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Setting the Scene

Dictatorship and Industrial Growth

INTRODUCTION

According to the generals, their 1964 coup was "carried out in order to build,"[1] and they wasted no time in making good on the promise. During its tenure, the military dictatorship orchestrated one of the biggest construction booms in Brazil's history. The generals hired teams of eager engineers to build roads, bridges, power plants, and other big infrastructure projects. More than anything else, massive hydropower dams came to symbolize the dictatorship's directive to build, and none was bigger than Itaipu, the giant binational dam on the Paraná River. In November 1982, shortly after its reservoir filled, one of the country's leading newspapers – which was no longer censored but still submissive to the government – ran a full-page spread about Itaipu's director José Costa Cavalcanti, "the great dam builder," as the headline called him. The article featured text from an interview in which the director reflected on the prestige that building Itaipu afforded the military regime. Costa Cavalcanti remarked, "Itaipu is, without a doubt, a testament to the capacity of the government ... it certainly bolsters the country's image abroad, raising confidence in our entrepreneurial capacity and stimulating national pride."[2] The military regime's great dam builders were fulfilling the generals' mandate to build, and their work showcased the capabilities of the government and helped legitimize dictatorship.

[1] Original Portuguese is "A Revolução foi feita para construir." See Emílio Garrastazu Médici, *I Plano Nacional de Desenvolvimento (PND), 1972/74* (Brasília: Congresso Nacional, 1971), 13, General Collection, BCN.

[2] "Costa Cavalcanti: O Grande Barrageiro," *O Estado de Paraná*, November 14, 1982.

This chapter sets the scene for this book, providing the requisite background for the chapters that follow. It begins with a short overview of the military regime, focusing on repression and the gradual restoration of democratic freedoms, highlighting the role the latter played in facilitating the country's burgeoning environmental movement. It then turns to the dictatorship's plans for industrial growth and energy production. The chapter closes with an overview of the symbolism that surrounds big dams and an introduction to the influential generals and engineers responsible for orchestrating the dictatorship's dam-building campaign.

This chapter also lays the groundwork for the book's first argument, that political pressures encouraged the military regime to build big dams quickly and with little regard for their social and environmental impacts. The Brazilian military had a long record of helping overthrow governments, and over time it constructed the narrative that its role in these coups was legitimate because in each instance the period of formal military rule had been short-lived. After the 1964 coup, in contrast, the generals postponed returning the country to civilian leadership, which meant they had to look elsewhere for validity.

This chapter argues that building giant dams in distant hinterlands was appealing to the military government because they produced an essential resource for economic growth, aligned with the goals of the National Integration Program, and generated huge symbolic benefits, all of which helped legitimize military rule. The argument is not that these political considerations alone motivated the dictatorship to build dams. Dams are an eminently practical means of producing electricity, and the Brazilian government had been investing in hydropower since the 1930s. The claim here is that politics were a powerful supplementary motivation that accounts for the accelerated and enlarged nature of the military's dam-building campaign, which produced some of the biggest and most controversial dams in the world with minimal environmental safeguards.

DICTATORSHIP

On March 31, 1964, a military coup overthrew the government of João Goulart, and the military seized control of the country.[3] The officers

[3] There is a debate in the literature as to whether the most appropriate term for the period of military rule is "military dictatorship" or "civilian-military dictatorship." The latter term highlights the role of civilian actors who supported the coup and military rule thereafter. The consensus is that either term is fine so long as writers acknowledge the support of

marketed their takeover as a righteous effort to forestall a communist dictatorship, but as was the case with other military coups of the time, the threat was greatly exaggerated. The context of the Cold War was influential; the Brazilian military was staunchly anti-communist, and the 1959 Cuban Revolution had made officers fearful that a similar uprising could occur in Brazil.

Goulart was a left-leaning nationalist among a group of reform-minded statesmen who had worked with former president Getúlio Vargas and were following in his footsteps.[4] During his term, Goulart attempted to implement modest reforms in landholding, taxes, education, and housing aimed at simultaneously resolving Brazil's long-standing social inequalities and a short-term economic downturn. These moderate reforms – Goulart was after all a large landowner himself – upset his wealthy and powerful adversaries, which included the military. His opponents did not have the congressional majority needed for an impeachment hearing, so the military conspired to remove him illegally.[5]

The United States indirectly supported the coup, offering various forms of aid. During the years leading up to the coup, the US Central Intelligence Agency channeled millions of dollars to right-wing political candidates with ties to the generals plotting the revolt. US military personnel also established close relationships with the generals themselves, who kept US intelligence informed of their plans. During the coup, the United States kept a fleet of ships ready to help the military regime and recognized its rule immediately.[6] After the coup, the United States

civilian actors. This book uses the term "military dictatorship" throughout and acknowledges civilian cooperation. For an overview of this debate, see Marcelo Ridenti, "The Debate over Military (or Civilian-Military?) Dictatorship in Brazil in Historiographical Context," *Bulletin of Latin American Research* 37, no. 1 (January 2018): 33–42.

[4] Vargas' first administration lasted from 1930 to 1945, the last eight years of which were a dictatorship. He was reelected democratically in 1951 and committed suicide in 1954.

[5] This paragraph and the others in this section are drawn from Thomas E. Skidmore, *The Politics of Military Rule in Brazil, 1964–85* (New York: Oxford University Press, 1988); Maria Helena Moreira Alves, *State and Opposition in Military Brazil* (Austin: University of Texas Press, 1988); Daniel Aarão Reis Filho, *Ditadura e democracia no Brasil: do golpe de 1964 à Constituição de 1988* (Rio de Janeiro: Zahar, 2014); and Daniel Aarão Reis Filho et al., eds., *A ditadura que mudou o Brasil: 50 anos do golpe de 1964* (Rio de Janeiro: Zahar, 2014).

[6] On the US support for the coup, see Carlos Fico, *O grande irmão da Operação Brother Sam aos anos de chumbo: O governo dos Estados Unidos e a ditadura militar brasileira* (Rio de Janeiro: Civilização Brasileira, 2008); Anthony Pereira, "The US Role in the 1964 Coup: A Reassessment," *Bulletin of Latin American Research* 37, no. 1 (January 2018): 5–17.

continued to support the dictatorship through its Office of Public Safety, a police training program, and the Alliance for Progress, a regional foreign aid program.[7]

The Brazilian officers in charge of the coup promoted the narrative that they were following a time-honored tradition in which the military helped overthrow unpopular governments and then stepped down shortly thereafter. The narrative failed to account for the continued influence of the military and authoritarianism in the civilian administrations that officers helped install, but it was nevertheless the military's popular account of its role in Brazilian political history.[8] That military officers used this narrative to justify their intervention in 1964 reflects the fact that those in charge of the coup cared much more about public opinion and approval than did other military dictatorships in the region.

However, the officers were divided into two camps on what should come next. Moderates argued that the takeover should swiftly purge the country of the radical leftist threat and then step down, whereas hardliners believed that more enduring and harsh measures were needed to restore order. Though the hardliners envisioned a longer mandate, even they did not plan for the military to retain control of the country indefinitely.

The military consolidated power and then held on. The first general to become president was Humberto Castelo Branco, a moderate. But thereafter, the hardline faction took control. What was originally planned as a short stint of military rule turned into more than two decades of dictatorship, which lasted from 1964 until 1985. The dictatorship was overseen by a procession of five generals, whose terms each ranged from three to five years.

Military officers and cabinet ministers chose the presidential successor, whom the military-controlled Congress then installed through indirect elections. Castelo Branco had envisioned that his own term would only last until 1965, the end date of Quadros' original presidential mandate, but his economic policymakers convinced him to extend his term for two

[7] See Stephen Rabe, *The Killing Zone: The United States Wages Cold War in Latin America* (New York: Oxford University Press, 2012), 108–113.

[8] Aarão Reis Filho, *Ditadura e democracia no Brasil*, 21. In 1889, the military intervened to dispose of the monarchy and then returned the country to civilian leadership. In 1930, the military responded to mounting opposition against elected candidate Júlio Prestes with a coup that removed the sitting president and installed opposition leader Getúlio Vargas as president. In 1945, the military forced Vargas – who had instituted a dictatorship in the 1930s – to step down and briefly took power before resuming elections.

more years so there would be sufficient time for their economic policies to produce results.[9] In 1965, he implemented a decree, Institutional Act No. 2, that made elections indirect and installed a strict two-party system consisting of the National Renewal Alliance [Aliança Renovadora Nacional, ARENA] and the Brazilian Democratic Movement [Movimento Democrático Brasileiro, MDB]. Both were right-wing and supported the dictatorship, though the latter was the more moderate of the two and was considered the opposition party.[10]

In 1967, Congress indirectly elected Artur da Costa e Silva as president, the first of two hardline presidents. The second was Emílio Garrastazu Médici, whose term lasted from 1969 to 1974. Both began their military careers at a young age and had become generals by March 1964, and both helped orchestrate the coup that overthrew João Goulart.[11] Their terms were the dictatorship's darkest years.

Both presidents relied on political repression to curb dissent. They justified their actions by citing the National Security Doctrine, which maintained that the military had the right to use extreme measures to protect itself from internal enemies. These hardliners widened the number of offenses considered threats to national security and increased the severity of punishments, even going so far as to reinstate the death penalty, which had long been illegal.[12] In December 1968, President Costa e Silva issued Institutional Act No. 5 (AI-5), which suspended both the Congress and habeas corpus rights. The latter meant that military officers could freely spy on and arrest anyone deemed a threat to national security and subject them to any form of punishment.

Officers did just that. During the military dictatorship, more than 350 officers tortured more than 6,000 people and killed or "disappeared" more than 430 people.[13] Since these figures are based on just the cases that can be traced, experts estimate that the true figures are much higher.

[9] Aarão Reis Filho, *Ditadura e democracia no Brasil*, 34–48.

[10] Colloquially, people called them the parties of Yes and Yes Sir. In 1979, ARENA and MDB were reorganized as the Social Democratic Party [Partido Democrático Social, PDS] and the Brazilian Democratic Movement Party [Partido do Movimento Democrático Brasileiro, PMDB], respectively.

[11] See Renato Lemos, "Biografia de Artur da Costa e Silva," and Sônia Dias, "Biografia de Emílio Médici," General Collection, CPDOC-FGV.

[12] Mariana Joffily, "O aparato repressivo: Da arquitetura ao desmantelamento," in Aarão Reis Filho et al., eds., *A ditadura que mudou o Brasil*, 158–171; Skidmore, *The Politics of Military Rule in Brazil*, 83–84.

[13] These figures come from Brazil's National Truth Commission [Comissão Nacional de Verdade, CNV], a government agency created in 2011 to report on the human rights

Institutional Act No. 5 also introduced censorship for all forms of media, which the military regime used alongside a robust propaganda department to protect its image and promote its agenda. The military purged universities of left-leaning professors and monitored lectures. Under such political repression, anyone who disagreed with the military government's plans could not speak out without risking their safety, including those who objected to the dictatorship's big dams.[14]

The military regime restored political liberties gradually. In 1974, Congress elected Ernesto Geisel, a moderate, as president. Geisel subscribed to Castelo Branco's original vision that military intervention should be short, and after a decade in power, repression was deteriorating the regime's image and stirring broad mobilization for the return to civilian rule. In response, he set about reinstating democratic freedoms through a gradual process he labeled *distensão* (decompression).

But restoring political rights while also appeasing his fellow officers proved difficult. In November 1974, Geisel permitted direct congressional elections with uncensored television advertising for all candidates. The opposition party, MDB, won in a landslide. To ensure that the opposition did not undermine military rule further, thereafter Geisel used the powers that AI-5 granted him to close Congress, make gubernatorial elections indirect, and retire political adversaries. Decompression had stalled before it could even get started. In 1975, Geisel did lift censorship from some major newspapers, but he was unwilling to curb torture or other human rights abuses.[15]

A more genuine restoration of political rights accelerated at the end of Geisel's term. In 1978, he began the second phase of his redemocratization plan known as *abertura* (opening). He softened the hardline interpretation of the National Security Doctrine, reducing the number of offenses considered crimes against the state and reducing penalties for others. More importantly, he implemented Constitutional Amendment

violations committed during the dictatorship. For the number of those tortured, see CNV, *Relatório Vol. I* (Brasília: CNV, 2014), 349, and for the number of killed or disappeared, see CNV, *Relatório Vol. III: Mortos e Desparecidos Políticos* (Brasília: CNV, 2014), 7–14. Both reports are digitized and available at http://cnv.memoriasreveladas.gov.br/ (last accessed April 2023).

[14] Joffily, "O aparato repressivo"; Marcelo Ridenti, "Censura e ditadura no Brasil, do golpe à transição democrática, 1964–1988," *Revista Concinnitas* 2, no. 33 (2018): 86–100.

[15] Aarão Reis Filho, *Ditadura e democracia no Brasil*, 73–94; Skidmore, *The Politics of Military Rule in Brazil*, 160–210.

No. 11, which abolished AI-5, thereby eliminating the president's ability to shut down Congress and dismiss political opponents. Terminating AI-5 also restored both habeas corpus and freedom of the press to newspapers, radio, and television. In December, he granted political exiles the right to return without prosecution.

Abertura had its limits. For example, Constitutional Amendment No. 11 carried a clause that permitted the president to declare a state of emergency that granted them powers resembling those in AI-5. Moreover, Geisel's reforms had done nothing to dismantle the government's surveillance programs and security forces, and the law still permitted officers to hold prisoners without granting them access to communication for at least eight days. Lastly, in 1979, João Figueiredo – Geisel's successor and the last of the military presidents – passed an amnesty law that shielded officers from being prosecuted for human rights abuses.

Despite these limits, abertura was a giant step toward restoring democracy, and Figueiredo continued the program. In 1982, the military government permitted direct elections at the state level for the first time. By 1984, there were widespread demonstrations for direct elections at the federal level. Though Figueiredo did not concede to the protestors' demands, his administration did endorse, for the first time, a civilian politician as president. In 1985, Congress indirectly elected popular Brazilian Democratic Movement Party [Partido do Movimento Democrático Brasileiro, PMDB] moderate Tancredo Neves, marking the formal end to military rule.

He never got the chance to serve as president. He became ill on the eve of his inauguration and died shortly thereafter. The presidency fell to his unpopular vice president, José Sarney, a corrupt congressman who had aligned himself with the pro-dictatorship party during military rule. Sarney nevertheless pressed forward with democratic reforms, and in 1988, his administration oversaw the writing of a new constitution. In 1989, direct elections returned, shedding the last vestiges of military dictatorship.[16]

Abertura enabled activism that changed the political landscape. Beginning in 1978, repressed social movements regained momentum, and protests erupted in support of women, Indigenous people, Black people, LGBT people, labor unions, and landless farmers, among other groups. The Catholic Church was an umbrella organization for many of

[16] Aarão Reis Filho, *Ditadura e democracia no Brasil*, 114–127.

these movements (see Chapter 4), although it did not support LGBT and reproductive rights movements.

Social movements found common cause in protesting the dictatorship. Restoring democratic freedoms was a shared goal, and many movements set aside more specific campaigns to fight broader injustices, such as authoritarianism. Indeed, social movements were considered relatively safe spaces to launch criticism against the dictatorship because they had broad enough support that it was harder for the military government to label activists socialist or communist subversives. Protests culminated in 1984 with a massive campaign calling for direct elections that brought millions of people out onto the streets. The return of civilian rule in 1985 and direct elections in 1989 further emboldened these movements, which became potential political forces thereafter. It was in this context that the modern environmental movement was born.

Environmentalism has deep roots in Brazil. Beginning in the 1820s, prominent intellectuals, many of whom were abolitionists, debated the ills of slash-and-burn agriculture and deforestation, though their comments did not inspire remedial efforts.[17] Starting in the 1930s, some scientists and politicians began lamenting deforestation and implemented limited regulations to curb it.[18] In 1934, the National Museum hosted the First Brazilian Conference on the Protection of Nature, and that same year, the government implemented modest environmental safeguards through Forest, Mining, and Water Codes, as well as a Hunting and Fishing Code.[19] During this period, the government also began creating national parks. However, meager enforcement did little to mitigate the damage

[17] José Augusto Pádua, *Um sopro de destruição: Pensamento político e crítica ambiental no Brasil escravista (1786–1888)* (Rio de Janeiro: Zahar, 2002).

[18] José Augusto Pádua, "Environmentalism in Brazil: An Historical Perspective," in J. R. McNeill and Erin Mauldin, eds., *A Companion to Global Environmental History* (Oxford: Wiley-Blackwell, 2012), 455–473.

[19] For more on environmental protection during this period, see José Luiz Franco and José Augusto Drummond, *Proteção à natureza e identidade nacional no Brasil, anos 1920–1940* (Rio de Janeiro: Editora Fiocruz, 2009); Regina Horta Duarte, *A biologia militante: O museu nacional, especialização científica, divulgação do conhecimento e práticas políticas no Brasil, 1926–1945* (Belo Horizonte: Universidade Federal de Minas Gerais, 2010), translated into English by Diane Grosklaus Whitty as *Activist Biology: The National Museum, Politics, and Nation Building in Brazil* (Tucson: University of Arizona Press, 2016).

from deforestation or other economic activities, and, after 1945, industrialization accelerated, unleashing a new set of environmental problems.[20]

The modern environmental movement began as a series of disconnected local campaigns during decompression and abertura. Its earliest rumblings began in 1971, when retired chemical engineer-turned-activist José Lutzenberger created the Gaúcha Association for the Protection of the Natural Environment [Associação Gaúcha de Proteção ao Ambiente Natural, AGAPAN] in Rio Grande do Sul.[21] But the organization's campaigns were limited. Popular environmentalism did not gain momentum until the end of the decade, when people began mobilizing against urban pollution and big infrastructure projects in the Southeast, such as airports and nuclear plants.[22]

In the late 1980s and 1990s, issues outside the industrial Southeast became more prominent, and disparate campaigns coalesced into national, and sometimes international, networks. For example, in the Amazon Rainforest, rubber tappers began promoting extractive reserves that would preserve both the forest and the livelihood of those living in it. Starting in the 1990s, national and international networks of environmentalists strengthened and helped local activists pressure the government to curb deforestation rates, which it did during the 2000s and 2010s.[23]

[20] For more on nature protection in the 1940s–1960s, see Marluza Marques Harres and Fabiano Quadros Rückert, *A Natureza, o tempo, e as marcas da ação humana: Políticas públicas e ambiente em perspectiva histórica, São Leopoldo, RS* (São Leopoldo: Editora Oikos, 2011); Daniel Porciuncula Prado, *A figueira e o machado: Uma história das raízes do ambientalismo no Sul do Brasil e a crítica ambiental de Henrique Roessler* (Carreiros: FURG, 2011); Elenita Malta Pereira, *Roessler: O homem que amava a natureza* (São Leopoldo: Oikos, 2013); Filipe Oliveira da Silva, "O Conselho Florestal Federal: Um parecer de sua configuração institucional (1934–1967)," *Historia Ambiental Latinoamericana y Caribeña (HALAC)* 7, no. 2 (2017): 101–129.

[21] For more on Lutzenberger, see Elenita Malta Pereira et al., *José Lutzenberger: Um ambientalista global* (São José: Editora Sobre o Tempo, 2022).

[22] See Kathryn Hochstetler and Margaret Keck, *Greening Brazil: Environmental Activism in State and Society* (Durham: Duke University Press, 2007), 75–83, 85, 189–202.

[23] For more on environmentalism in the Amazon Rainforest, see Chico Mendes and Tony Gross, *Fight for the Forest: Chico Mendes in His Own Words* (London: Latin American Bureau, 1989); Andrew Revkin, *The Burning Season: The Murder of Chico Mendes and the Fight for the Amazon Rainforest* (Boston: Houghton Mifflin, 1990); Susanna Hecht and Alexander Cockburn, *The Fate of the Forest: Developers, Destroyers and Defenders of the Amazon* (New York: HarperCollins, 1990); and Lise Sedrez, "Rubber, Trees and Communities: Rubber Tappers in the Brazilian Amazon in the Twentieth Century," in Marco Armiero and Lise Sedrez, eds., *A History of Environmentalism: Local Struggles, Global Histories* (London: Bloomsbury Academic, 2014), 147–166.

Environmental activism during the dictatorship generated a political response. The military government had already created some infrastructure to deal with environmental problems before the environmental movement gained momentum – it had rewritten the Forest, Hunting, and Mining Codes and created a National Sanitation Policy – but went much further thereafter.[24] In response to the 1972 Stockholm Conference, discussed in Chapter 3, the military government created a Special Secretariat of the Environment [Secretaria Especial do Meio Ambiente, SEMA].[25] It was housed within the Ministry of the Interior, then under the leadership of dam builder Costa Cavalcanti, who was uninterested in environmental protection. The government appointed environmentalist Paulo Nogueira Neto as SEMA's leader, who remained in charge until 1986. Nogueira Neto had been a well-known environmentalist since the 1950s, when he cofounded the Association in Defense of the Environment [Associação em Defesa do Meio Ambiente], one of Brazil's first conservation associations. Despite SEMA's high-profile leadership, it was understaffed and did little to protect the environment.[26]

During the 1980s, environmentalists pressured the government to implement more effective legislation and enforce it. Environmental licensing was particularly important. In 1981, the government promulgated legislation that required companies to obtain an environmental operating license – which was contingent upon completing an environmental impact study – before building big infrastructure projects.[27] Yet, specific resolutions from the newly created National Council for the Environment [Conselho Nacional do Meio Ambiente, CONAMA] were needed to enable these laws, and the council dragged its feet during the final years of the dictatorship.[28] The return to civilian rule emboldened the council, and in January 1986, it passed the enabling resolutions that required environmental licensing and impact studies for projects with potential to

[24] Hochstetler and Keck, *Greening Brazil*, 26.

[25] Médici, *Decreto No. 73.030, de 30 de outubro de 1973, Cria no âmbito do Ministério do Interior, a Secretaria Especial do Meio Ambiente – SEMA, e da outras providências*, October 30, 1973, ACD, laws and decrees accessible online. For more on SEMA's policies, see Roberto Guimarães, *The Ecopolitics of Development in the Third World: Politics and Environment in Brazil* (Boulder: Lynne Rienner, 1991).

[26] See Hochstetler and Keck, *Greening Brazil*, 27.

[27] João Figueiredo, *Lei No. 6.938, de 31 de agosto de 1981, Dispõe sobre a Política Nacional do Meio Ambiente, seus fins e mecanismos de formulação e aplicação, e dá outras providências*, August 31, 1981, ACD.

[28] Hochstetler and Keck, *Greening Brazil*, 35–40.

damage the environment.[29] Two years later, the federal government wrote these and other protections into the Constitution.[30] This legislation reflected the political impact of the environmental movement and its growth from a movement based on direct-action campaigns to one that counted on regulatory policies to forestall damaging projects and curb pollution.[31]

Dam critics were among those emboldened by abertura, and their efforts to mitigate the deleterious impacts of big dams were an integral part of the environmental movement. The immediate results of such activism were mixed, as the following chapters illustrate. In some cases, displaced populations won some victories, but many did not, and no group succeeded in modifying or halting a project altogether. Environmentalism was not strong enough to interfere with the military regime's plans for unrestrained industrial growth.

INDUSTRIAL GROWTH

Industrialization in Brazil dates to the 1930s, when then president Getúlio Vargas promoted domestic industrialization to reduce dependence on imported industrial goods, which became unaffordable after the Great Depression slashed demand for coffee exports.[32] Vargas believed that a strong federal government would be the engine for this growth, and he created a series of agencies and companies charged with orchestrating this industrial program. His plan was popular, and it continued to be the organizing principle of subsequent administrations.

Industrialization and urbanization began in earnest after the Second World War. Both trends created a positive feedback loop: Manufacturing jobs encouraged more people to migrate to cities, and urban living in turn demanded more industrial goods. In the 1940s, just 15 percent of

[29] *Resolução CONAMA No. 001, de 23 de janeiro de 1986*, published in the Diário Oficial do União on February 17, 1986, ASF.

[30] Hochstetler and Keck, *Greening Brazil*, 46–51.

[31] In 1989, the government created the Brazilian Institute of the Environment and Natural Resources [Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais, IBAMA] to replace SEMA. IBAMA continues to oversee the country's environmental protection today. Nelson Carneiro, *Lei No. 7.735, de 22 de fevereiro de 1989, Dispõe sobre a extinção de órgão e de entidade autárquica, cria o Instituto Brasileiro do Meio Ambiente e dos Recursos Naturais Renováveis e das outras providências*, February 22, 1989, ACD.

[32] Stanley E. Hilton, "Vargas and Brazilian Economic Development, 1930–1945: A Reappraisal of His Attitude toward Industrialization and Planning," *The Journal of Economic History* 35, no. 4 (1975): 754–778.

Brazilians lived in cities, but thereafter urban growth exploded. In the 1990s, 75 percent of Brazil's population was urban (a trend underway throughout Latin America).[33] Industrial growth boomed alongside urbanization, and manufacturers built giant industrial centers.

The country's commitment to industrial and urban growth was neither partisan nor tied to a singular form of governance. However, the character of these trends was markedly shaped by the fact that one of the greatest periods of growth was orchestrated by a military dictatorship.

The military saw its intervention as necessary to forestall a communist threat and it believed that sustained growth could raise the standard of living and boost the country's international standing, which would help justify its illegal intervention. Its efforts were successful in the short term. Between 1967 and 1973, the hardline generals and their administrators orchestrated a big economic boom, later dubbed the Brazilian economic miracle, during which economic growth averaged about 11 percent annually. The industrial sector led the way, and the most prosperous industries, such as automobile manufacturing, electronics, and construction, saw annual growth rates upwards of 20 percent during this period.[34] The military regime looked toward big, government-built infrastructure projects such as dams as a means of stimulating such growth and providing much-needed energy.

The Brazilian military regime was part of a global cohort of military dictatorships that sought validity through their dedication to industrial and economic growth, a phenomenon scholars have called "military modernization."[35] Brazil's South American neighbors were some of the most eager of these military modernizers: There, the right-wing generals seized power and installed repressive dictatorships that shared a

[33] US-LOC, Federal Research Division, *Brazil: A Country Study* (Washington, DC: LOC, 1998), General Collection, US-LOC, accessible online.

[34] Aarão Reis Filho, *Ditadura e democracia no Brasil*, 58–60; Francisco Vidal Luna and Herbert S. Klein, "Transformações econômicas no período militar (1964–1985)," in Aarão Reis Filho et al. eds., *A ditadura que mudou o Brasil*, 92–111; Skidmore, *The Politics of Military Rule in Brazil*, 138–144.

[35] See Bradley R. Simpson, *Economists with Guns: Authoritarian Development and U.S.–Indonesian Relations, 1960–1968* (Stanford: Stanford University Press, 2008) and Thomas C. Field Jr., "Ideology as Strategy: Military-Led Modernization and the Origins of the Alliance for Progress in Bolivia," *Diplomatic History* 36, no. 1 (2012): 147–183.

commitment to industrial and economic growth through bureaucratic organization and technocratic decision-making.[36]

Military modernization was also popular in newly independent countries rebuilding their economies and political institutions. Some of these regimes embraced socialism. In 1952, Egyptian military officer Gamal Nasser staged a coup that brought the military to power. Thereafter, he carried out a modernization program based on socialism and Arab nationalism, which included building the gigantic Aswan High Dam on the Nile River.

Other military regimes were more ideologically aligned with Brazil. In 1965, right-wing Indonesian General Suharto led a coup that brought the military to power under his leadership, which ruled the country for more than thirty years thereafter. Suharto looked to industrial and economic growth as a means of legitimizing his rule and built many big dams.[37]

Energy was central to the Brazilian military regime's goal of accelerating economic and industrial growth. Energy is the most basic ingredient of all growth, whether the source is organic energy, such as human or animal labor, or inorganic energy, such as fossil fuels. Food production and mining, the two industries upon which all others depend, require inputs of energy and water, and big waterworks often require massive inputs of cheap energy to construct. Thus, the military regime's economic goals had a basic material requirement: The generals needed to expand the country's energy infrastructure if its cities and industries were to grow.

Energy projects were also central to the military's related plans for ensuring national security. Brazil had become independent with a gigantic territory, most of which was inhabited only by Indigenous communities.

[36] The most infamous were the Argentine, Chilean, and Uruguayan dictatorships. See Guillermo O'Donnell, *Modernization and Bureaucratic-Authoritarianism: Studies in South American Politics* (Berkeley: University of California Institute of International Studies, 1973); James Malloy, ed., *Authoritarianism and Corporatism in Latin America* (Pittsburgh: University of Pittsburgh Press, 1977); David Collier, ed., *The New Authoritarianism in Latin America* (Princeton: Princeton University Press, 1979); Guillermo O'Donnell, *El Estado burocrático: Triunfos, derrotas y crisis* (Buenos Aires: Editorial Belgrano, 1982), translated in English by James McGuire in collaboration with Rae Flory as *Bureaucratic Authoritarianism: Argentina 1966–1973 in Comparative Perspective* (Berkeley: University of California Press, 1988).

[37] George Aditjondro and David Kowalewski, "Damning the Dams in Indonesia: A Test of Competing Perspectives," *Asian Survey* 34, no. 4 (April 1994): 381–395; Sanjeev Khagram, *Dams and Development: Transnational Struggles for Water and Power* (Ithaca: Cornell University Press, 2004), 159–165.

Politicians and military officers worried that distant and underpopulated areas could be lost to border disputes or foreigners' imperial greed.[38] This fear was most pronounced in the Amazon Rainforest, which was rich in resources and sparsely populated compared to the industrialized Southeast.

The Cold War raised the specter of a second source of potential political disintegration and territorial loss: the appeal of socialism. Brazil has long-standing social and racial inequalities that the dictatorship put off addressing in favor of increasing the country's overall wealth.[39] Thus, during the dictatorship, large segments of the country lived in poverty, and political ideologies that promoted a more just distribution of resources were likely to appeal to much of the country's population. For example, in the late 1960s, communists gained the sympathy of locals in the Araguaia region of the Amazon and staged a rebellion. Between 1972 and 1974, the Brazilian military stamped out the uprising, but the incident reaffirmed the generals' fears that socialism and communism could gain traction among groups in the interior and cause political instability that could lead to territorial loss.

To forestall these threats, previous administrations had orchestrated campaigns to fill these underpopulated regions and stimulate economic and industrial growth, which they believed would discourage foreign influence. The dictatorship accelerated this program. In 1970, President Médici promulgated legislation that launched the National Integration Program, which built upon more targeted legislation from the previous administrations.[40] The military regime embellished its campaign with the

[38] This idea is presented in José Augusto Pádua, "The Dilemma of the 'Splendid Cradle': Nature and Territory in the Construction of Brazil," in John Soluri et al., eds., *A Living Past: Environmental Histories of Modern Latin America* (New York: Berghahn, 2018), 91–114.

[39] Regina Horta Duarte, "'Turn to Pollute': Poluição atmosférica e modelo de desenvolvimento no 'milagre' brasileiro (1967–1973)" *Revista Tempo* 21, no. 37 (2015): 64–87, 65.

[40] Médici, *Decreto-Lei No. 1.106, Cria o Programa de Integração Nacional, altera a legislação do imposto de renda das pessoas jurídicas na parte referente a incentivos fiscais e dá outras providências*, June 16, 1970; Médici, *Decreto-Lei No. 1.164, Declara indispensáveis à segurança e ao desenvolvimento nacionais terras devolutas situadas na faixa de cem quilômetros de largura em cada lado do eixo do rodovias na Amazônia Legal, e dá outras providências*, April 1, 1971; Médici, *Decreto-Lei No. 1.243, Eleva a dotação do Programa de Integração Nacional (PIN) criado pelo Decreto-Lei No. 1.106, de 16 de junho de 1970, altera o Decreto-Lei No. 1.164, de 1 de abril de 1971, e dá outras providências*, October 30, 1972, ACD.

slogan "integrate to not hand over," an alliteration in the original Portuguese, "integrar para não entregar."[41]

The program designated funds for projects in the North and Northeast to raise the standard of living there. It emphasized road building in the Amazon Rainforest and settling farmers from the Northeast and Southeast along these highways. It also encouraged industrial development in designated regional hubs in order to stimulate demographic and economic growth in underpopulated regions. But the program's importance transcended specific projects: It was the dictatorship's guiding manifesto for all its infrastructure projects and a core component of its two broad National Development Plans [Planos Nacionais de Desenvolvimento, PNDs], which were the design plans for the economic boom that the military hoped would legitimize its coup.[42]

As with the goal of accelerating industrial growth generally, expanding energy production was central to the National Integration Program. Highway construction and agricultural colonization overshadowed energy in the program's earliest legislation, but electricity was always a principal underpinning of its industrial component.[43] Indeed, the dictatorship slated some of its biggest power plants for the Northeast and the Amazon precisely because it thought these areas were most vulnerable to foreign influence or socialist subversion. For the military regime, both highways and transmission lines connecting power plants to consumption centers were threads that wove these strategic hinterlands into the national fabric, simultaneously making them more accessible to both military officers and landless farmers, and showcasing the benefits of government-led capitalism.

Geography limited the energy resources that the dictatorship could choose from. Brazil had modest coal seams in its southernmost states,

[41] Castelo Branco is credited with popularizing the phrase in 1966 in reference to *Lei No. 5.173, de 27 de outubro de 1966, Dispõe sobre o Plano de Valorização Econômica da Amazônia; extingue a Superintendência do Plano de Valorização Econômica da Amazônia (SPVEA), cria a Superintendência do Desenvolvimento da Amazônia (SUDAM), e dá outras providências*, October 27, 1966, ACD.

[42] On the PNDs, see Médici, *Lei No. 5.727, Dispõe sobre o primeiro Plano Nacional de Desenvolvimento (PND) para o período de 1972 a 1974*, November 4, 1971; Médici, *I Plano Nacional de Desenvolvimento*, 13–31; Geisel, *Lei No. 6.151, Dispõe sobre o Segundo Plano Nacional de Desenvolvimento (PND), para o período de 1975 a 1979*, December 4, 1974. ACD; and Ernesto Geisel, *II Plano Nacional de Desenvolvimento (1975–1979)* (Brasília: Congresso Nacional, 1974), 62–65, General Collection, BCN.

[43] Médici, *I Plano Nacional de Desenvolvimento*, 13–31; Geisel, *II Plano Nacional de Desenvolvimento*, 62–65.

but these reserves have never been big enough to sustain the country's industrial ambitions.[44] Domestic petroleum was also scarce. Though Brazil is now among the global petroleum superpowers, it was not during the dictatorship (geologists discovered big offshore deposits in the late 2000s). Throughout the twentieth century, domestic oil reserves were too meager to fuel industrial growth.[45]

Foreign oil, however, did have a major role in Brazil's industrialization. Petroleum was the fuel that undergirded industrial development and economic growth in most countries during the postwar period, and Brazil was no exception. The government used its foreign exchange to buy petroleum through its state-owned company, Petrobras, and foreign oil companies set up downstream operations in the country. However, dependence on foreign oil inspired a widespread backlash from nationalists, which put pressure on the military government to substitute imported oil with domestic alternatives.[46]

Two oil crises during the 1970s exacerbated the problem. During the preceding decades, power balances among oil producers shifted as the United States depleted much of its domestic reserves fueling unprecedented demographic and industrial growth, while, at the same time, geologists discovered massive oil deposits in the Middle East. As the industry's epicenter moved to the Middle East, oil-producing countries there gained the power to influence the price of petroleum. In October 1973, Israel and Palestine were at war, and the Organization of Arab Petroleum Exporting Countries (OAPEC) – a Palestinian ally – decided to use its newfound economic power to protest the United States and other countries that were supporting Israel. The organization embargoed petroleum sales to the United States and a handful of other countries and cut production across the board, which caused a shortage that more than tripled the price of oil.

[44] Dias Leite, *Energia do Brasil*, 51, 55–56, 67–68. See also Christian Brannstrom, "Was Brazilian Industrialisation Fuelled by Wood? Evaluating the Wood Hypothesis, 1900–1960," *Environment and History* 11 (2005): 395–430.

[45] Natascha Otoya, "Petroleum and Science: The National Petroleum Council and the Development of Oil and Geology in Brazil," in Silvia Fernanda Figueirôa et al., eds., *History, Exploration & Exploitation of Oil and Gas* (New York: Springer, 2019), 37–49. Geologists discovered the first offshore field in 1968, and the first giant one, Tupi, in the Santos Basin, in 2007. See Tyler Priest, "Petrobras in the History of Offshore Oil," in Ben Ross Schneider, ed., *New Order and Progress: Development and Democracy in Brazil* (New York: Oxford University Press, 2016), 53–77.

[46] Dias Leite, "Perspectivas da energia no Brasil," 1974, 8–9, File ADJ.0.0.38, FADL, AN-RDJ.

Brazil and other countries that were dependent on foreign oil were hit hard.

Just as the global economy began to recover, a second oil crisis erupted. In 1979, revolutionaries in Iran toppled the government in a violent confrontation that halted oil production. The revolution also transferred power to a government hostile to the United States and its allies, and businessmen worried that the government would withhold oil sales and cause another shortage. Once again, the price of petroleum shot up and caused a financial crisis in countries dependent on importing petroleum. Both oil crises put more pressure on the military regime to divest from foreign oil.

The military government implemented a multifaceted program to slash foreign oil consumption. The top priority was finding domestic oil reserves to substitute for imports.[47] Second, the government invested in developing a fleet of cars that would run on ethanol produced from sugarcane, already widely planted.[48] Third, it set out to replace petroleum-fired power plants with both nuclear and hydropower, and to substitute petroleum-powered engines with electricity wherever possible. Thermoelectric power plants that burned petroleum were not the norm in Southeast Brazil, but some remote cities, such as Manaus, generated electricity using oil (see Chapter 6). Of course, the military regime valued nuclear and hydropower for more than just mitigating the oil crises; they were important sources of electricity in their own right, which was essential to the dictatorship's plans for industrial development and national integration.

Nuclear power was popular within the military government, but it never approached the scale of hydropower, which was the cornerstone of the regime's electrification plans. During the 1950s and 1960s, optimism abounded around the world that nuclear fission, in addition to fueling bombs, could be used to generate cheap electricity. Brazil shared this enthusiasm for both atomic bombs and nuclear power, and in the 1970s, the dictatorship began planning a series of ambitious nuclear plants.[49] Both financial difficulties and opposition from environmentalists

[47] Ministério de Minas e Energia, *Balanços Energéticos Nacionais*, 1977–1980, Biblioteca Roberto Simonsen, São Paulo. I am grateful to my colleague Bruno Biasetto for generously sharing his copies of these documents with me.

[48] On Brazilian ethanol, see Eaglin, *Sweet Fuel*, and Rogers, *Agriculture's Energy*.

[49] Dias Leite, "Opções da energia nuclear," 1974, File ADJ.0.0.38, FADL, AN-RDJ.

derailed most of the projects, some of which never even got off the ground. Even before these setbacks, nuclear power investment was modest, as were the results of the nuclear program: In 1990, nuclear power accounted for just 1 percent of Brazil's electricity production.[50] For the Brazilian dictatorship, nuclear reactors were novel and unreliable, and building them would take time and money. Building hydropower plants also took time, but dams were familiar ground for the country's engineers and, according to the military government's economic advisors, comparatively cheap.

Hydropower dams have a long history in Brazil.[51] What the country lacked in accessible fossil fuels, it made up for in good dam sites. Brazil has many giant rivers with reliable flow, many of which run near population centers. Notably, the headwaters of the eastern tributaries of the mighty Paraná River begin in the coastal mountain range near São Paulo and Rio de Janeiro, flowing inland toward the main stem. These rivers all had ample dam sites. In the Northeast, the powerful São Francisco River plummets through a series of cascades in its lowest stretches that were ideal sites for power plants. The Amazon River had even more potential. It is the world's most powerful river, and its biggest tributaries all have propitious dam sites. These prodigious waterfalls, or "white coal," as boosters called them, made dams an appealing source of power.

Industrialists had long recognized the country's hydropower potential. Manufacturers built Brazil's first hydropower plant in 1883, and during the first three decades of the twentieth century, multinational companies built a handful of dams on the rivers near São Paulo and Rio de Janeiro. During this first dam-building campaign, power plants and reservoirs were small and disconnected from one another. Much has changed since these initial dams, but the position of hydropower in the country's electricity profile has remained remarkably consistent. Hydropower has been Brazil's principal source of electricity since 1900, always accounting for at least 60 percent of installed capacity and often much more, upwards of 80 percent (Figure 1.1).[52]

[50] International Energy Agency (IEA)'s webpage on Brazil's energy profile, www.iea.org/countries/brazil (last accessed April 2023).

[51] See Nathalia Capellini, "A grande aceleração e a construção de barragens hidrelétricas no Brasil," *Vária História* 34, no. 65 (2018): 315–346.

[52] For installed capacity from 1883 to 1920, see Dias Leite, *Energia do Brasil*, Appendix 2-E.

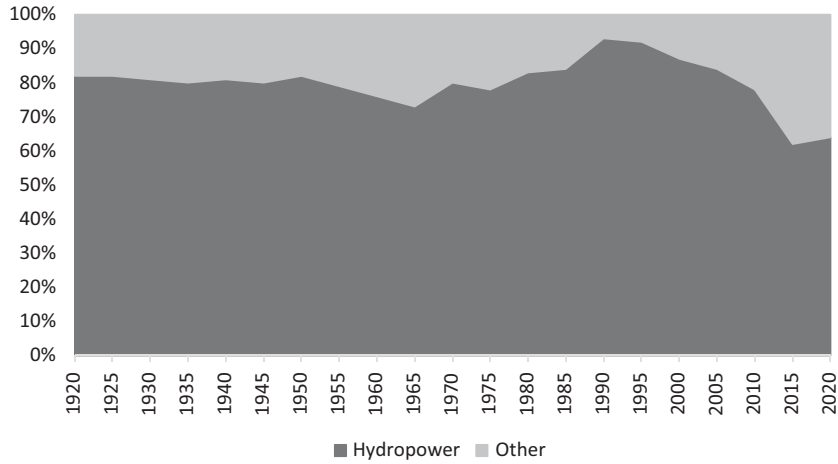

FIGURE 1.1. Installed electricity capacity by source, Brazil, 1920–2020. Area chart created by author using data from Antônio Dias Leite, *Energia do Brasil, 3ª edição* (Rio de Janeiro: Editora Nova Fronteira, 2014), Appendix 2-E for the 1920–1930 period; Memória da Eletricidade, *Panorama do setor de energia elétrica no Brasil* (Rio de Janeiro: Memória da Eletricidade, 1988), 99, 149, and 232, for the 1930–1970 period; the Ministério de Minas e Energia's online *Sistema de Informações Energéticos* for the 1970–1990 period; and the International Energy Agency's online database for the 1990–2020 period.

Between the 1940s and the 1960s, the basic characteristics and scale of dam building changed immensely. In the 1930s, President Vargas strengthened the federal government, and he and his successors created state-owned companies at both the state and federal levels to oversee dam construction. The Great Depression and World War II stalled the government's hydropower ambitions, but thereafter the government supplanted private companies as the country's principal dam builders.

Four additional features distinguished these dams from their predecessors. First, they were not confined to the coastal Southeast. During the late 1940s and 1950s, the government began building dams further inland from Southeastern population centers and in the Northeast. For example, the federal government built its first big dam, Paulo Afonso (1948–1955), on the São Francisco in the Northeast to electrify the region's coastal cities and industrial centers. The government also began using transmission lines to connect power plants with one another and create fledgling national grids. Third, these hydropower dams were much more powerful than their predecessors. For example, Furnas, the most powerful dam built during this period, had an installed capacity of more than 1,000

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megawatts after upgrades. Lastly, these dams also had much larger reservoirs. The two biggest were Furnas and Três Marias, which each had reservoirs with surface areas greater than 1,000 sq. km.[53]

In March 1964, the military regime seized control of the country, taking over this government-orchestrated effort to build powerful dams with big reservoirs in distant hinterlands. The generals floored the gas pedal on the campaign. Dams were an obvious means of meeting the material requirements for economic growth, and hinterland power plants and transmission lines were useful tools for the National Integration Program.

There was one final benefit: symbolism. Big dams are a potent symbol of government capability because they are a striking visual representation of engineering on a herculean scale, which requires tremendous expertise and coordination. The symbolism surrounding the dictatorship's big dams was especially strong because the rivers it set out to tame were some of the world's most powerful.

For all these reasons, worldwide, building big dams was remarkably nonpartisan until the environmental movement gained momentum in the late twentieth century – capitalists, communists, democracies, dictatorships, and both imperial and revolutionary governments throughout the world all invested in big dams as a means of powering industrial growth and legitimizing their administrations.[54] Most did so with little to no attention to environmental safeguards until the rise of popular

[53] See Warren Dean, *With Broadax and Firebrand: The Destruction of the Brazilian Atlantic Forest* (Berkeley: University of California Press, 1995), 294–298.

[54] For capitalists, see Richard P. Tucker, "Containing Communism by Impounding Rivers: American Strategic Interests and the Global Spread of High Dams in the Early Cold War," in J.R. McNeill and Corinna R. Unger, eds., *Environmental Histories of the Cold War* (New York: Cambridge University Press, 2010), 139–164, and Christopher Sneddon, *Concrete Revolution: Large Dams, Cold War Geopolitics, and the US Bureau of Reclamation* (Chicago: University of Chicago Press, 2015). For communist and socialist regimes, see Paul Josephson et al., *An Environmental History of Russia* (New York: Cambridge University Press, 2013), 162–172, and Shapiro, *Mao's War against Nature*, 2001, 48–65. For imperial governments, see chapters in Deepak Kumar et al., *The British Empire and the Natural World: Environmental Encounters in South Asia* (New York: Oxford University Press, 2011), and Matthew P. Johnson, "'Thirsty Sugar Lands': Environmental Impacts of Dams and Empire in Puerto Rico since 1898," *Environment & History* 27, no. 3 (August 2021): 337–365. For revolutionary and newly independent governments, see Stephan Miescher, *A Dam for Africa: Akosombo Stories from Ghana* (Bloomington: Indiana University Press, 2022), and Nancy Reynolds, "Building the Past: Rockscapes and the Aswan High Dam in Egypt," in Alan Mikhail, ed., *Water on Sand: Environmental Histories of the Middle East and North Africa* (New York: Oxford University Press, 2012), 181–205.

environmentalism. There is no better example than the Brazilian military dictatorship, which built some of the world's biggest and most controversial dams.

MODERN PHARAOHS

During the dictatorship, many Brazilians referred to big dams as pharaonic projects, a term meant to highlight their grandiose nature by comparing them to the pyramids of ancient Egypt. Project proponents sometimes used the term to laud grand projects, but more often critics used the term to discredit projects they deemed economically senseless and thus having alternative motives, such as the symbolic benefits of carrying out an impressive engineering feat, or the private gains for construction firms and politicians.

The term could easily be applied to other dams throughout the world. Indeed, on at least one occasion an Egyptian politician made celebratory associations between a big dam and the monuments of Pharaonic Egypt.[55] On the critical side, one North American journalist used the term to describe the US congressmen funding economically senseless multipurpose dams in the American West.[56] But such references are rare. Although the Brazilian military regime was not alone in building dams that could be labeled pharaonic, its citizens appear to be unparalleled in using the term so widely and consistently.

The term's modern usage began in reference to Brasília. In 1956, the federal government began building a new capital in the middle of the country, about 900 kilometers northwest of Rio de Janeiro, the capital at that time. Politicians designed Brasília to represent their effort to better integrate the country's territory by filling its underpopulated areas, a program that the dictatorship later accelerated. During construction, senators critical of the ambitious scheme began protesting, labeling it a pharaonic project.[57]

The term spread widely during the dictatorship, and dams became one of the biggest targets. In the late 1980s, the popular magazine *Veja* ran an exposé on corruption and engineering projects during the dictatorship

[55] Elizabeth Bishop, "Talking Shop: Egyptian Engineers and Soviet Specialists at the Aswan High Dam" (PhD Diss., University of Chicago, 1997), 125.
[56] Reisner, *Cadillac Desert*, 511.
[57] See Senator Mem de Sá, "Discurso no Senado Federal," February 5, 1960, and Senator Jefferson de Aguiar, "Discurso no Senado Federal," February 9, 1960, ASF.

titled "a game of pharaohs and contractors." Of the ten projects the article identified, seven were dams – four of which are featured in this book – two were nuclear plants, and one was a railroad.[58]

The pharaonic phrasing dovetails with another reference that historians have used to highlight the symbolism surrounding big dams. In the 1950s and 1960s, India's prime minister Jawaharlal Nehru gave two speeches at the Bhakra Dam, in North India: the first when construction began and the second when it finished. During the speeches, he called the dam a "temple," and in subsequent years, he continued to refer to dams and other big infrastructure projects as the "temples of modern India," a phrase that has become somewhat of a cliché among historians writing about dams.[59]

Nehru's phrase is powerful because it captures both an unwavering faith in science and the symbolism associated with big dams. Since the Enlightenment and the Industrial Revolution, governments have looked toward science and technology to overcome disease and hunger and to improve the standard of living of their constituents. Faith in science reached its apogee in the 1950s and 1960s, when governments around the world and across the ideological spectrum witnessed remarkable gains in health and prosperity through modern science and became convinced that research and big engineering projects – such as mega dams – could overcome most natural limitations. Nehru's comment captures this worldview, as it imbues secular science with religious reverence. His phrase also highlights the potent symbolism surrounding big dams, which showcase the capabilities of the countries and administrations that build them.

Such symbolic benefits were especially important during the era of decolonization in the second half of the twentieth century. During this period, newly independent countries such as India worked to overcome legacies of racism and imperialism. One of the reasons governments in

[58] "Um jogo de faraós e empreiteiros," *Veja*, May 20, 1987, 30. The seven dams were Itaipu, Tucuruí, Itaparica, Balbina, Xingó, Pedra do Cavalo, and Salto Segredo. North American historian Lewis Mumford also compared big dams to Egyptian pyramids in "The Architecture of Power," *New Yorker* (June 1941), 58, though he did not use the phrase "pharaonic projects," and it is unclear if his writings influenced Brazilians who coined the term.

[59] See Jawaharlal Nehru, "Temples of the New Age Speech, July 8, 1954," in *Jawaharlal Nehru's Speeches Vol. 3, March 1953–August 1957* (New Delhi: Ministry of Information and Broadcasting, 1958), 1–4, and Nehru, "Bhakra Project Inauguration Speech," October 22, 1963, available on the website of the Bhakra Beas Management Board, https://bbmb.gov.in/speech.htm (last accessed April 2023).

both India and Egypt pressed ahead with environmentally harmful dams was because building them would refute racist imperial stereotypes that both countries were inferior to Europeans in science and engineering.[60]

Brazilians shared this faith in science and also looked toward engineering feats to overcome such stereotypes. Though Brazil's independence had come much earlier than India's, it remained a predominantly agrarian country with little industrial growth through World War II. Thereafter, Brazil set out to industrialize and thereby overcome its peripheral position in the global economy and prove that its engineering prowess matched that of the industrial world.

Energy projects were essential to this ambition. The Brazilian government championed both domestic petroleum and ethanol as sources of economic independence and liberation, though both remained mostly latent until the 1980s.[61] Both industries were also venues for Brazil to showcase its technological genius. Starting in the 1970s, Brazilian scientists and engineers became world leaders in designing and building equipment for offshore oil production, and they developed an ethanol-fueled car that was successful and popular in the 1980s.[62]

Hydroelectricity was also an important arena for developing domestic energy and engineering expertise, and mega dams were an even more grandiose symbol of Brazil's industrial capabilities. Like India's, Brazil's giant hydroelectric dams were its modern temples. The biggest and most iconic were temples of the military dictatorship, a cadre of generals and technocrats – "modern pharaohs" – who saw dams as a means to gain political legitimacy.

The first group worthy of this designation might be the presidents. Three presidents in particular played an important role in the

[60] Christopher Hill, "Case Study C: Narmada Bachao Andolan (Save the Narmada Movement)," in Christopher Hill, *South Asia: An Environmental History* (Santa Barbara: ABC-CLIO, 2008), 234–248; J. Donald Hughes, "Case Study C: The Aswan Dams and Their Environmental Results," in J. Donald Hughes, *The Mediterranean: An Environmental History* (Santa Barbara: ABC-CLIO, 2005), 213–232.

[61] See Antoine Acker, "A Different Story in the Anthropocene: Brazil's Post-Colonial Quest for Oil (1930–1975)," *Past and Present* 249 (November 2020): 167–211; Eaglin, *Sweet Fuel*; and Rogers, *Agriculture's Energy*.

[62] See Edmilson Moutinho dos Santos and Peyerl, "The Incredible Transforming History of a Former Oil Refiner into a Major Deepwater Offshore Operator: Blending Audacity, Technology, Policy, and Luck from the 1970s Oil Crisis up to the 2000s Pre-salt Discoveries," in Silvia Fernanda Figueirôa et al., eds., *History, Exploration & Exploitation of Oil and Gas* (New York: Springer, 2019), 87–100; Priest, "Petrobras in the History of Offshore Oil"; Eaglin, *Sweet Fuel*; and Rogers, *Agriculture's Energy*.

dictatorship's hydropower program: generals Costa e Silva, Médici, and Geisel. But the generals in charge of the government were not trained as economists or engineers themselves and thus designed their plans based on the guidance of experts, such as economic ministers Antônio Delfim Netto and Roberto Campos. For the dictatorship's big dam-building boom, two energy ministers in particular stand out for having played an outsized role in orchestrating the campaign.

The first was José Costa Cavalcanti, a military officer and politician. Born in 1918 in Fortaleza, the capital of the northeastern state of Ceará, Costa Cavalcanti began his military career in 1935, when he enrolled in military school in Rio de Janeiro. In 1950 and 1951, he studied at the United States Army Infantry School, at Fort Benning, Georgia, now infamous for training many of the officers responsible for installing repressive dictatorships across Latin America during the Cold War. Indeed, Costa Cavalcanti supported the coup that toppled Goulart in March 1964, and once the military was in power, he sided with the hardline faction that advocated for strict censorship, torture, and other forms of violence to curb dissent. Costa Cavalcanti championed AI-5 and was close with Costa e Silva, the first hardline president who promulgated the act.[63]

Costa Cavalcanti played a big role in the energy sector during the dictatorship. In 1967, President Costa e Silva appointed him to the position of Minister of Mines and Energy, where he oversaw the passage of legislation designed to stimulate research for building dams in the Northeast and the Amazon (see Chapter 2). In 1969, the president transferred him to the Department of the Interior, but his hiatus from the energy sector was brief. In 1974, President Geisel appointed Costa Cavalcanti to head Itaipu Binacional, the binational state company in charge of building the colossal Itaipu Dam. In 1981, President Figueiredo made him president of Eletrobras, the state company whose regional subsidiaries were in charge of building dams across the country. Costa Cavalcanti remained in charge of both Itaipu and Eletrobras until 1985, when the military stepped down. He died in 1991.[64]

The second important energy minister was Antônio Dias Leite. Trained as an engineer and economist, he was one of Brazil's most respected energy experts, which set him apart from Costa Cavalcanti, who had no

[63] Fátima Valença, "Biografia de José Costa Cavalcanti," General Collection, CPDOC-FGV.
[64] Ibid.

formal training in engineering. Dias Leite was born in 1920 in Rio de Janeiro, and in the late 1930s, he enrolled in the National Engineering School at the Universidade do Brasil (now the Universidade Federal do Rio de Janeiro). During the 1940s, he was an economic consultant for the government, and in 1946, he became a professor of economics at the National Engineering School and, soon thereafter, at the Universidade do Brasil's Economic Sciences Department. He earned doctorates in both engineering and economics while teaching at the university. In 1963, Dias Leite began his career in government as an undersecretary of economic affairs in the Ministry of Finance.[65]

After the coup, the generals recognized his expertise and appointed him to key positions in the military government. In 1965, President Castelo Branco put Dias Leite in charge of an economic planning commission that both Delfim Netto and Campos participated in. In 1967, the president nominated Dias Leite to head the state mining company, Companhia Vale do Rio Doce, and, in 1969, transferred him to the position of Minister of Mines and Energy, where he replaced Costa Cavalcanti.

Dias Leite remained energy minister until 1974.[66] During his tenure, he oversaw the planning stages of the dictatorship's most iconic dams. For example, he was on the three-member commission that decided Itaipu was the best solution to a diplomatic rift with Paraguay, and he championed Tucuruí as a tool of the National Integration Program (see Chapter 2). After stepping down as energy minister, he remained a consultant on energy matters. Dias Leite's expertise as an engineer and economist, rather than as a military officer, made him exemplary of the technocratic elite that guided the generals who oversaw the big dam-building boom.[67]

Costa Cavalcanti and Dias Leite believed strongly in building big dams at all costs. Like their superiors, they maintained that hydropower had appealing economic and political benefits. They also shared their superiors' uncompromising attitude regarding environmental protection. Both contended that economic growth trumped environmental preservation and that there was no middle ground until the country had advanced further economically (see Chapter 3). These values, shared by others in

[65] "Biografia de Antônio Dias Leite Júnior," General Collection, CPDOC-FGV. [66] Ibid.
[67] After the dictatorship, Dias Leite returned to his position teaching at the Universidade Federal do Rio de Janeiro and later published the most comprehensive overview of energy in Brazil to date. See Dias Leite, *Energia do Brasil*.

the military regime, reflected the logic of the generals and energy ministers in charge of building the dictatorship's big dams.

These modern pharaohs had collaborators. Generals and ministers relied on a small cohort of domestic construction companies to build their dams.[68] International companies had been major protagonists in earlier construction booms, but the nationalistic dictatorship designed policies to strengthen domestic engineering and construction companies. President Costa e Silva's tenure was the starting point for this policy. In 1969, he promulgated legislation that required state companies to hire domestic firms to build public works projects. The law was regularly upheld, except on rare occasions, and came just in time to ensure that domestic construction companies got most of the contracts for the government's big dams.[69]

Dam construction became concentrated in the hands of six domestic companies, the biggest of which were Camargo Corrêa and Mendes Júnior.[70] These six companies were responsible for building the dams featured as case studies in this book, as well as the dictatorship's other big reservoirs.[71] Of the twenty-five big dams identified in the Introduction, 80 percent were built by these six companies.[72]

[68] The following paragraphs draw heavily on Pedro Henrique Pedreira Campos, *Estranhas Catedrais: As empreiteiras brasileiras e a ditadura civil-militar, 1964–1988* (Rio de Janeiro: Editora da Universidade Federal Fluminense, 2014).

[69] Costa e Silva, *Decreto No. 64.345, de 10 de abril de 1969, Institui normas para a contratação de serviços, objetivando o desenvolvimento da engenharia nacional*, ACD, and Campos, *Estranhas Catedrais*, 67.

[70] The other four companies are Andrade Gutierrez, Companhia Brasileira de Projetos e Obras (CBPO), Cetenco, and Servix. Camargo Corrêa was the most prolific dam-building company during the dictatorship in terms of both the number of dams and installed capacity. Mendes Júnior was the second, though it built more of the 25 powerful dams with big reservoirs identified in the Introduction than Camargo Corrêa. For more on these companies, see Campos, *Estranhas Catedrais*, 65–112, 320–324.

[71] Servix built Sobradinho, Camargo Corrêa built Tucuruí, Mendes Júnior built Itaparica, and Andrade Gutierrez built Balbina. Two consortiums, one Brazilian and one Paraguayan, built Itaipu. The Brazilian consortium was responsible for 90 percent of the construction, although the workforce was divided evenly between the two countries. The Brazilian consortium consisted of 5/6 of the companies listed in the preceding footnote: Camargo Corrêa, Mendes Júnior, Andrade Gutierrez, CBPO, and Cetenco. Ibid., 389.

[72] The only dams not built by these companies were São Simão, Samuel, Paulo Afonso IV, Salto Santiago, and Estreito. Camargo Corrêa built Itaipu, Tucuruí, Jupiá, Ilha Solteira, and Água Vermelha. Mendes Júnior built Itaipu, Itaparica, Itumbiara, Marimbondo, Volta Grande, and Boa Esperança. Andrade Gutierrez built Itaipu, Emborcação, Salto Osório, and Balbina. CBPO built Nova Avanhandava, Capivara, Chavantes, and Foz de Areia. Cetenco built Itaipu and Promissão, and Servix built Sobradinho and Rosana.

These firms were close with the generals and their civilian ministers. In some cases, ministers worked for construction companies before or after their tenure in government. Both Costa Cavalcanti and Dias Leite spent parts of their careers working for private engineering firms, though neither worked for the six big dam-building companies. In 1985, Shigeaki Ueki – who succeeded Dias Leite as energy minister from 1974 to 1979 – became the executive director of Camargo Corrêa.[73] In other cases, ministers and construction firms were close without formal ties. César Cals, energy minister from 1979 to 1985, was close friends with the presidents of big construction companies, such as Cetenco's president Eduardo Celestino Rodrigues.

During the dictatorship, such relationships were also common in other departments and ministries, and at different levels of government. For example, Mário Penna Bhering, who was president of Eletrobras from 1967 to 1975 and 1985 to 1990, had close ties with private construction firms, including Servix, which built Sobradinho. In São Paulo, two engineers with ties to Camargo and other São Paulo-based firms were in charge of the Companhia Energética de São Paulo (CESP), the government-owned company then overseeing dam building in the state.[74]

To be sure, friendships between government officials and construction firms were not an exclusive feature of the dictatorship. Similar relationships permeated the Kubitschek administration's construction projects and continued long after the military stepped down from power. For example, the president of Eletrobras during Luiz Inácio Lula da Silva's administration (2003–2010) was a former Camargo Corrêa employee.

Corruption was rampant during the dictatorship. Some of this corruption originated from within the companies, which often proposed cheap blueprints to secure the contract and then added additional features during construction to raise the cost and generate more revenue.[75]

Companies also collaborated with politicians to further increase their profit margins. The most common form of such collusion was rigged bids: Government dam-building companies ensured that most of the contracts went to a small cohort of big firms. The presidents of these firms acknowledged and defended the practice. In 1980, Andrade Gutierrez's president Sérgio Andrade argued that over the previous decade, the government had begun "building big projects that demanded big companies. To build such projects, a company needed equipment …, specialized technical

[73] Campos, *Estranhas Catedrais*, 318. [74] Ibid., 316–325. [75] Ibid., 399–410.

teams, unique construction methods, lots of capital, versatility, and a series of other factors that only big companies can provide."[76] But even within this small stratum of elite businesses, state companies rigged bids to favor certain firms, often those from the same state as the politicians in charge. For example, Camargo Corrêa's close ties to São Paulo's political elites helped it win dam contracts there. Sometimes the practice caused tensions among these construction firms, as was the case at Itaparica, São Simão, and Nova Avanhandava. In the case of the latter, CESP cancelled the bidding auction outright and simply gave the contract to Camargo Corrêa.[77]

In return for securing contracts, politicians got kickbacks. In one high-profile case presented to Congress in 1978, a whistleblower exposed Delfim Netto's illicit charges to companies for helping secure contracts for equipment for Água Vermelha and Tucuruí.[78] Though such corruption was not always well documented, it was common practice during the dictatorship. Historian Warren Dean argues that during the 1970s–1980s, Brazilians were well aware that corruption accounted for much of Itaipu's inflated US$20 billion price tag, which was double its original cost estimate.[79]

Overpriced dams drained public coffers. Starting in the late 1970s, the US Federal Reserve Board raised interest rates on foreign loans to fight inflation, which, by the early 1980s, caused a recession in Brazil and other borrowing countries (see Chapter 3). Most of Brazil's loans had financed public works projects, which accounted for 70 percent of the country's debt during the 1980s.[80] The ensuing debt crisis crippled the economy and compelled the government to curtail public spending. Politicians and the businessmen in charge of big construction firms, on the other hand,

[76] Ibid., 126. [77] Ibid., 322. [78] Ibid., 403–404.

[79] Dean, *With Broadax and Firebrand*, 298. Itaipu Binacional's official figures for the dam's final cost are slightly lower, at US$ 17.6 billion. See www.itaipu.gov.br/en/press-office/faq (last accessed April 2023). The final cost of the dictatorship's other big dams was also often much greater than original estimates. Tucuruí's earliest studies estimated that the dam would cost US$4.2 billion, taking into account interest. The World Commission on Dams estimated the final cost to be US$7.5 billion, and prominent Brazilian journalist Lúcio Flávio Pinto argues the figure is closer to US$10 billion. See World Commission on Dams (WCD), *WCD Case Study Tucuruí Hydropower Complex Brazil, Final Report* (Cape Town: WCD, 2000), viii; Lúcio Flávio Pinto, "De Tucuruí a Belo Monte: A história avança mesmo?" *Boletim Museu Paraense Emílio Goeldi*, 7 no. 3 (2012): 777–782.

[80] "Um jogo de faraós e empreiteiros," 28.

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made a fortune from these contracts and became some of the country's wealthiest people.

Consider the case of Camargo Corrêa, which won the contracts for some of the dictatorship's biggest and most prestigious dams.[81] São Paulo businessman Sebastião Ferraz Camargo founded the company in 1938 and shortly thereafter teamed up with Silvio Brand Corrêa – the brother-in-law of São Paulo's governor – who had capital and important political connections. Its earliest construction projects were railroads, cityscapes, and highways, mostly in the state of São Paulo. In the 1960s, the company began building dams, and it turned into such a prolific dam builder that hydropower plants became its trademark. Camargo Corrêa was building so many dams during the 1970s that it became the single biggest consumer of cement in Brazil. The profits from these dam contracts enabled the company to grow tremendously. In the 1980s, Camargo Corrêa was the company that owned the most Caterpillar construction equipment in the world, and the machinery retailer judged it to be the biggest construction company on the planet.

Camargo shared the military dictatorship's ideology and agenda. In 1967, the Escola Superior de Guerra awarded him the title of honorary diplomat, and he developed a close friendship with Paraguayan dictator Alfredo Stroessner (introduced in Chapter 2). Camargo also helped finance Operação Bandeirantes, an intelligence gathering center established in June 1969 – shortly after AI-5 was implemented – that sought to locate and capture dissidents, who were often tortured and disappeared. Such ideological ties further cemented bonds between the construction giants and the government agencies awarding contracts for dams.

These contracts made Camargo and his family rich. He accumulated a fortune of more than US$1.3 billion before he died in 1994. Upon his death, his wife, Dirce Navarro de Camargo, took over the company and increased its total revenue tenfold. By 2012, she had amassed a personal fortune of roughly US$13 billion, which made her the second-richest

[81] The following passages on Camargo Corrêa are drawn from Campos, *Estranhas Catedrais*, 85–89, 118–119, and 128–129. For more on the company and its dams, see Wilson Quintella, *Memórias do Brasil Grande: A história das maiores obras do país e dos homens que as fizeram* (São Paulo: Editora Saraiva, 2008). Quintella worked for Camargo Corrêa between 1949 and 1984. He was a close associate of Sebastião Camargo and became a manager and then president of the company during the dictatorship. Former finance minister Delfim Netto wrote the preface to his memoirs, further illustrating the close ties between construction companies and government elites.

person in Brazil. When she died in 2013, her three daughters inherited the estate.

The profits that flowed to both construction firms and politicians were a powerful supplementary motivation for the government's commitment to big dams. The degree to which such personal gains influenced decision-making varied on a case-by-case basis. Some authors have suggested that pressure from construction firms and the lure of profit were the main drivers behind the dictatorship's construction boom,[82] but the military government had sufficient motivation to build big dams without such enticements. The need for cheap electricity and the political appeal of dams were reasons enough for the generals to invest in building dams. But creating jobs for domestic engineering firms and profiting from kickbacks sweetened the deal and was a secondary motivation that shaped the character of the dam-building campaign. The generals and their ministers all agreed on the economic and political reasons for building dams, and for some – it is impossible to know how many – profits for their friends and kickbacks for themselves provided additional incentive to prioritize construction at all costs.

CONCLUSION

This chapter provides essential context on repression and the gradual restoration of democratic freedoms, environmentalism, the dictatorship's plans for industrial growth and energy production, the symbolism that surrounds big dams, and the influential generals and engineers responsible for orchestrating the military regime's dam-building campaign. The dictatorship of 1964–1985 was a period of severe repression during which military officers tortured and disappeared critics they deemed subversive. Censorship was also rife, and such repression enabled the military regime to begin building its dams without public debate. The gradual redemocratization process (1978–1989) emboldened the regime's critics and enabled a diverse set of social movements to flourish. Among them was the environmental movement, which was part of the global reaction to the deleterious ecological impacts that unrestrained industrial growth had unleashed. It was in this context in the late 1970s and 1980s that Indigenous communities, their allies, and environmentalists

[82] "Um jogo de faraós e empreiteiros," 28; Philip M. Fearnside, "Brazil's Balbina Dam: Environment and the Legacy of the Pharaohs in Amazônia," *Environmental Management* 13, no. 4 (1989): 401–423; and Campos, *Estranhas Catedrais*.

organized to protest dams, although outpourings of opposition came much too late to modify or halt the projects.

This chapter also lays the foundation for this book's first argument, that politics influenced the decision-making processes undergirding the dictatorship's dam-building boom. The chapter argues that the military regime accelerated the government's dam-building program, expanded its geographic reach, and scaled up dams and reservoirs because the material benefits of hydropower dovetailed with the goals of its National Integration Program and offered potent symbolism of aptitude that would help legitimize the regime, which had come to power in a coup and installed an enduring and increasingly unpopular dictatorship. In short, dams had appealing political characteristics in addition to their basic technical merits as power plants.

Political pressure also influenced the military regime's dam-building campaign in a second and more profound manner: It often competed with technical and environmental considerations in debates about where to build the biggest and most controversial dams. It is to these stories about choosing dam sites that the next chapter turns.

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