

# Cahora Bassa Dam & the Delusion of Development

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*On December 6, 1974, two pressure-driven steel gates of the Cahora Bassa Dam, each weighing 220 tons, stopped the mighty Zambezi River in its course. After five years of toil by more than five thousand workers, the construction of Mozambique's Cahora Bassa was complete. At the time, it was the fifth-largest dam in the world. The hydroelectric dam was the last megaproject constructed in Africa during the turbulent era of decolonization. Through the voices of peasants and fishermen, displaced by the dam and the workers who built it, this essay analyzes the far-reaching social, political, and ecological consequences of Cahora Bassa. It also explores the devastating impact on riparian life downriver from the dam, which dramatically reduced the annual inundation of the floodplain that supported hundreds of thousands of farmers as well as fish, birds, and mammals.*

When completed in December 1974, the final year of Portuguese rule over Mozambique, the Cahora Bassa Dam attracted considerable attention. Hydrologists, engineers, and economists heralded its technical complexity and its potential to transform life for millions in the Zambezi River valley. Built in a remote corner of the Portuguese colony, it was at the time the fifth-largest dam in the world. Its completion confirmed that nature could be conquered and biophysical systems transformed to meet the needs of humankind. One after another, the late colonial state (1965–1975), the socialist state (1975–1987), and the neoliberal state (1987–2020) all celebrated this great achievement as part of their different development narratives. Governments of very different ideological perspectives operating in very different global economies found the dam hugely appealing. Whether Portuguese or Africans have held the reins of state power, the dam has symbolized the ability of science and technology to control nature and ensure human progress. To the degree that official versions of Cahora Bassa's history have become the dominant narrative, critical voices continue to challenge the interpretative authority of the state and question the social and ecological consequences of the hydroelectric project.

The optimistic official forecasts have not been realized. As in the case of many large hydroelectric projects in the Global South, the Cahora Bassa Dam precipitat-

ed disruption in the lives of the rural poor, exacerbated by global climate change.<sup>1</sup> The history of Cahora Bassa raises the troubling question of development for whom? Put somewhat differently, who benefits and who loses from such a massive project?

In 1965, when Portugal proposed a dam at Cahora Bassa, colonial officials envisioned that numerous benefits would flow from the US\$515 million hydroelectric project and the managed environment it would produce. These included the expansion of irrigated farming, increased European settlement and mineral output, improved communication and transportation throughout the Zambezi River valley, and reduced flooding in this zone of unpredictable and sometimes excess rainfall.<sup>2</sup> According to Overseas Minister Joaquim da Silva Cunha, Lisbon's objective was "to tame the wild river and transform it into a valuable tool for progress . . . for the betterment of the indigenous peoples who are an integral part of the Portuguese nation."<sup>3</sup> As a follow-up to this technological triumph, Portuguese planners envisioned building a second dam 60 kilometers south of Cahora Bassa at Mphanda Nkuwa.

Military realities on the ground, however, forced Lisbon to drastically narrow this vision. Because of a growing threat from anticolonial guerrillas known as FRELIMO (The Front for the Liberation of Mozambique), Cahora Bassa became a security project masked as a development initiative.<sup>4</sup> Both South Africa's apartheid regime and the Portuguese state viewed the dam and its connected lake as a buffer that would block the advance of FRELIMO and, by extension, its ally the African National Congress (ANC), which was committed to overthrowing White minority rule. In return for Pretoria's assistance against FRELIMO, in 1969, Portugal agreed to export to South Africa the vast majority of the energy that Cahora Bassa would generate at a fraction of the world price. With this agreement, the purpose of Cahora Bassa, whose original functions were to include the provision of hydroelectric power to stimulate agriculture and the control of flooding, was effectively reconfigured to be both a source of cheap energy for South Africa and a barrier to prevent the advance of "terrorist forces."<sup>5</sup> The energy generated would be transmitted to the apartheid regime using the innovative high-voltage direct-current (HVDC) method rather than the conventional alternating-current method. This new technology, however, precluded its use by Mozambican consumers since Mozambique lacked the capacity to convert HVDC to alternating current. Controlling the output of Cahora Bassa was the first phase of Pretoria's ambitious plan to integrate all dams in Lesotho, Angola, Namibia, Zambia, and Zimbabwe into one centralized power grid. "In this way, South African planners hoped to 'capture' the region and become its 'natural' engine and powerhouse."<sup>6</sup>

From the moment the dam's massive steel gates closed to restrict water flows in 1974, South Africa's needs dictated the timing, frequency, duration, and mag-

nitude of water released from the dam. Cahora Bassa became the largest dam in the world constructed for the specific purpose of exporting energy.<sup>7</sup> Over one million peasants living downriver adjacent to the floodplains felt the hydroelectric project's devastating economic and ecological consequences as did fifty thousand peasants whose fertile homelands were inundated by the massive lake formed behind the dam walls.

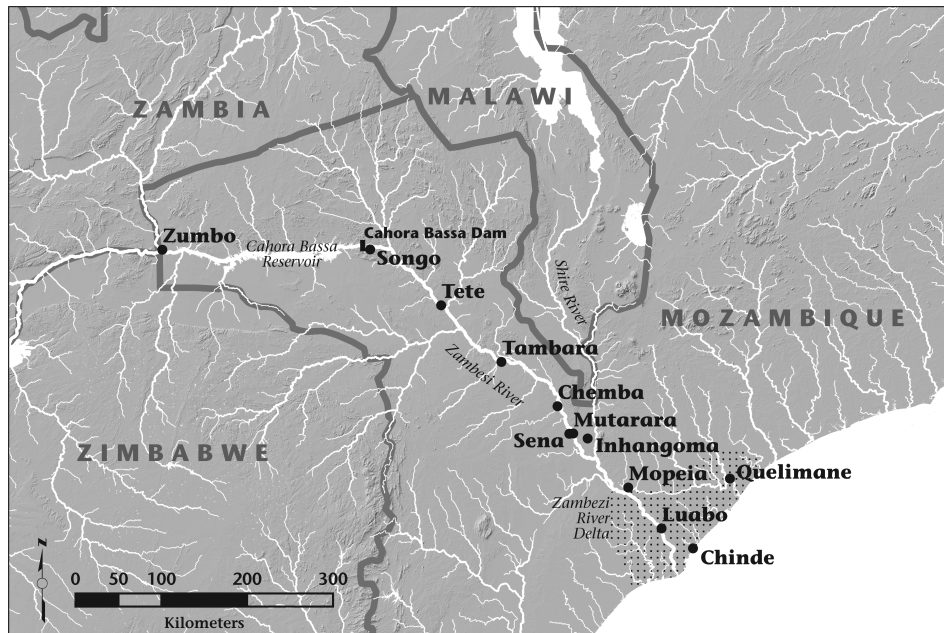
Three hydrological factors are critical to understanding the rationale for constructing the dam in its relatively vulnerable geographic position. First, although the Cahora Bassa Dam and reservoir are contained entirely within Mozambican territorial boundaries, the vast bulk of the Zambezi drainage basin, the third-largest river system in Africa, lies outside of the country. Since Mozambique is at the end of the stream, it is dependent on its neighbors for access to the river's water. Second, there are only a few locations in the Zambezi basin suitable for reservoirs or hydroelectric plants. In most of the basin, located on the Central African plateau, the waters flow slowly through low plains and swamps, providing few potential sites for dams. Third, and most relevant for this discussion, was the pronounced seasonality of Zambezi flows and the serious impact of annual floods on the riverine communities and their natural habitats as well as for the European sugar plantations located near the mouth of the river. Indeed, flood control was one of the presumed advantages of building the dam and containing massive flooding, which had occurred sporadically.<sup>8</sup>

Contrary to popular perceptions, seasonal flooding did not have deleterious effects. Waters from the flooding river typically inundated the banks of the Zambezi during the rainy season from December through March. When the waters receded, they left a rich deposit of nutrients along the shoreline. In lowland areas, this spillover often extended over a several-kilometer stretch of land. Peasants throughout the valley considered these rich dark *makande* soils of the floodplains to be the most desirable agricultural sites in the region. Beatriz Maquina, an elderly woman who had farmed her entire life, stressed that the "*makande* land located near the banks of the river always gave us good production. We cultivated a great deal of sorghum as well as some corn."<sup>9</sup> All the elders with whom we spoke distinguished *makande* from the more common sandy, rocky *ntchenga* soils, which did not retain water and were difficult to farm.<sup>10</sup>

Given the low and irregular rainfall in the Zambezi valley, access to the *makande* river-fed soils was critical to ensuring household food security. Much of the Tete district and the Lower Zambezi valley has a semi-arid climate and savanna-like environment. The average annual rainfall in much of Tete is only 600 millimeters. Droughts occur regularly, often with devastating consequences to the crops. Without *makande* lands, peasant households faced the prospect of periodic crop failures on a regular basis and, even in the best years, little likelihood of producing

*Figure 1*

Map of the Zambezi River Basin Showing Geopolitical Boundaries and Reservoirs



Source: University of Minnesota Cartography Laboratory.

a second annual crop. This vulnerability was true downriver as well, where rainfall was more appreciable, but still erratic.

Peasant cultivation of river-fed land constituted a critical feature of the complex and highly adaptive indigenous agronomic system. Drawing on a rich repertoire of farming practices, born out of years of trial and error and detailed micro-ecological knowledge, local communities creatively adapted to the uneven soil quality, fluctuations in rainfall, and challenges of flooding. Carlos Soda Churo, who was forced to relocate because of the dam, described, in some detail, farming practices prior to the impoundment:

Before Cahora Bassa each family had several fields. The number and size varied depending on strength of a person and the size of his family. The land near the river was very good. It was called *makande*. When the river rose and then receded in June, the area that had been covered with water was very good for farming. There we first planted maize. We cultivated beans in the same field as the maize. Beans needed something

to rest on and the maize stalks served well. Nearby we cultivated a second small plot with sweet potatoes, tomatoes, cabbage and more beans. We harvested our gardens in September and October before the rains and flooding. By November we were working in our larger fields away from the river. On the *ntchenga* soils we planted sorghum, which does not require as much water. The mixed *ntchenga-makande* soils were better for maize, which needs more moisture than sorghum. Some people planted peanuts in their maize fields. We harvested these crops in June and July and then returned to our gardens.<sup>11</sup>

Churo's account underscores three important features of the indigenous agronomic system. First and foremost, the food production systems of local agriculturalists coevolved with the seasonal cycle of the river's flood patterns. Decisions regarding the spatial and temporal patterns of food production, including selection of the most appropriate crops and amounts planted, with reference to the season and different micro-ecological zones, were finely tuned to changes in the river's discharge rates as well as variations in soils and sunlight. Second, intercropping was an effective labor-saving device since several crops could be tended simultaneously. Cultivating peanuts in maize fields had the added advantage of restoring badly needed nutrients to depleted *ntchenga* soils. Finally, households spent most of the year engaged in agricultural production in order to minimize labor bottlenecks and to ensure an adequate supply of food.

The free-flowing Zambezi provided sustenance to riverine communities in two other important respects. Before Cahora Bassa, approximately sixty species of fish inhabited the river.<sup>12</sup> Elders recalled that the Zambezi provided a large catch, which they consumed.<sup>13</sup> Fish were a major source of protein. The river also attracted large herds of impala, gazelle, elephants, buffalo, and eland from the nearby forests to water on the banks of the Zambezi and adjacent wetlands, where they became prey for skilled hunters.<sup>14</sup> Game was an integral part of the local diet. Peasants also consumed meat in larger amounts at important social occasions and at rituals propitiating the ancestor spirits. All of this changed, however, with the construction of Cahora Bassa.

Colonial planners stressed that the long-term benefits of the dam would far outweigh any short-term inconveniences in the lives of the riverine communities. Despite such assurances, Cahora Bassa had immediate, multiple, and far-reaching consequences for the displaced communities whose homelands and farms were flooded to create the massive lake behind the dam. The most immediate effect was the permanent inundation of 2,700 square kilometers of highly productive floodplains effectively used by peasant communities for centuries. As Masecha residents Pezulani Mafulanjala, Maurício Alemão, and Bernardo Tapuleta Potoroia recalled, "All the crops grown on the *makande* had a good supply



of water and nutrients. In some lowland areas the river deposited sediments on banks for 2 – 3 kilometers from the river.”<sup>15</sup>

Yet it was not simply eviction from their homes and ancestral lands that proved so devastating. Unlike other powerless groups around the world displaced by hydroelectric schemes, the Zambezi peasants were herded into strategic hamlets with few basic amenities. These *aldeamentos* were an integral part of Portugal’s broader counterinsurgency program designed to cut FRELIMO off from its rural base. Mafulanjala, Alemão, and Potoroia remembered what happened the day they were told to move:

They came and told us that the water was going to rise and that we would have to leave. ... Among us there were people who complained and did not want to move. They were very angry because they had fields and houses here and their whole life was here. But they had no choice.<sup>16</sup>

Although colonial authorities initially claimed that only 25,000 Africans would be displaced, by the end of 1973, the number had jumped to over 42,000.<sup>17</sup>

The displaced peasants lived in mud and wattle huts laid out in a grid enclosed by a barbed wire fence. The peasants were effectively held captive. Their only access to the outside world was through a checkpoint manned around the clock by local militia.<sup>18</sup> The lands surrounding their villages were rocky, hard to work, not very fertile, and often far from the strategic hamlets. They stood in sharp contrast to the lands left behind.<sup>19</sup> The arid conditions and absence of rain-fed lands dramatically reduced agricultural yields. So too did the colonial policies that limited each household to one small plot, typically less than a hectare in size. Government agronomists, by discouraging intercropping on the grounds that it created “messy” fields, also exacerbated low productivity.

Food shortages were not the only problem these uprooted communities experienced. As in other dam projects in Ghana, Egypt, and Sudan, sickness and death rates increased markedly, especially among the very young and very old.<sup>20</sup> Inadequate rural diets, combined with problems caused by poor sanitary conditions regularly exacerbated by heavy rains in January and February, left rural communities reeling from cholera. In *aldeamentos* located near Lake Cahora Bassa, waterborne parasitic illnesses such as schistosomiasis and malaria posed new health threats. The commonly held explanation for these misfortunes – that the flooding of sacred shrines and burial sites had alienated powerful royal ancestor spirits (*mhondoro*) – underscores the sense of cultural obliteration and vulnerability experienced by the uprooted peasants.<sup>21</sup>

The inundated floodplain habitats also constituted some of Mozambique’s most diverse ecosystems. The dry savanna near the river had supported numerous trees whose leaves would fall and act as natural fertilizer upon decomposition. The diversity of tree species in the region is provided by the accounts of people

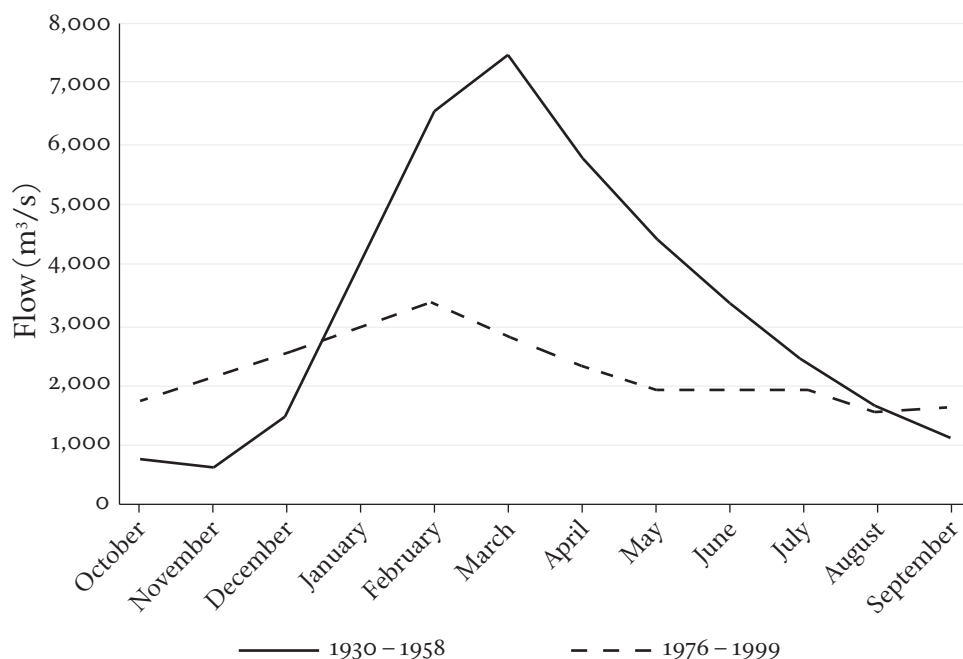
who, during times of drought, would forage for wild fruit.<sup>22</sup> These riparian ecosystems also supported substantial numbers and types of animal species, including elands, bush pig, buffalo, nyasa, gazelle, elephant, and rhinoceros.<sup>23</sup> Despite the government's much vaunted plan (termed "Noah's Ark") to protect wildlife, officials did little.<sup>24</sup> The effects were devastating. Residents Bento Estima and Joseph Ndebvuchena remembered that

After the flooding began many animals were stranded on Tanzwa and Manherere which are islands in the Zambezi. Some died on these islands because they could not get enough food. As the water kept coming higher, many animals were swept away if they couldn't swim to the other side of the river.<sup>25</sup>

In addition to the permanent inundation of ecologically important riverine lands, the decision to fill the Cahora Bassa reservoir at a breakneck pace also had far-reaching consequences for human communities and ecological systems downstream. Despite the hydrologic fact that the portion of the river below Cahora Bassa was highly dependent on the main channel for continued flows, dam operators refused to allow compensatory releases through the dam during the filling of the reservoir. The flow rate of less than 60 cubic meters per day for over three months had catastrophic results below the dam. The river was stopped in December precisely when the annual inundation of floodplains for agricultural production typically occurred. This was also a time when many fish species of the Lower Zambezi begin to spawn in adjacent floodplains. With the closure of the dam and discharge reduced to 10 percent of its average flow, the fish were stranded as flood waters receded. Local farmers who depended on fish for supplemental protein harvested them in large numbers during this period, placing further pressure on fish populations.<sup>26</sup>

In April, with construction of the dam and turbines almost complete, engineers employed by Hidroeléctrica de Cahora Bassa (HCB; the Portuguese company managing the dam) discovered a small defect in one of the turbines deep in the water of the almost full reservoir. Without any warning or consultation, they opened the turbines and sluice gates to full capacity and delivered an unnatural coursing of floodwaters downstream from the dam. Numerous small-scale farmers, at the time residing close to the river's edge to take advantage of the fertile soils, lost significant numbers of cattle and small poultry, and, in many cases, almost lost their lives. By May and early June, the gates of Cahora Bassa were being opened and closed on a daily basis, timed to the power generation schedules of HCB engineers. At no time in the first six months of the dam's operation were the waters of the reservoir stagnant, and the pattern was "that of a vast mass of raw floodwater in constant, though very slow, motion down the dam."<sup>27</sup> The transformation of the river's annual cycle from a punctuated, highly seasonal flow regime that supported farming to one characterized by unpredictable flows that rotted maturing crops was complete (see Figure 2).

Figure 2  
Pre-Kariba and Post-Cahora Bassa Mean Flows of Zambezi River at Mutarara



Source: Richard Beilfuss and David dos Santos, "Patterns of Hydrological Change in the Zambezi Delta, Mozambique," Working Paper No. 2, Program for the Sustainable Management of Cahora Bassa Dam and the Lower Zambezi Valley, 2001, fig. 2-61.

On June 25, 1975, six months after the dam was completed, Mozambique gained its independence. With state power, Frelimo's socialist government was theoretically positioned to launch policies that, over time, might transform Mozambique's distorted economy and reduce its dependence on the apartheid regime.<sup>28</sup> Cahora Bassa figured prominently in the state's new socialist agenda. Mozambican state planners, committed to social engineering, were confident that the hydroelectric project would play a pivotal role in developing the Zambezi valley and improving the lives of millions of Mozambicans across the country who lacked electricity. Together with the organization of a network of state farms and communal villages, Cahora Bassa would, in the Marxist parlance of Frelimo, be instrumental "in the socialization of the countryside." In my discussion with President Samora Machel, he was adamant that:



We cannot irrigate without energy. The electrification of the central area of the north and of the south of our country is fundamental for us to be able to meet the needs of agriculture. We must domesticate the “white elephant” Cahora Bassa. This “elephant’s” ivory – electricity and irrigation – should go to our agriculture and industry. . . . Within the next decade the north bank power station [at Cahora Bassa] must begin functioning and numerous dams must be built for irrigation and electrification.<sup>29</sup>

Domesticating the “white elephant” was not an easy task. Under the 1974 Lusaka Peace Accord, Lisbon assumed responsibility for the massive debt incurred in building the dam. Until it was repaid, Portugal, rather than the Mozambican state, retained effective control over Cahora Bassa.<sup>30</sup> That Mozambique’s total energy requirement was less than 10 percent of the dam’s output further complicated Frelimo’s efforts to harness the hydroelectric project for domestic purposes. Moreover, the cash-starved nation lacked the capital to develop the agricultural and industrial sectors that could utilize the cheap energy.

Despite these constraints, the government undertook several economic initiatives so that Cahora Bassa would not simply be a source of cheap energy for apartheid South Africa. In 1978, it began building power stations to provide energy from the dam to the provincial capital Tete and the nearby coal mines at Moatize, the largest in the country. Most important, state planners envisioned a second set of power lines and substations on the northern bank of the Zambezi River to provide cheap energy to the densely populated provinces of Zambezia and Nampula and other parts of northern Mozambique. Both were major food-producing zones and the source of most of the country’s cotton, tea, and sugar for export. In 1980, the government signed a multimillion-dollar agreement with France and Italy to begin the first phase of the project, which was to be completed two years later.<sup>31</sup>

Before most of these projects could get underway, South Africa intensified its destabilization campaign, effectively paralyzing these efforts. Within six months of Mozambique’s independence in 1975, South African security forces working with their Rhodesian counterparts had created RENAMO (Mozambican National Resistance) and trained and armed the insurgents. Between 1976 and 1979, Mozambique suffered from more than 350 RENAMO and Rhodesian attacks. Although the dam was left unscathed, anti-FRELIMO forces regularly targeted regions adjacent to Cahora Bassa and periodically sabotaged power lines and substations.<sup>32</sup> With the fall of the Rhodesian government in 1980 and the independence of Zimbabwe, the apartheid regime transferred RENAMO headquarters and bases from Rhodesia to the Transvaal, a northern province of South Africa adjacent to Mozambique. Pretoria provided RENAMO with large supplies of war matériel, including rockets, mortars and small arms, critical logistic support, and instructors. This was part of a broader campaign that South African security forc-

es orchestrated to destroy Mozambique's infrastructure, paralyze the economy, and bring the African-led socialist nation to its knees.<sup>33</sup>

Cahora Bassa's power lines were a particularly inviting target. At first glance, such a strategy might seem counterproductive since the pylons transported energy to South Africa. But set within Pretoria's broader destabilization strategy designed to punish Mozambique for its support of the ANC, it made perfect sense to military planners. After all, FRELIMO had placed great importance on Cahora Bassa's potential to transform the countryside. Paralyzing the hydroelectric scheme underscored the country's vulnerability.

The results of the attacks on power lines were both predictable and devastating. The Mozambican government lacked the capacity to protect the four thousand pylons that cut across 900 kilometers of remote country. As early as 1981, RENAMO forces had dynamited pylons, reducing electricity exports by 50 percent. This pattern was repeated on a regular basis. Guerrillas destroyed power lines and towers and mined the adjacent areas, making it virtually impossible for the government to repair them. By 1988, 891 pylons had been destroyed and that number doubled again over the next three years.<sup>34</sup> The cost of repairing the power lines was estimated at US\$500 million – almost three times the total value of Mozambican exports. RENAMO's campaigns in Tete and Zambezia provinces, moreover, had effectively blocked plans to develop the Zambezi valley and electrify the northern part of the country. The dam remained a white elephant.

In addition to paralyzing Cahora Bassa and destroying many other strategic targets, RENAMO initiated a reign of terror throughout the riverine zone, particularly in areas considered loyal to the government. Among the most vulnerable communities were the peasants who had been displaced by the dam and herded into hamlets during the colonial period. With independence, the barbed wire surrounding their villages was taken down and the guards were removed, leaving them defenseless. Since their original homes were under water, most had little alternative but to remain where they were. According to resident Vernácio Leone:

When RENAMO would come into a village, they would call all the people together. Then they would go into the house and steal all that was inside. They ordered the people back into their homes and set them on fire. People elsewhere heard these stories, so when RENAMO was coming, they would flee to Estima (an administrative center).<sup>35</sup>

Peasants downriver from the dam suffered similar abuses from marauding bands of RENAMO guerrillas.

It is hardly surprising that thousands of peasants who survived these attacks experienced food shortages and malnutrition. Many starved. Death rates from yellow fever, tuberculosis, and malaria soared. Throughout the region, the social fabric of society was destroyed.<sup>36</sup>

It is difficult to distinguish the environmental and social disruptions that the dam precipitated from those caused by the war, and the extent to which they were interconnected. What is certain is that the construction of Cahora Bassa adversely affected the livelihoods of hundreds of thousands of peasant households and irrevocably altered the biophysical relations of the Lower Zambezi from the reservoir to coastal regions. According to a United Nations report, “Cahora Bassa has the dubious distinction of being the least studied and possibly least environmentally acceptable dam project in Africa.”<sup>37</sup>

With the construction of Cahora Bassa, the lifeblood of the floodplains, delta, and estuary regions was placed in the hands of the Portuguese-dominated HCB, who had agreed to sell more than 80 percent of the electricity. The consequences have been profoundly negative. Flows that once reached rates of 28,000 cubic meters per second during the flood season and averaged 2,000 – 3,000 centimeters during the rest of the year were eliminated and replaced with flow rates of 900 centimeters that varied little from month to month (see Figure 2).<sup>38</sup> A leading scientist concluded that erratic and mistimed discharges have been “catastrophic” for downstream wetlands, where vegetative growth and animal populations depended on annual flooding that brought nutrients and sediments.<sup>39</sup> By 1996, the geomorphology of the Lower Zambezi itself – formerly a wide river system with “open mosaics of marsh, pond, oxbows and shallow wetlands” – had been converted to a system with “choked wetlands, tree and bullrush encroachment along margins,” and impoverished marshlands. The overall result is less diverse, less productive riverine ecosystems.<sup>40</sup> A disinterest in the downstream hydrological effects spurred by the dam also reflected a tacit disregard for the peasant and fishing communities for whom the floodplain system was a critical resource. According to the current director of the Zambezi Valley Authority:

Pre-dam lifestyles [*sic*] of hundreds of thousands of local residents were dependent on annual flooding which sustained a diversified production system that incorporated flood recession agriculture, livestock management, fishing, gathering and hunting. Flooding was especially important for providing otherwise unavailable grazing during the latter months of the dry season and for maintaining the productivity of the riverine fishery.<sup>41</sup>

The impacts on riverine fish populations are especially pernicious, due to the apparent loss of biological diversity and to the drastic reduction of an important food source for riverine communities. While information concerning the dam’s effects on other aspects of downstream floodplains is sketchy, the impacts on fish have almost certainly been devastating. According to engineer Richard Beilfuss, who has worked in the region, “Villages correctly attribute . . . a drop in the productivity of their fishery to dam construction.”<sup>42</sup>

Even the predicted benefits of the dam in terms of downstream flood control did not materialize. A massive flood in 1978 resulted in over forty lost lives, left 200,000 homeless, and destroyed more than 60,000 hectares of crops. In 2000 – 2001, and again in 2007 – 2008, thousands of homes and fields were destroyed by the raging river. This devastation stands in stark contrast to the claims made in early documents of Cahora Bassa projects, touting the period of “total control” over discharges that the dams would usher in.<sup>43</sup>

Some of the most far-reaching and difficult-to-measure ecological impacts of large dams have occurred in the delta and estuary zones of impounded rivers, where there has been a marked reduction of biological diversity, simplified landscapes, and continued threats to ecologically and economically important biota. The delta region’s vast populations of large mammals have been devastated by the effects of the dam. Before the dam, the floodplain supported large herds of Cape buffalo, waterbuck, zebra, and reedbuck. The desiccation of the floodplain made the region accessible to commercial poachers as well as to RENAMO and government soldiers. Consequently, the buffalo population declined by upwards of 90 percent and other mammal species, including zebra, hippopotamus, and waterbuck, and several bird species have experienced similar reductions.<sup>44</sup>

The adverse effects of Cahora Bassa extend to the mouth of the Zambezi. The sharp decline in silt transported downriver has hampered the Zambezi’s important delta-building function.<sup>45</sup> As deposition of silt decreases with unknown implications for the coast’s vulnerable communities of natural vegetation, the estuary is subject to greatly increased wind and sea erosion. This in turn almost certainly generates negative impacts on the estuarine fisheries that evolved under more stable conditions and depended on the annual flooding cycle that brought nutrients and sediments. Mangrove forests and shrimp fisheries, critical elements of the delta and estuarine system, have been particularly degraded at least in part if not wholly by the altered character of Zambezi flows. The full effects of the decrease in sediment transfer to the Zambezi delta on the coast’s mangrove ecosystems are little known, although a recent survey showed that only a single channel of the Zambezi exhibited healthy mangroves. Throughout the rest of the coastal region, there are large gaps in the mangrove forest with evidence of dried-out areas, dead mangroves, and severe coastal erosion.<sup>46</sup>

What is also clear are the devastating effects of the reduced wet season water flows of the Zambezi on Mozambique’s strategic shrimp industry. The Sofala Bank, a broad and shallow shelf just outside the mouth of the Zambezi, is the site of a productive shrimp fishery that is one of Mozambique’s most important sources of foreign currency. Since the early 1980s, catches of the coastal fisheries’ two most important shrimp species (*Penaeus indicus* and *Metapenaeus monoceros*) have declined substantially due to both environmental factors and increasing fishing effort. There is a high degree of correlation between wet season river runoff and

the abundance of these economically important shrimp species. The dam at Cahora Bassa both reduces the amount of water discharged by the river and alters the seasonal pattern of runoff. After the dam's completion, the wet season runoff was reduced by about 40 percent.<sup>47</sup> Significant decreases in the amount of water released, particularly during the onset of the flood seasons when shrimp normally migrate toward the ocean, could drastically reduce the shrimp population by impeding an important stage in their life cycle.<sup>48</sup> This would be disastrous for commercial shrimping operations that depend on continued shrimp production. For local fishermen as well as for the impoverished nation hard-pressed for foreign currency, this loss of shrimp revenue is highly significant.

The construction of Cahora Bassa sounded a death knell for this particular set of socioecological relations by regulating the river. Flow rates became much lower than normal during the former flood season and much higher than normal during the dry season. Moreover, the river was subject to erratic, unseasonal flooding caused by dam operators' manipulation to generate hydroelectricity.<sup>49</sup> The consequences led ecologist Bryan Davies, who had periodically worked in the valley for the past three decades, to conclude that the Lower Zambezi "has been abused to a degree that has, fortunately, few parallels anywhere else in the world."<sup>50</sup>

**T**wenty-five years after independence, it was no longer tolerable that Portugal still owned and operated the dam. From Maputo's perspective, Portugal's continued ownership of the dam, the sale of electricity to South Africa at a fraction of the market value, and the need to re-import some of that exported electricity were colonial artifacts that subverted Mozambique's political and economic sovereignty and national security.<sup>51</sup> Cahora Bassa was a living symbol of a violent and oppressive past. Songo, the small city that served the dam, remained a Portuguese enclave in the heart of Mozambique, with European managers and workers retaining many of their past privileges and almost all 850 Mozambican workers stuck in low-wage positions.<sup>52</sup> One worker summed up their shared sense of anger and alienation this way: "As time goes on we feel more marginalized.... We feel like foreigners in our own country."<sup>53</sup> Strike threats and periodic work stoppages reported in the media were powerful reminders of how little had changed.<sup>54</sup>

The lack of electricity in the countryside powerfully underscored this extreme neocolonial reality. Even after transmission lines were rehabilitated and the dam began producing electricity again at full power in 1998, the Portuguese company HCB continued to pay little attention to Mozambique's domestic energy requirements.<sup>55</sup> Instead, these developmental needs were held hostage to HCB's search for new markets in the larger energy-starved region, where it could command higher prices than the energy sold locally.<sup>56</sup> Elsewhere I have detailed how Frelimo then began a vigorous campaign to reclaim Cahora Bassa, proposing several

plans that would reduce or erase the debt and transfer its sovereignty from Lisbon to Maputo.<sup>57</sup> Lisbon rejected all of them, provoking a strong nationalist reaction.<sup>58</sup> As a leading newspaper stressed, “the continuation of the present situation makes Mozambique look like a country too weak to defend its own interests,” making expropriating the dam a “national imperative which all of Mozambican society should unconditionally support.”<sup>59</sup> In 2007, under increasing pressure from Mozambique, joined by South Africa’s ANC government and other African nations, Lisbon reluctantly agreed to relinquish control of the dam for the price of US\$950 million.

Throughout these negotiations, Frelimo resurrected the colonial idea of building a second dam at Mphanda Nkuwa, which could supply South Africa and thus decrease the profitability of Cahora Bassa, making it of little value to Lisbon.<sup>60</sup> Once planning for Mphanda Nkuwa got underway, however, it took on a life of its own. By the time Cahora Bassa passed into Mozambican control, Frelimo had decided that two dams on the Mozambican stretch of the Zambezi were better than one. Mphanda Nkuwa was no longer a means of pressuring Portugal by creating competition for Cahora Bassa; instead it had become useful in itself, both to help electrify the countryside and to generate badly needed hard currency by selling energy to neighboring countries. Post-apartheid South Africa was a particularly attractive market; the ANC government faced a serious energy shortfall.<sup>61</sup> The extension of power lines into low-income areas and shanty towns along with increased demands for energy from the service and financial sectors and mining sorely taxed its energy infrastructure and required South Africa to look beyond its borders for cheap and secure energy.<sup>62</sup> A new dam on the Zambezi to supplement Cahora Bassa’s output was the obvious choice.

The colonial-era plan for Cahora Bassa had envisioned construction of a dam at Mphanda Nkuwa, located downriver, halfway to the city of Tete. It is named for the mountain that juts into the Zambezi River, creating a narrow choke point that colonial engineers considered an ideal site for a dam. A 2002 government feasibility report enthusiastically endorsed the project.

Unlike its predecessor, the new dam would be developed as a “run of river” scheme, which would not disrupt the flow of water downriver and would only require that 260 households be relocated. Moreover, the displaced families would “be brought into the market economy as commercial fishermen with access to water, a school and a hospital.”<sup>63</sup> In short, much like the original justification for Cahora Bassa, the new dam would stimulate development.

The Mozambican government organized an Investors Conference for the Mphanda Nkuwa Hydroelectric Project. More than two hundred state officials, consultants, and representatives of large energy companies, contracting companies, equipment manufacturers, and investment banks descended on Maputo in May 2002. The meeting’s intent was clear: to mark the official launch of the proj-



ect and to invite investors to prequalify as participants in the dam's construction, which was expected to begin in 2004 or 2005.<sup>64</sup> The dam would generate roughly 1,300 megawatts, about two-thirds the output of Cahora Bassa.

The planning of Mphanda Nkuwa represented a new assertion of Mozambican sovereignty over the Zambezi River, and possible financial gains for government officials overseeing the project. In harnessing the river for Mozambique's economic interests, Frelimo chose to narrowly define what those interests were and whose interests it would consider. While it would make big decisions about the fate of the communities along the Zambezi, the state demonstrated little interest in seeking meaningful input from those communities themselves. This top-down approach to governance – one in which Maputo effectively asserted a monopoly on wisdom and power – tends to characterize megadevelopment projects, particularly those involving dams.<sup>65</sup>

South African, Brazilian, and Chinese investors all expressed considerable interest in the project.<sup>66</sup> In April 2006, as part of Beijing's ongoing efforts to expand its influence in Africa, the Export-Import Bank of China signed a US\$2.3 billion Memorandum of Understanding with the Mozambican government to finance the Mphanda Nkuwa Dam.<sup>67</sup> The preliminary agreement covered the cost of the dam, the power station, and the transmission line from Tete to Maputo. Despite the initial optimism, negotiations with the Chinese and Brazilian firms stalled. For all the hoopla, multivolume studies, and a slick multicolor prospectus, the Mozambican state was not able to obtain firm commitments from foreign investors. The project languished for more than a decade.

Opposition from public interest and environmental groups and foreign scientists intensified because the state failed to consult in a meaningful way with riverine communities and because hydrological studies showed that Mphanda Nkuwa would have deleterious ecological and economic consequences.<sup>68</sup> For its part, Mozambican authorities attempted to discredit international critics of Mphanda Nkuwa by characterizing them as irresponsible opponents of development. Mechanical engineer Sérgio Elísio, who worked with Unidade Técnica de Implementação dos Projectos Hidroeléctricos (UTIP), a government regulatory body established in 1996, distinguished the government's position from the World Commission on Dams: "We do not agree with all of the standards of the World Commission on Dams. We have our own laws. The WCD has a single agenda: To stop all development of dams. The U.S. has some 7,000 dams. We have one and we want to have two."<sup>69</sup> Even some who were aware of the damage created by Cahora Bassa supported the plan to build Mphanda Nkuwa. "We already ruined everything [with Cahora Bassa] so we might as well get the added value of a new dam," said a retired structural engineer formerly involved in the planning of Mphanda Nkuwa.<sup>70</sup> In September 2020, the government signed an agreement with a consortium that includes a Brazilian company. Mphanda Nkuwa's fate is still uncertain.

The legacies of the hydroelectric project live on. The citizens of Mozambique have not, as yet, derived significant benefits from the massive hydroelectric project on the Zambezi River. Despite official plans calling for the electrification of the countryside, almost a half-century after independence, the power grid from Cahora Bassa reaches only 30 percent of the population, primarily in urban areas and provincial and district capitals. Of this number, it is estimated that only half are actually on the grid because the cost for most of the rural poor is prohibitive.<sup>71</sup> Almost 80 percent of the energy Cahora Bassa produces is either exported to South Africa or used to fuel MOZAL, a massive foreign-owned aluminum smelting company in which the Mozambican state holds only a 4 percent investment.<sup>72</sup> The dam generates about US\$280 million per year, but the state has invested little in the affected region. Income from energy sales has not been spent locally for schools or health clinics, or to stimulate industry or training.

Rather than promoting local or regional economic development or sustainable livelihoods, the dam robbed Mozambique of precious energy, since harnessing the river's flow regime to meet the needs of the South African state deprived rural communities in the Zambezi valley of the life-sustaining nutrients that had supported agricultural production and local ecosystems for centuries. While the natural energy of the river was transformed into an export commodity, the vast majority of Mozambique's population has had little or no access to this critical resource.

Climate change has further subverted the planners' original prediction that the dam would be a powerful weapon to increase irrigation and agricultural production. Instead, it has intensified hazardous conditions for the inhabitants of the river valley. Between 1960 and 2006, average annual rainfall has decreased at a rate of 3 percent per decade, but the proportion of rain falling in heavy rain years has increased by a similar amount. The results have been longer periods of drought and shorter, but more intense, rainfall leading to recurring droughts and periodic massive flooding, soil erosion, food shortages, and disease. Every decade since the construction of the dam has seen massive floods, displacing thousands of households and inundating much of the most valuable farmlands. In 2000, when Mozambique experienced its worst flood in more than half a century, more than a half-million citizens were displaced, many of whom lived adjacent to the Zambezi River.<sup>73</sup>

Global warming has contributed in another way to these extreme events. The Zambezi, which flows into the Indian Ocean, is also subject to increased threats of cyclones owing to the warming of the ocean. In 2019, cyclones Idai and Kenneth devastated the river valley and threatened the structural integrity of the Cahora Bassa Dam. Planners were forced to consider a rapid discharge of rainwater, which would have compounded the problems of flooding downriver. Although this last-ditch effort did not prove necessary, more than 400,000 people were left homeless.

Too often forgotten in the discourse on water, development, and national security are the people whom large dams are purported to help. This essay has explored the deleterious socioeconomic and environmental changes brought about by the Cahora Bassa Dam and South Africa's destabilization campaign in an era of rapid climate change. The essay is part of an alternative history of Cahora Bassa, which argues that the historical memories and lived experiences of these riverine communities must figure prominently both in any scholarly analysis of the effect of Cahora Bassa and any new initiatives to remedy the situation. That serious consideration is being given to building a new dam at Mphanda Nkuwa, fifty miles downstream from Cahora Bassa, suggests that lessons of the past have not been learned. Decolonizing development and using the nation's resources to deliver materially better lives to all Mozambican citizens remains the challenge.

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#### ENDNOTES

- <sup>1</sup> For a discussion of high modernism, see James Scott, *Seeing like a State: How Certain Schemes to Improve the Human Condition Have Failed* (New Haven, Conn.: Yale University Press, 1998).
- <sup>2</sup> Arquivo Histórico Diplomático de Ministério dos Negócios Estrangeiros, Processo EAA 146, Pasta 1: Domingues de Almeida, June 3, 1970.
- <sup>3</sup> Joaquim M. da Silva Cunha, *Cabora Bassa: Who Will Benefit by It?* (Lisbon: Agência-Geral do Ultramar, 1970), 9.
- <sup>4</sup> As is standard practice, I use the capitalized term “FRELIMO” to refer to the liberation movement and lower case “frelimo” to indicate the political party in the postindependence period.
- <sup>5</sup> Arquivo Histórico Diplomático de Ministério dos Negócios Estrangeiros, Processo EAA 146. According to Keith Middlemas, *Cahora Bassa: Engineering and Politics in Southern Africa* (London: Weidenfeld and Nicolson, 1975), 75, the rate was 0.3 cents per kilowatt-hour, falling to 0.2 cents after 1990. ESKOM sold the energy for 0.55 cents per kilowatt-hour. RSA, DIRCO Archives, BTS1/1/3/2/1, vol. 5, “Mozambique: Cahora Bassa Project,” 4–9,

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- <sup>6</sup> "Cabora Bassa Rethink," *South* 1 (1980).
- <sup>7</sup> Allen Isaacman and Barbara Isaacman, *Dams, Displacement, and the Delusion of Development: Cahora Bassa and Its Legacies in Mozambique, 1965–2007* (Athens: Ohio University Press, 2013).
- <sup>8</sup> An examination of hydrological data between 1900 and 1975 indicated there were at least nine major floods. *Ibid.*, 44.
- <sup>9</sup> Interview with Senteira Botão, Eliot Jumbo, Muatisembero Sargento, and Beatriz Maquina, Chipalapala, Mozambique, May 26, 1998.
- <sup>10</sup> *Ibid.*; interview with Supia Sargent and Carlos Soda Churo, Estima, Mozambique, May 22, 1998; interview with Sene Simico, Mauzene Dique, and Mzwengane Mafala-Njala, Nyatapiria, Mozambique, May 27, 1998; and interview with Bento Estima and Joseph Ndebvuchena, Estima, Mozambique, May 19, 1998.
- <sup>11</sup> Interview with Sargent and Churo.
- <sup>12</sup> P. B. N. Jackson and K. H. Rogers, "Cabora Bassa Fish Populations Before and During the First Filling Phase," *Zoológica Africana* 11 (2) (1976): 377.
- <sup>13</sup> Interview with John Paul and Khumbidzi Pastor Estima, Mozambique, May 21, 1998; and interview with Sargent and Churo.
- <sup>14</sup> Interview with Sargent and Churo.
- <sup>15</sup> Interview with Pezulani Mafalanjala, Maurício Alemão, and Bernardo Tapuleta Potoroia, Masecha, Mozambique, May 25, 1998.
- <sup>16</sup> *Ibid.*
- <sup>17</sup> This figure includes Africans relocated downriver at Caia. It is difficult to determine the actual number since there was a great deal of secrecy surrounding the forced villagization program.
- <sup>18</sup> Interview with Mafalanjala et al.
- <sup>19</sup> Interview with Jack Sobrinho and Wiseborn Benjamin, Estima, Mozambique, May 20, 1998.
- <sup>20</sup> See Leila M. Harris, "Everyday Experiences of Water Insecurity: Insights from Underserved Areas of Accra, Ghana," *Dædalus* 150 (4) (Fall 2021); Stephan F. Miescher, "Ghana's Akosombo Dam, Volta Lake Fisheries & Climate Change," *Dædalus* 150 (4) (Fall 2021); Julie Livingston, "Water Scarcity & Health in Urban Africa," *Dædalus* 150 (4) (Fall 2021); Jennifer L. Derr, "The Dammed Body: Thinking Historically about Water Security & Public Health," *Dædalus* 150 (4) (Fall 2021); and Harry Verhoeven, "The Grand Ethiopian Renaissance Dam: Africa's Water Tower, Environmental Justice & Infrastructural Power," *Dædalus* 150 (4) (Fall 2021).
- <sup>21</sup> Interview with Sobrinho and Benjamin.
- <sup>22</sup> Interview with Vernácio Leone, Estima, Mozambique, May 19, 1998.
- <sup>23</sup> Interview with Sobrinho and Benjamin.

- <sup>24</sup> A. H. M., Governo Geral Cota 864, “Plano base para salvamento e transferencia da fauna brava da albufeira de Cahora Bassa em Moçambique,” K. L. Tinley, March 1973.
- <sup>25</sup> Interview with Estima and Ndebvuchena.
- <sup>26</sup> Bryan Davies, “They Pulled the Plug Out of the Lower Zambezi,” *African Wildlife* 29 (1975): 27.
- <sup>27</sup> Jackson and Rogers, “Cabora Bassa Fish Populations Before and During the First Filling Phase,” 381.
- <sup>28</sup> Jason Sumich, “‘Just Another African Country’: Socialism, Capitalism and Temporality in Mozambique,” *Third World Quarterly* 42 (3) (2021): 582–598.
- <sup>29</sup> Agência de Informação de Moçambique, *Information Bulletin* 38 (1979): 6.
- <sup>30</sup> Portuguese interests retained 82 percent ownership of Cahora Bassa and appointed the directors of HCB.
- <sup>31</sup> Agência de Informação de Moçambique, *Information Bulletin* 47 (1980): 18.
- <sup>32</sup> Agência de Informação de Moçambique, *Information Bulletin* 45 (1980): 27.
- <sup>33</sup> Margaret Hall and Tom Young, *Confronting Leviathan: Mozambique since Independence* (London: C. Hurst, 1997), 129.
- <sup>34</sup> M. Gebhardt, “Switching into Cahora Bassa,” *Mail and Guardian*, December 19, 1997; and Alex Vines, *RENAMO: Terrorism in Mozambique* (London: James Curry, 1991), 87–96.
- <sup>35</sup> Interview with Leone.
- <sup>36</sup> Vines, *RENAMO*.
- <sup>37</sup> Richard Beilfuss and Bryan Davies, “Prescribed Flooding and Wetland Rehabilitation in the Zambezi Delta, Mozambique,” in *An International Perspective on Wetland Rehabilitation*, ed. William Stever (Dordrecht, The Netherlands: Kluwers Academic Publishers, 1995), 143–158.
- <sup>38</sup> See Bryan Davies, “The Zambezi River System,” in *The Ecology of River Systems*, ed. Bryan R. Davies and K. F. Walker (Dordrecht, The Netherlands: Dr. W. Junk Publishers, 1986), 235–242; and A. Muhai, “Cahora Bassa and Lower Zambezi Workshop,” unpublished manuscript prepared for Workshop Sobre Uso Sustentável da Barragem de Cahora Bassa e do Vale do Rio Zambese, Songo, Mozambique, September 29–October 2, 1997, 4.
- <sup>39</sup> Beilfuss and Davies, “Prescribed Flooding and Wetland Rehabilitation in the Zambezi Delta, Mozambique,” 143–158.
- <sup>40</sup> Davies, “Zambezi River,” 235–242.
- <sup>41</sup> Muhai, “Cahora Bassa and Lower Zambezi Workshop,” 4.
- <sup>42</sup> Quoted in Richard Beilfuss and Bryan Davies, “Prescribed Flooding and Restoration Potential in the Zambezi Delta,” Working Paper no. 4, Program for the Sustainable Management of Cahora Bassa and the Lower Zambezi Valley, Maputo, Mozambique, 2001, 4.
- <sup>43</sup> Peter Bolton, “The Regulation of the Zambezi in Mozambique: A Study of the Origins and Impact of the Cahora Bassa Project” (Ph.D. diss., University of Edinburgh, 1983), 397–398.
- <sup>44</sup> Beilfuss and Davies, “Prescribed Flooding and Restoration Potential in the Zambezi Delta.”

- <sup>45</sup> As rivers transport sediments to their mouths year after year, the slow flowing water of the delta allows the silt to settle, thus typically widening and extending the semiterrestrial area of the delta itself.
- <sup>46</sup> Bryan Davies, "Rehabilitation Programme for Cahora Bassa Dam and the Lower Zambezi," unpublished and unpaginated paper, International Crane Foundation, 1996.
- <sup>47</sup> Tod Gammelsröd, "Improving Shrimp Population by Zambezi Regulation," *Ambio* 21 (1992): 145–147; and A. Honguane, "Shrimp Abundance and River Run-Off in Sofala Bank, The Role of the Zambeze," paper presented at Workshop Sobre Uso Sustentável da Barragem de Cahora Bassa e do Vale do Rio Zambese.
- <sup>48</sup> Freshwater stimulates recruitment of shrimp to the shelf area and provides nutrients to the coastal waters. The shrimp spawn at sea but require brackish water to serve as nursery areas. Gammelsröd, "Improving Shrimp Population by Zambezi Regulation."
- <sup>49</sup> Ibid., 145–147; and Honguane, "Shrimp Abundance and River Run-Off in Sofala Bank."
- <sup>50</sup> Davies, "Zambezi River," 256.
- <sup>51</sup> *The East African Standard*, Nairobi, August 7, 2002.
- <sup>52</sup> *Diário de Moçambique*, August 3, 2003; *Notícias*, April 30, 1996; *Notícias*, September 20, 1996; and *Savana*, May 19, 1995.
- <sup>53</sup> *Savana*, May 19, 1995.
- <sup>54</sup> *Notícias*, September 19, 1995; *Domingo*, October 24, 1996; *Notícias*, September 20, 1996; *Tempo* 379, January 8, 1978, 56–65; and *Diário de Moçambique*, August 3, 2003.
- <sup>55</sup> That year, South Africa received 850 megawatts (60 percent) of the dam's generated electricity. Of the remainder, the Portuguese firm designated 400 megawatts for Zimbabwe and only 200 megawatts (about 14 percent) for Mozambique's electricity utility. To make matters worse, HCB refused a request from Frelimo to redirect unused energy to a proposed aluminum smelter in Beira, Mozambique's second-largest city. "Still No End in Sight for Cahora Bassa Tussle," *AllAfrica*, April 6, 1998; and *Engineering News* [South Africa], June 18, 1999.
- <sup>56</sup> Isaacman and Isaacman, *Dams, Displacement, and the Delusion of Development*.
- <sup>57</sup> *Mozambiquefile* 316 (2002); Martin Zhuwakinyu, "Cahora Bassa Power Flows, Talks Continue," *Engineering News* [South Africa], November 15, 2002; and "Giant Hydroelectric Plant Threatens to Cut SA Supplies," *Sapa-LUSA*, 2002.
- <sup>58</sup> *Mozambiquefile* 293 (2000), 21; *Mozambiquefile* 316 (2002), 17; "Portugal to Make Fresh Offer on Cahora Bassa Dam in Mozambique," *Xinhua News Agency*, September 5, 2002; "Castigo Langa Under Pressure," *Indian Ocean Newsletter*, September 21, 2002; and "Portugal não querem largar Cahora Bassa," *Savana*, April 2, 2004.
- <sup>59</sup> "Mozambique Might Nationalise the Dam," *AllAfrica*, July 24, 2004, <http://allafrica.com/stories/200407260476.html>.
- <sup>60</sup> Ibid.
- <sup>61</sup> David A. McDonald, "Electric Capitalism: Conceptualising Electricity and Capital Accumulation in (South) Africa," in *Electric Capitalism: Recolonising Africa on the Power Grid*, ed. David A. McDonald (Cape Town: HSRC Press, 2009), 14.
- <sup>62</sup> Ibid.



- <sup>63</sup> Interview with Nazário Meguigy, Ministry of Energy, and Sérgio Elísio, Unidade Técnica de Implementação dos Projectos Hidroeléctricos (UTIP), Maputo, Mozambique, June 18, 2008.
- <sup>64</sup> República de Moçambique, *Mphanda Nkuwa Hydropower Project Development Prospect*, 4.
- <sup>65</sup> For a discussion of the politics of development and its impact on the ground, see, for example, Peter Vandergeest, Pablo Idahosa, and Pablo S. Bose, eds., *Development's Displacements: Ecologies, Economies, and Cultures at Risk* (Vancouver: UBC Press, 2007); Lyla Mehta, ed., *Displaced by Development: Confronting Marginalisation and Gender Injustice* (New Delhi: SAGE Publications India, 2009); Timothy Mitchell, *Rule of Experts: Egypt, Techno-Politics, Modernity* (Berkeley: University of California Press, 2002); and Scott, *Seeing like a State*.
- <sup>66</sup> Interview with Madalena Dray, environmental manager of Hidroeléctrica de Mphanda Nkuwa, Maputo, Mozambique, March 11, 2010.
- <sup>67</sup> *Notícias*, April 22, 2006; and "China Exim Bank Grants Loan for Hydroelectric Dam in Mozambique," *MacauHub*, April 4, 2006. By 2008, China had pulled its financing.
- <sup>68</sup> James Morrissey, *Livelihoods at Risk: The Case of the Mphanda Nkuwa Dam* (Maputo: Justiça Ambiental, 2006).
- <sup>69</sup> Interview with Maguigy and Elísio.
- <sup>70</sup> Interview with anonymous engineer, Cape Town, South Africa, March 18, 2011.
- <sup>71</sup> "Mozambique–Energy Situation," Energypedia; and Kees Mokveld and Steven von Eije, "Final Energy Report on Mozambique" (Amsterdam: Ministry of Foreign Affairs, 2017), 3.
- <sup>72</sup> The plant is located on the outskirts of Maputo. Although there were forecasts that thousands of Mozambicans would be employed at the plant, only 1,250 are working there.
- <sup>73</sup> Channing Arndt, Kenneth Strzepeck, Finn Tarp, et al., "Adapting to Climate Change: An Integrated Biophysical and Economic Assessment for Mozambique," *Sustainability Science* 6 (2011): 7–8.