

## Hydropower in Authoritarian Brazil

During the later twentieth century, Brazil's right-wing military dictatorship built a vast network of hydropower dams that became one of the world's biggest low-carbon electricity grids. Weighed against these carbon savings, what were the costs? Johnson unpacks the social and environmental implications of this project, from the displacement of Indigenous and farming communities to the destruction of Amazonian biodiversity. Drawing on rich archival material from forty sites across Brazil, Paraguay, and the United States, including rarely accessed personal collections, Johnson explores the story of the military officers and engineers who created the dams and the protestors who fought them. Brazilian examples are analyzed within their global context, highlighting national issues with broad consequences for both social and environmental justice. In our race to halt global warming, it is vital that we learn from past experiences and draw clear distinctions between true environmentalism and greenwashed political expedience.

Matthew P. Johnson, PhD, is an environmental historian and a 2022–2024 Environmental Fellow at the Harvard University Center for the Environment.

## Studies in Environment and History

### Editors

J. R. McNeill, *Georgetown University*  
 Ling Zhang, *Boston College*

### Editors Emeriti

Alfred W. Crosby, *University of Texas at Austin*  
 Edmund P. Russell, *Carnegie Mellon University*  
 Donald Worster, *University of Kansas*

### Other Books in the Series

- Ellen Arnold *Medieval Riverscapes: Environment and Memory in Northwest Europe, c. 300-1100*  
 Richard C. Hoffmann *The Catch: An Environmental History of Medieval European Fisheries*  
 Samuel Dolbee *Locusts of Power: Borders, Empire, and Environment in the Modern Middle East*  
 Andy Bruno *Tunguska: A Siberian Mystery and Its Environmental Legacy*  
 Lionel Frost et al. *Cities in a Sunburnt Country: Water and the Making of Urban Australia*  
 Adam Sundberg *Natural Disaster at the Closing of the Dutch Golden Age: Floods, Worms, and Cattle Plague*  
 Germán Vergara *Fueling Mexico: Energy and Environment, 1850-1950*  
 Peder Anker *The Power of the Periphery: How Norway Became an Environmental Pioneer for the World*  
 David Moon *The American Steppes: The Unexpected Russian Roots of Great Plains Agriculture, 1870s-1930s*  
 James L. A. Webb Jr. *The Guts of the Matter: A Global Environmental History of Human Waste and Infectious Intestinal Disease*  
 Maya K. Peterson *Pipe Dreams: Water and Empire in Central Asia's Aral Sea Basin*  
 Thomas M. Wickman *Snowshoe Country: An Environmental and Cultural History of Winter in the Early American Northeast*  
 Debjani Bhattacharyya *Empire and Ecology in the Bengal Delta: The Making of Calcutta*  
 Chris Courtney *The Nature of Disaster in China: The 1931 Yangzi River Flood*  
 Dagomar Degroot *The Frigid Golden Age: Climate Change, the Little Ice Age, and the Dutch Republic, 1560-1720*  
 Edmund Russell *Greyhound Nation: A Coevolutionary History of England, 1200-1900*  
 Timothy J. LeCain *The Matter of History: How Things Create the Past*  
 Ling Zhang *The River, the Plain, and the State: An Environmental Drama in Northern Song China, 1048-1128*

# Hydropower in Authoritarian Brazil

*An Environmental History of Low-Carbon  
Energy, 1960s–1990s*

MATTHEW P. JOHNSON

*Harvard University*



CAMBRIDGE  
UNIVERSITY PRESS

Cambridge University Press & Assessment  
978-1-009-42869-9 — Hydropower in Authoritarian Brazil  
Matthew P. Johnson  
Frontmatter  
[More Information](#)



CAMBRIDGE  
UNIVERSITY PRESS

Shaftesbury Road, Cambridge CB2 8EA, United Kingdom  
One Liberty Plaza, 20th Floor, New York, NY 10006, USA  
477 Williamstown Road, Port Melbourne, VIC 3207, Australia  
314-321, 3rd Floor, Plot 3, Splendor Forum, Jasola District Centre,  
New Delhi – 110025, India  
103 Penang Road, #05-06/07, Visioncrest Commercial, Singapore 238467

Cambridge University Press is part of Cambridge University Press & Assessment,  
a department of the University of Cambridge.

We share the University's mission to contribute to society through the pursuit of  
education, learning and research at the highest international levels of excellence.

[www.cambridge.org](http://www.cambridge.org)  
Information on this title: [www.cambridge.org/9781009428699](http://www.cambridge.org/9781009428699)

DOI: 10.1017/9781009428743

© Matthew P. Johnson 2024

This publication is in copyright. Subject to statutory exception and to the provisions  
of relevant collective licensing agreements, no reproduction of any part may take  
place without the written permission of Cambridge University Press & Assessment.

First published 2024

*A catalogue record for this publication is available from the British Library*

*A Cataloging-in-Publication data record for this book is available from the Library of  
Congress*

ISBN 978-1-009-42869-9 Hardback

Cambridge University Press & Assessment has no responsibility for the persistence  
or accuracy of URLs for external or third-party internet websites referred to in this  
publication and does not guarantee that any content on such websites is, or will  
remain, accurate or appropriate.

Cambridge University Press & Assessment  
978-1-009-42869-9 — Hydropower in Authoritarian Brazil  
Matthew P. Johnson  
Frontmatter  
[More Information](#)

---

*This book is dedicated to all my Brazilian and Paraguayan  
colleagues and friends who helped along the way, and to the  
memory of Lucas Mores, one of the brightest of them.*

Contents

<i>List of Figures</i>	<i>page</i> ix
<i>Acknowledgments</i>	xi
<i>Notes on the Text</i>	xvii
Introduction	I
1 Setting the Scene: Dictatorship and Industrial Growth	15
Introduction	15
Dictatorship	16
Industrial Growth	25
Modern Pharaohs	35
Conclusion	44
2 Building “the Big Dam”: Economic and Political Considerations during Planning, 1960s–1970s	46
Introduction	46
The Desert Becomes the Sea	48
São Paulo Cannot Stop	57
Specter of a Bellicose Past	61
Marcondes Ferraz’s Defense	70
Industrializing the Rainforest	76
Conclusion	84
3 Pharaonic Environmentalism: Mitigation Efforts during Planning and Reservoir Filling, 1970s–1980s	86
Introduction	86
Environment and International Loans	89
Goodland’s Stamp of Approval	94
Self-Defense and Environmentalism	102
Ostentatious Environmentalism	105

viii	<i>Contents</i>	
	Scrutiny and Condemnation	116
	Conclusion	123
4	Negotiating with Floodwaters: Impacts on Displaced Communities, 1970s–1990s	125
	Introduction	125
	Losing the Floodplain	127
	Church and State in the South	138
	Losing the Forests	142
	Sobradinho Never Again	151
	Losing the Archipelago	155
	Conclusion	162
5	Environmental Transformations: Impacts on National Parks, Fish, and Malaria, 1970s–1990s	164
	Introduction	164
	Visit before They are Gone	167
	Fishing Booms and Busts	177
	Still Waters in the South	182
	Malaria along Reservoir Margins	186
	Laughing with Closed Mouths	195
	Conclusion	201
6	The Notorious Balbina Dam: The Dictatorship’s Last and Most Infamous Dam, 1980s–1990s	203
	Introduction	203
	Concrete in the Jungle	205
	Down a Familiar Path	212
	In the Footsteps of Pharaohs	221
	Road to Reparations	224
	Ghost Forests	229
	Conclusion	240
7	Aftermath: The Anti-Dam Movement, Social Injustice, and Climate Change, 1990s–2010s	242
	Introduction	242
	The Anti-Dam Movement	244
	The Landless Generation	255
	The Sea Becomes the Desert	264
	Conclusion	270
	Conclusion	271
	<i>Bibliography</i>	279
	<i>Index</i>	305

Figures

1.1	Brazilian hydropower dams, 1964–1989.	<i>page</i> 4
1.1	Installed electricity capacity by source, Brazil, 1920–2020.	33
2.1	Paulo Afonso Falls, circa 1860s.	51
2.2	Hydropower dams on the lower-middle stretch of the São Francisco River, 1940s–1990s.	54
2.3	Octávio Marcondes Ferraz’s Sete Quedas Dam design and the disputed Brazilian-Paraguayan border, 1962–1982.	64
3.1	Animal rescue and specimen gathering campaigns, 1973–1989.	109
4.1	Tuxá land flooded by the Itaparica Dam’s reservoir in 1988.	157
5.1	Sete Quedas National Park and Guaíra, undated, circa 1960s–1982.	169
5.2	Sete Quedas National Park photographs, September 1982.	171
6.1	Protected land surrounding Balbina Dam, 1989–2023.	228
7.1	Hydropower dams in the Amazon Rainforest, 1960s–2023.	250



## Acknowledgments

This book is based on a dissertation I completed in the Department of History at Georgetown University, the research for which was funded in part by a grant from the Fulbright U.S. Student Program. I revised the manuscript for publication as a postdoctoral fellow at the Harvard University Center for the Environment, under the mentorship of Gabriela Soto Laveaga and Victor Seow in the Department of the History of Science. Parts of Chapter 2 are based on ideas first presented in “Sacrificing Guáira Falls: Geopolitics and the Environmental Impact of South America’s Biggest Dam, 1962–1982,” *Luso-Brazilian Review* 60, no. 1 (2023): 37–67, and parts of Chapters 4 and 7 are based on ideas first presented in “Uma geração sem terra: Injustiça ambiental em comunidades indígenas deslocadas por construções de hidrelétricas no Brasil, desde os anos 1980,” *Historia Ambiental Latinoamericana y Caribeña (HALAC)* 11, no. 3 (2021): 209–233.

Many people helped with the research and writing that went into producing this book. For starters, I owe tremendous debts of gratitude to those who helped me build this book’s bibliography. In Brazil and Paraguay, special thanks are due to the librarians and archivists at Eletronorte, the Companhia Hidrelétrica do Rio São Francisco, Itaipu Binacional, and the Centro da Memória da Eletricidade, as well as those at other government repositories such as the Arquivo Nacional in Rio de Janeiro, the libraries and archives of the Congresso Nacional in Brasília, and the library of the Instituto Nacional de Pesquisas da Amazônia in Manaus.

I am also thankful for the help of librarians and archivists at the repositories of the prominent nongovernmental institutions that

I consulted, such as the Fundação Getúlio Vargas in Rio de Janeiro, the Conselho Indigenista Missionário in Brasília, and the Comissão Pastoral da Terra in Goiânia.

I am also grateful for the time and help of those who assisted me in locating and accessing collections in smaller and sometimes informal repositories. In Manaus, Philip Fearnside set aside time to speak with me at length about Brazilian dams and opened up his personal collection of papers about the reservoirs he has studied. Malariologists Wanderli Tadei and Raul Amorim both spoke with me at length in a formal interview setting about the relationship between mosquitoes, malaria, and dams in the Amazon, providing invaluable information on the subject. In Presidente Figueiredo, a small town about an hour's drive north of Manaus, Egidio Schwade granted me access to the archive he maintains about the history of the Waimiri-Atroari and the industrial projects that have encroached on their land. His admirably organized collection had a wealth of information about the Balbina Dam.

In the Northeast, André Monteiro and Ruben Siqueira assisted in connecting me with helpful colleagues. In Juazeiro, Juracy Marques shared his research and put me in touch with two of his students, Adzamara Amaral and Luciano Silva de Menezes, who had also done research on the communities displaced by Sobradinho and Itaparica. Francisco de Assis Silva helped coordinate my visit to the Biblioteca de Dom José Rodrigues at the Universidade Estadual de Bahia, Juazeiro, which had a rich collection of useful documents. In Paulo Afonso, Valda Aroucha and Galilleu Torres Matias hosted me and helped me network during my time there, and I remain immensely grateful for their assistance and hospitality. They put me in touch with Ruy Tenório and Jamile Silveira, among others, at the Universidade Estadual de Bahia, Paulo Afonso, who shared helpful documents and information with me. Antônio Galdino kindly opened his personal collection of archived issues of *Folha Sertaneja*, a local newspaper with ample information about Paulo Afonso Falls. Galdino and tour guide Antônio Souza also spoke with me at length about the history of the falls and the long-extinct national park that once existed there. Nicolas Kalango took me to see the falls and dams and accompanied me on other adventures during my visit. Valda also put me in touch with Alzeni Tomaz and Uilton Tuxá, both of whom helped deepen my understanding of the region's Indigenous communities and their fights for social justice. Uilton shared important documents with me about the Tuxá's struggle for land and generously accompanied me on a visit to both Rodelas and D'zorobabé.

*Acknowledgments*

xiii

There I met with Tuxá leaders, who graciously welcomed me and recounted painful stories about broken promises and continued hardships.

In Curitiba, Fernanda Striker Fernandes, the librarian at the Centro de Formação Urbano Rural Irmã Araújo, helped me find important documents and put me in touch with Werner Fuchs, who graciously sat down with me for interviews. At the regional branch of the Fundação Nacional de Saúde, Elisangela and Enéas Cordeiro helped me get in touch with Allan Martins da Silva and Roderlei Araujo, who generously spoke with me in a formal interview setting about mosquitoes and malaria at Itaipu and other reservoirs in the state, opened their personal collections of documents to me, and put me in touch with helpful colleagues in Western Paraná. At the Núcleo de Documentação da Justiça Federal do Paraná, Valdir Chacon helped me locate and access an important set of documents about fisheries.

In Western Paraná, I was lucky to meet equally helpful and generous people. At the Centro de Pesquisa e Documentação sobre o Oeste de Paraná in Marechal Cândido Rondon, Rodrigo Ribeiro Paziani and Jussara Dornelles de Souza helped me locate an important collection of documents about the Sete Quedas National Park before it was flooded. In Guaíra, Mario and Diego Prado helped me network and put me in contact with helpful individuals, as did Bentinho, who also took me out on the reservoir during a time of drought to boat over what was once Guaíra Falls and check out the rocky outcroppings that protruded when water levels dropped. Ana Menél, Edson Galvão, Frei Pacífico, and Joel Onofre shared information and stories about the history of Guaíra and Sete Quedas, and José Cirineu Machado and other fishermen at the Colônia de Pescadores Z-13 also generously shared their stories. Suemy and Ana Helena Foletto kindly opened their personal collection of archived issues of *Jornal Ilha Grande*, a local newspaper that contains a wealth of information about Guaíra Falls.

In Foz de Iguaçu, Vilma Macedo generously shared the personal papers of her late husband, Juvêncio Mazzarollo, which included copies of local newspaper and magazine articles, and Alexandre Palmar also shared with me his digitized copies of local newspapers. At the Núcleo de Entomologia, Adão Celeste Ferreira, Adelino Fideles, and Alvir Swiderski shared helpful information and put me in touch with Maria do Carmen and Mário Pillecco, whose interviews were valuable for helping me understand the history of malaria outbreaks alongside Itaipu's reservoir. Flávio Kabroski, the president of the Colônia de Pescadores Z-12, sat

down with me for an interview about the experience of fishermen in the reservoir and invited me to attend one of the fishing colony's meetings, where I explained my research project and met with other fishermen who shared their stories.

In Asunción, Paraguay, many people helped me with my research. Enrique Gaska, director of the Coordinación Nacional de Pastoral Indígena, opened the organization's library to me, shared his own articles about the Avá Guaraní communities displaced by Itaipu, and spoke with me at length about the subject. He also put me in touch with Mariblanca Barón, who graciously opened her library in Nueva Esperanza and shared stories about her decades-long work with the Avá Guaraní communities dispossessed by Itaipu. Although we never got a chance to meet in person, Ricardo Caballero Aquino, ambassador and director of the Archivo Histórico de la Cancillería, was very supportive and offered some helpful suggestions.

In both Asunción and Ciudad del Este, many malariologists at the Servicio Nacional de Erradicación del Paludismo helped me locate documents about malaria and Itaipu and shared important information in interviews. The abbreviated list includes Patricia Luraschi, Mónica Ozorio, Liz Paola Ruiz Diaz, Alexis Liz Palacios, Miguel Diarte, Cinthia, Cándido, and Amado Villalba, Christian Sisanovsky, Leonardo Taboada, and Mirtha Franco.

I was also fortunate to cross paths with two engineers, Luiz Fernando Rufato and João Paulo Aguiar, the chief engineers of two of this book's case studies (Tucuruí and Sobradinho, respectively) during the 1970s and 1980s. They both generously took the time to share their thoughts with me. Rufato spoke with me in an informal setting when I was beginning my research, and João Paulo sat down with me for a formal interview during the later stages of my research and shared helpful documents from his personal collection. I am grateful to them for sharing their stories and perspectives on these dams.

This book's bibliography was also built by generous colleagues in academia. Felipe Oliveira shared his copies of rare documents, some of which were destroyed in the tragic fire at Brazil's Museu Nacional. Bruno Biasetto also shared some of his documents, and Nathalia Capellini shared helpful information about electricity in Manaus from her own research on energy in Amazônia. I am also grateful to Dana Aronowitz and Amanda Rudd at the Georgetown University Library's Interlibrary Loan office for tracking down countless rare articles.

*Acknowledgments*

xv

When the time came to write the manuscript, I was fortunate to be surrounded by many smart and generous colleagues who shared valuable input. Special thanks are due to the following people for their time and help with the manuscript.

For reading and commenting on earlier drafts of the full manuscript, J.R. McNeill, Meredith McKittrick, David Painter, Shawn Miller, Ling Zhang, Lucy Rhymer, and two anonymous reviewers with Cambridge University Press.

For reading and commenting on earlier drafts of multiple chapters, Lise Sedrez, Bryan McCann, Erick Langer, Timothy Newfield, Jackson Perry, Douglas McRae, and David Jones; and for reading and commenting on earlier drafts of individual chapters or subsections, Natascha Otoyá, Emma Moesswilde, Bryna Cameron-Steinke, Rebecca Andrews, Dylan Proctor, Rob Christensen, Andrew Ross, Francisco Céntola, Ishmael Annang, Loren Galesi, André Felipe Cândido da Silva, Gabriel Lopes, Ingrid Casazza, Leonardo Lignani, Matthew Tarduno, and Hélène Benveniste.

For listening and offering helpful comments on parts of the research shared as oral presentations, Lise Sedrez, Dominichi Miranda de Sá, Stephen Bell, Eurípides Antônio Funes, Rogério Ribeiro de Oliveira, José Augusto Pádua, Valéria Fernandes, Filipe Oliveira, Natasha Barbosa, Hana Mariana, Millena Farias, Bruno Capilé, Paula Fortini, Bruno Araujo, Letícia Andrade, Gabriel Paes, Gabriel Pereira, Alexia Shellard, Lucas Mores, Sandro Dutra e Silva, André Vasquez, Eric Carter, and Jamile Silveira; students and faculty in the Georgetown University Environmental History Research Group, the Laboratório de História e Natureza na Universidade Federal do Rio de Janeiro, the Laboratório de História Ambiental do Cerrado, and the Grupo de Pesquisa de Água e Saúde; and panel attendees at the Sociedad de Historia Ambiental Latinoamericano y Caribeña meeting in Liberia, Costa Rica, the World Congress of Environmental History in Florianópolis, Brazil, and the American Society for Environmental History meeting in Eugene, Oregon, United States.

Geoff Wallace designed the maps for this book with great skill and patience, and a handful of Georgetown and Harvard colleagues weighed in with helpful feedback on the visuals.

There are many more people still who helped indirectly and supported me while I was researching and writing this book, and I owe tremendous thanks to all of them.

## Notes on the Text

### ON ABBREVIATIONS

Many of the actors in this book are companies, government agencies, and nongovernmental organizations whose names are commonly referred to using acronyms.

For all such entities, I have spelled out the full name in both English and Portuguese at the first reference in each chapter (and at the first reference in the footnotes of each chapter) and then used the acronym thereafter.

For the company Itaipu Binacional, the standard abbreviation is Itaipu, and I refer to the company using this abbreviation except when there might be ambiguity about whether the dam or the company is the subject. In those circumstances, I use the full name.

For all archival and library collections, I use only the acronym in chapter footnotes. The bibliography lists all archives and libraries, with both acronyms and full spelling, as well as their geographic location.

### ON NAMING AND SPELLING

Many of the subjects in this book include people and places from across borders, which invites multiple naming conventions. Four of the most common are addressed here.

Guaíra Falls, a binational waterfall on the Brazilian–Paraguayan border discussed in Chapters 2 and 5, is referred to as Sete Quedas in Brazil and Los Saltos del Guairá in Paraguay and is most commonly

translated as Guaíra Falls in English. I use Guaíra Falls throughout, except when referencing the Sete Quedas Dam and the Sete Quedas National Park, and maintaining the original phrasing of primary sources.

Ernst Mann, a naturalist from Guaíra who makes brief appearances in this story and whose collection provided rich information about the Sete Quedas National Park, sometimes spelled his first name Ernest or Ernesto. I have used Ernst except when maintaining original phrasing in citations.

Avá Guaraní, an Indigenous group living along the Brazilian–Paraguayan border whose story is discussed in Chapters 4 and 7, is spelled Avá Guaraní (and sometimes Ava Guaraní) in Spanish, and they are also referred to as Avá Chiripa and Guaraní Paranaenses in Paraguay. In Brazil, their name is spelled Avá Guarani, and they are also referred to as Ñandeva. I use the Spanish spelling of Avá Guaraní when referring to the communities in Paraguay and the entire community broadly, and I use the Portuguese spelling of Avá Guarani when referring specifically to the communities on the Brazilian side of the reservoir.

Waimiri-Atroari, an Indigenous community living north of Manaus whose story is discussed in Chapter 6, is sometimes hyphenated and sometimes not. I have hyphenated the name throughout, except when maintaining original phrasing in titles.