Blue Gold Programme Document contains no reference to the System Rehabilitation Project or to the Flood Action Plan and its component in Tangail. FAP-20 was by no means a minor episode of Dutch involvement in Bangladesh. Its controversy regularly made the news and parliamentary debates.

This leads to questions about the failure to acknowledge and learn from past experiences. It is remarkable that William Willcocks criticised colonial engineering on very similar grounds. He argued that the construction of permanent embankments (even though on a much smaller scale than during the second half of the century) had concentrated what had generally been benign and widely spread inundations into much more devastating floods. In one of his lectures, he said: "The resulting poverty of soil, congestion of the rivers, and malaria, have stalked the canals and banks, and the country is strewn today with the wrecks of useless and harmful works" (Willcocks, 1930: 27).

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