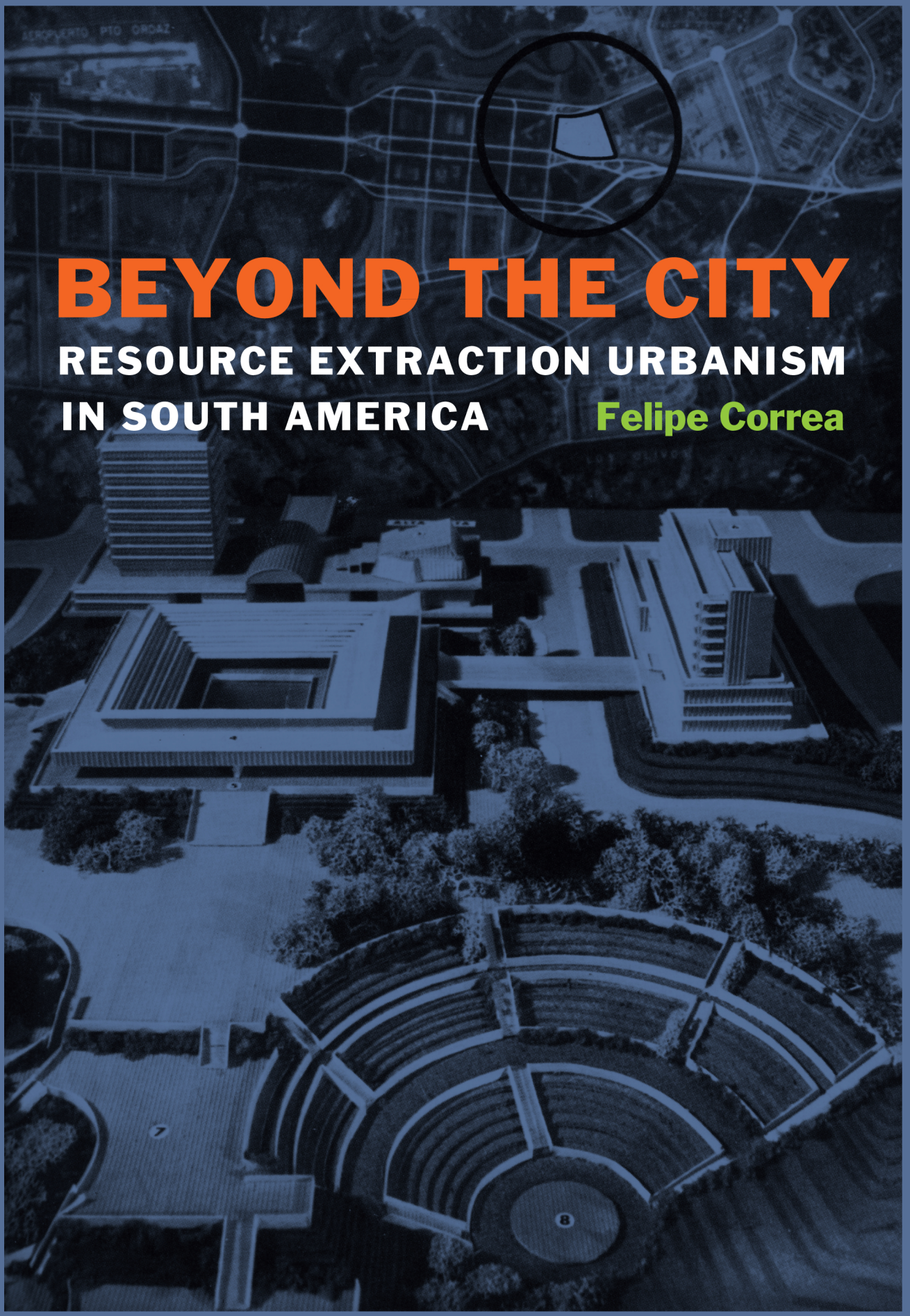
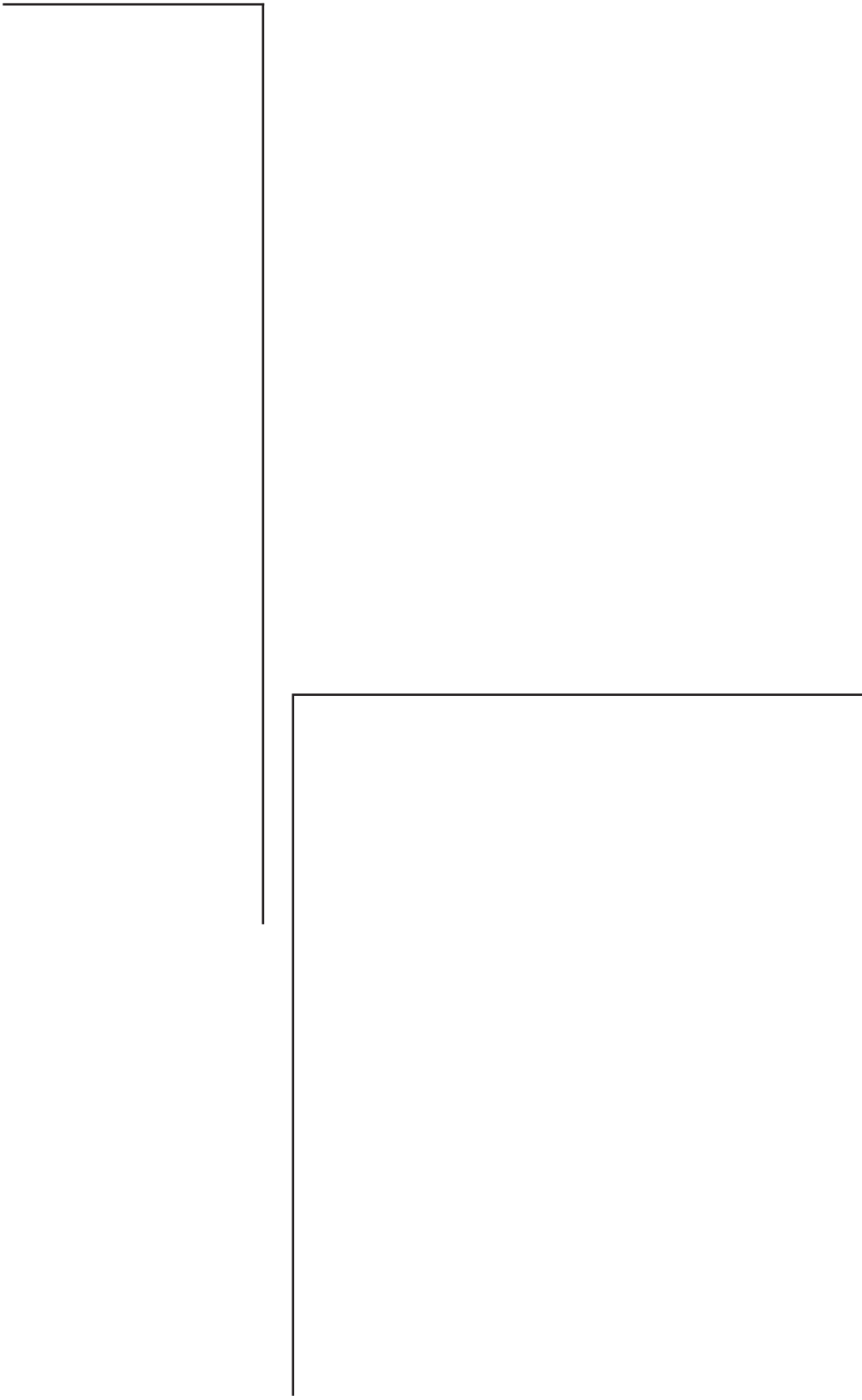


BEYOND THE CITY

RESOURCE EXTRACTION URBANISM IN SOUTH AMERICA

Felipe Correa

BEYOND THE CITY



BEYOND THE CITY

Resource Extraction Urbanism in South America

FELIPE CORREA

University of Texas Press AUSTIN

Printed in the United States of America

First edition, 2016

The paper used in this book meets the minimum requirements of

ANSI/NISO Z39.48-1992 (R1997) (Permanence of Paper).

Library of Congress Cataloging-in-Publication Data

Correa, Felipe, author.

Beyond the city : resource extraction urbanism in South

America / Felipe Correa. — First edition.

pages cm

Includes bibliographical references and index.

ISBN 978-1-4773-0941-4 (cloth : alk. paper) —

ISBN 978-1-4773-1024-3 (library e-book) —

ISBN 978-1-4773-1025-0 (nonlibrary e-book)

1. Urbanization—South America. 2. City planning—South

America. 3. Urban renewal—South America. 4. Natural

resources—South America. I. Title.

HT384.S63C67 2016

307.76098—dc23 2015035643

doi:10.7560/309414

To Anthony Acciavatti

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ACKNOWLEDGMENTS

The successful completion of this book owes much to the help and support of many individuals and institutions.

My deepest gratitude goes to the Harvard University Graduate School of Design. The institutional support provided by Harvard made the completion of this book possible. In particular, I must thank Mohsen Mostafavi, dean of the school, who provided me with the Dean's Research Grant that spearheaded this project. Much gratitude goes to my colleagues at the Graduate School of Design. Neil Brenner, Diane Davis, Ann Forsyth, Jerold Kayden, and Hashim Sarkis offered invaluable help and guidance in the development of the manuscript. I am indebted to Alex Krieger and Peter Rowe for their unwavering support and enthusiasm for this project. Indeed, their comments about a design studio class on Judibana (Venezuela) they had taught a few years earlier first piqued my interest in resource extraction and urbanization in South America. Anita Berrizbeitia, Ana María Durán Calisto, Rodolfo Machado, and Jorge Silvetti were essential to the development of this project. Passionate conversations about the continent we share helped significantly thicken the plot of this research. Furthermore, a great debt is owed to Joan Busquets for his generous feedback and unassailable guidance of this project and of my professional advancement as a whole. A very special acknowledgment goes to Rahul Mehrotra, whose leadership and vision as chair of the Urban Planning and Design Department constructed an ideal environment for research and disciplinary growth.

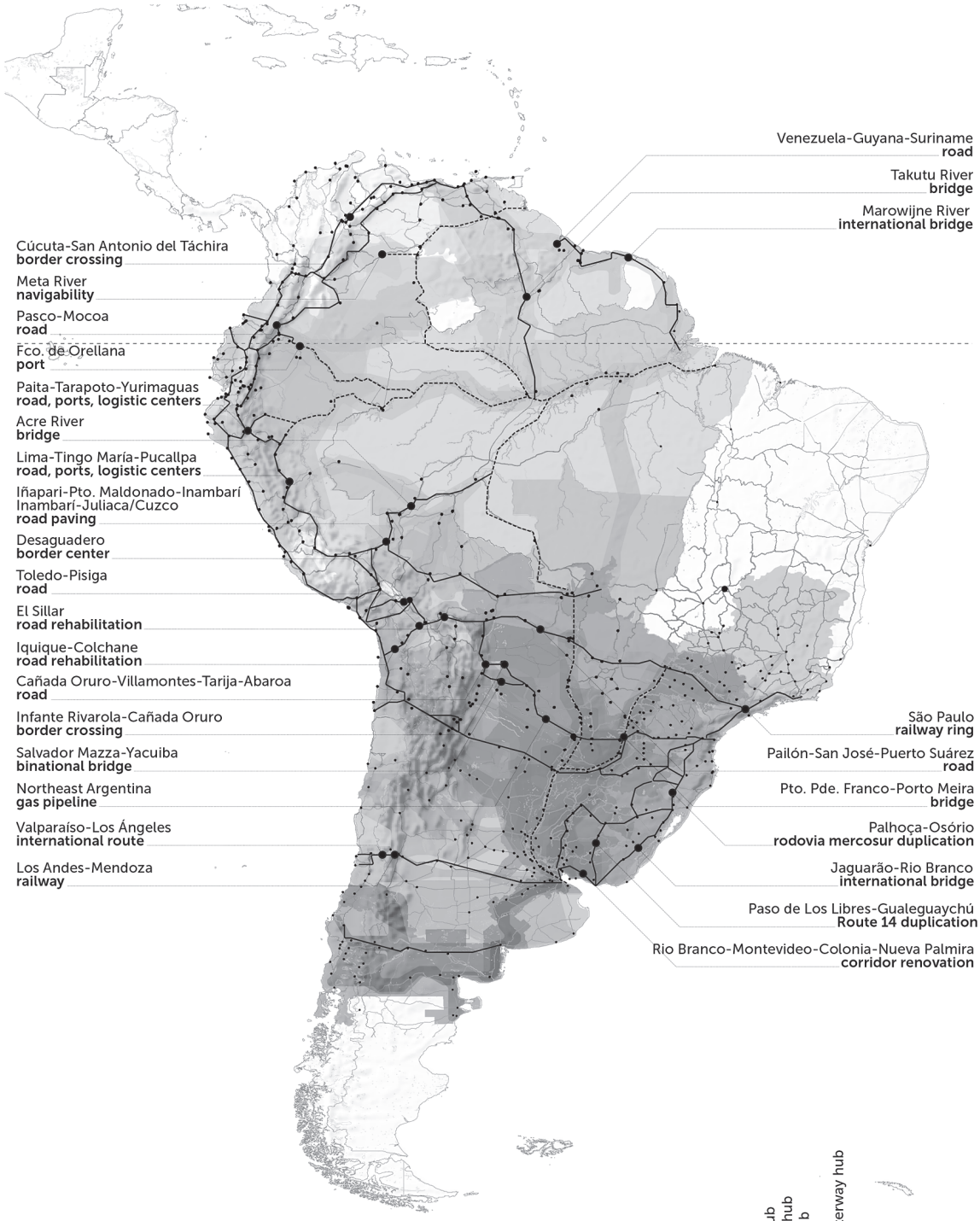
Another great debt is owed to everyone who read the manuscript and provided critical feedback, particularly Adrián Gorelik, Susanna B. Hecht, Fernando Luiz Lara, and Graciela Silvestri. Justin Fowler also deserves a special acknowledgment for his keen editorial eye. Carlos Garciavelez must also be acknowledged for his consistent support of this project.

A very special mention goes to the team of collaborators who helped me assemble the graphic material presented in the book. John Frey and Jacob Koch deserve this special mention, for they both worked on this project from beginning to completion. Duncan James Corrigall, Devin Dobrowolski, Juan Diego Izquierdo, Kyriaki Kasabalis, Gabriella Rodríguez Berrios, and Trax Wang must also be acknowledged for support and dedication in helping prepare the graphic material for the book. I am also indebted to my students from the Resource Extraction Urbanism seminars at Harvard for providing me an incredible sounding board for many of the ideas that shaped this book.

I remain extremely grateful to the University of Texas Press, and in particular to Robert Devens, who saw in a simple e-mail the promise of this book. Furthermore, Robert's editorial and graphic design team must also be acknowledged for doing an exceptional job throughout the editing and design process.

Finally, my greatest acknowledgment is to my family, and in particular to Anthony Acciavatti, who has always stood by me on this and many other projects for almost two decades.

BEYOND THE CITY



IIRSA PROJECT PORTFOLIO

Shaping Resource Extraction

Outside the dense urbanism of São Paulo and the cosmopolitanism of Buenos Aires, the South American continent has seen throughout the last decade an unparalleled push for transnational integration and a renewed desire to recast the geometries of its productive hinterland. Established by former Brazilian president Fernando Henrique Cardoso in 2000 and rapidly endorsed by the eleven other South American nations, the Initiative for the Integration of Regional Infrastructure in South America (IIRSA)[1]—a comprehensive energy, transportation, and communications network administered by the South American Council of Infrastructure and Planning (COSIPLAN)—is the most aggressive transcontinental integration project ever planned for South America.[2] Through the systematic deployment of ten east–west infrastructural corridors, the initiative is sidelining the Americas' time-honored north–south axis, as exemplified by the Pan-American Highway, to provide Brazil access to ports along the Pacific and to give its flourishing economy stronger trading ties with Asian markets, all while providing means of entering remote regions that have untapped surface and subsurface natural resources.[3] With a projected investment surpassing US$96 billion and an expansive portfolio of 524 projects distributed across the east–west development axes (with 61 percent of the projects under construction),[4] the scope and ambition of IIRSA is effecting an unprecedented reconfiguration of the urban and rural dynamics of the South American hinterland.

The initiative has been cast predominantly under the positive light of economic development, but its many side effects present powerful caveats to the project and deserve thoughtful scrutiny. The systematic construction of heavy infrastructure—primarily of roads, fluvial networks, and maritime ports—is having a catalytic effect on the already colossal processes of resource extraction ubiquitous to the region, further compounding con-

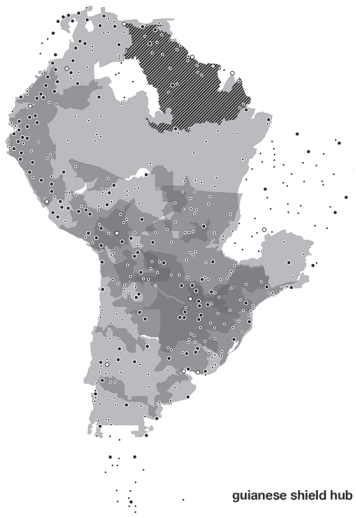
facing page
Figure 0.1. IIRSA project portfolio, highlighting new and upgraded mobility infrastructure projects throughout the continent. Drawing by Felipe Correa/South America Project.

above
Figure 0.2. IIRSA development corridors in relation to cities and towns. Drawing by Felipe Correa/South America Project.

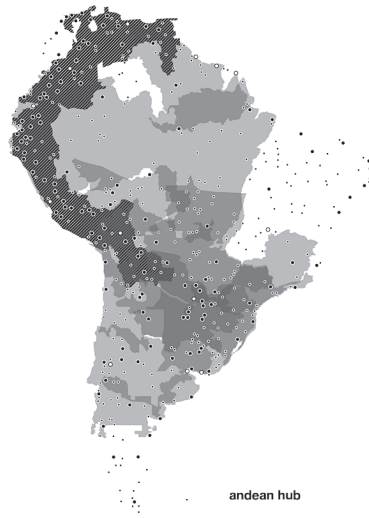
facing page
Figure 0.3. The nine most important IIRSA development hubs. Drawing by Felipe Correa/South America Project.

troversial patterns of urbanization and rapidly accelerating the unregulated urban development of vast regions outside of the larger metropolitan areas.[5] This polarizing urban condition, which finds infrastructure at odds both with its unstable patchwork of byproducts and with broader needs of regional continuity, is also consistent with the global emergence of the "metapolis" as defined by French urbanist and sociologist François Ascher.[6] As such, the gradual implementation of the IIRSA projects has proclaimed the South American interior a new and extremely relevant frontier of urbanization, opening up a unique set of design and management challenges for the disciplines of architecture and urban planning.

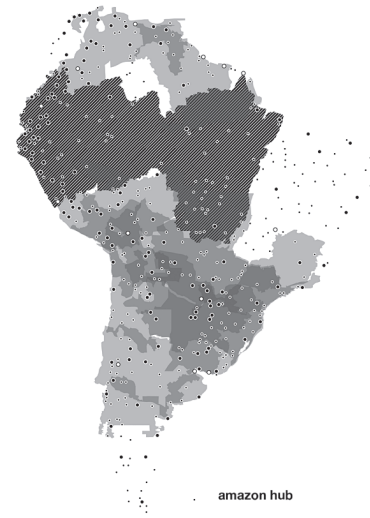
While the portfolio of infrastructure projects presented by IIRSA might be of a previously unseen scale, a more careful historical examination of resource extraction and regional integration in South America can help us better contextualize the spatial dimension of IIRSA and identify its stakes. This examination can work to frame this transnational initiative as the latest iteration in a long line of endeavors by the region's leaders to pioneer the hinterland for the purposes of resource extraction. Here, Cardoso's desire for a unified South America through IIRSA both recalls and reenacts former Peruvian president Fernando Belaúnde Terry's dream of a South American "forest-edge highway"[7] proposed to run along the western border of the Amazon jungle and connect to its major navigable rivers. The parallels between the projects of Cardoso and Belaúnde suggest that IIRSA was born from a developmentalist mindset similar to that which domes-



guianese shield hub



andean hub



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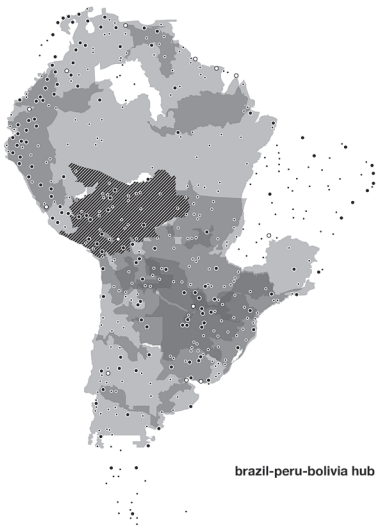
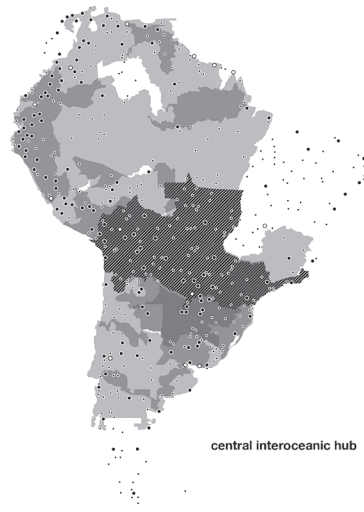
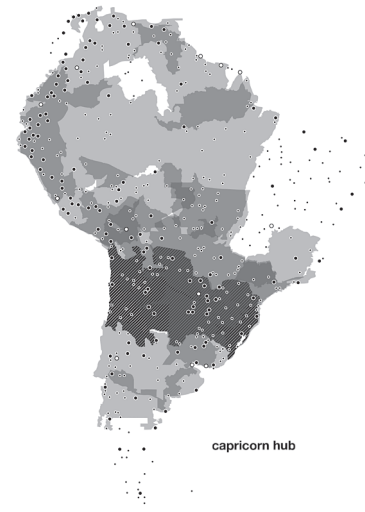


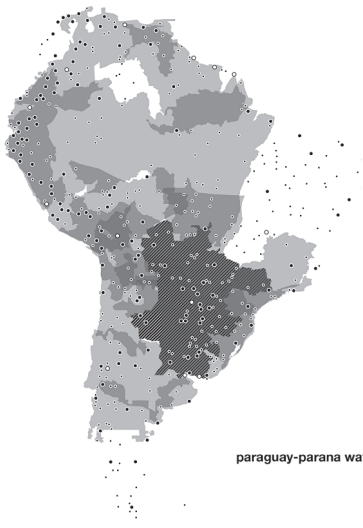
brazil-peru-bolivia hub



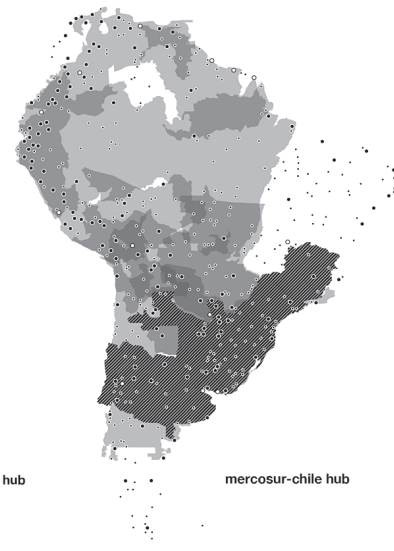
central interoceanic hub



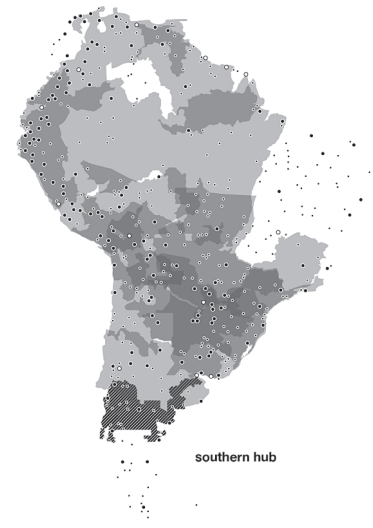
capricorn hub



paraguay-parana waterway hub



mercosur-chile hub



southern hub

ticated the region's hinterland throughout the twentieth century. Furthermore, placing IIRSA and the current territorial dynamics of the continent in the context of a broader set of models for urbanization and regional development highlights the unassailable role the disciplines of architecture and urban planning played in structuring much of the spatial identity of the South American hinterland throughout the 1900s. The centrality of the design disciplines to those efforts is perhaps all the more notable today given those disciplines' apparent marginalization within the IIRSA agenda.

Beyond the City: Resource Extraction Urbanism in South America ties together a series of spatial models and offers a survey of cities and regional strategies planned at the confluence of resource extraction and regional integration. By exhibiting five specific cases, the book presents an arc of projects that rest outside the traditional urban constructs that shaped the main South American metropolises along the Atlantic and Pacific coasts. From provisional encampments to regional capitals, the models of urbanization featured in this volume encapsulate the affinities between nation building, design aspirations, and transnational expertise that gave shape to experimental urban projects in conjunction with sites of extreme resource extraction within continental South America. The phrase that gives this book its subtitle, "*resource extraction urbanism*," was in no way utilized as a term in the conception or implementation of these projects, nor does it appear in the existing literature of any of the case studies. Rather, the phrase, which was conceived for this investigation is used here to bring together under a single cover a collection of projects that advocate for new and experimental urban identities in the context of government-sponsored resource extraction frontiers.

In "The Significance of the Frontier in American History," an essay presented by a young Frederick Jackson Turner at the World's Columbian Exposition in 1893, the historian states, "Up to our own day American history has been in large degree the history of the Great West. The existence of an area of free land, its continuous recession, and the advance of American settlement westward, explains American development." The concept of a new frontier in the North American context was conceived as a westward-moving target that, in Turner's words, allowed for the transformation of "the primitive economic and political conditions of the frontier into the complexity of city life."[8] At the opposite end of the American continent, the concept of the colonial new frontier was defined as a gradual expansion inward, away from the urban settlements along the coasts and into the vastness of the Amazon basin. Also called the great "Hiléia," a name given by the eighteenth-century German naturalist Alexander von Humboldt,[9] the Amazon River basin, along with its possible connections to the Orinoco River basin to the northeast and the Paraná River basin to the south, defined a central territorial axis to be explored and exploited. Circumscribed by colonial cities—Spanish American along the Caribbean Sea and Pacific Ocean and mostly Portuguese American along the Atlantic Ocean—the South American coastline became the staging ground for a gradual expansion into the continent's interior. A terra incognita of sorts, it was loosely divided by the Treaty

of Tordesillas (1494), which charted an ambiguous imaginary north–south line, deep into the continent, that attempted to separate Spanish America from Portuguese America. Visited by conquistadores, expeditioners, geographers, religious missionaries, and gold-seekers, this vast inner territory beyond the coastal ring of colonial cities has been, throughout the last five hundred years, South America's expanding frontier. In the development of this extraction frontier, the major urban and metropolitan centers that circumscribed the continent's edge—Buenos Aires, Caracas, Guayaquil, Rio de Janeiro, and São Paulo, among many others—became the main political and economic hubs for each nation, acting as the midpoints between resources in the interior and global markets across the ocean. This confluence of geography and economic ambition made the interior of the continent into an abundant site of intense resource extraction, establishing a unidirectional flow in which resources were tapped in the interior, transported to the continent's edge, and shipped to markets overseas.

Writing in his book *Sudamerica: Pasado y presente* (1906), the Uruguayan geographer Luis Cincinato Bollo claimed that "the future of the grand commercial route of South America is the canal." This bold pronouncement channels the findings of an experimental study conducted by the British

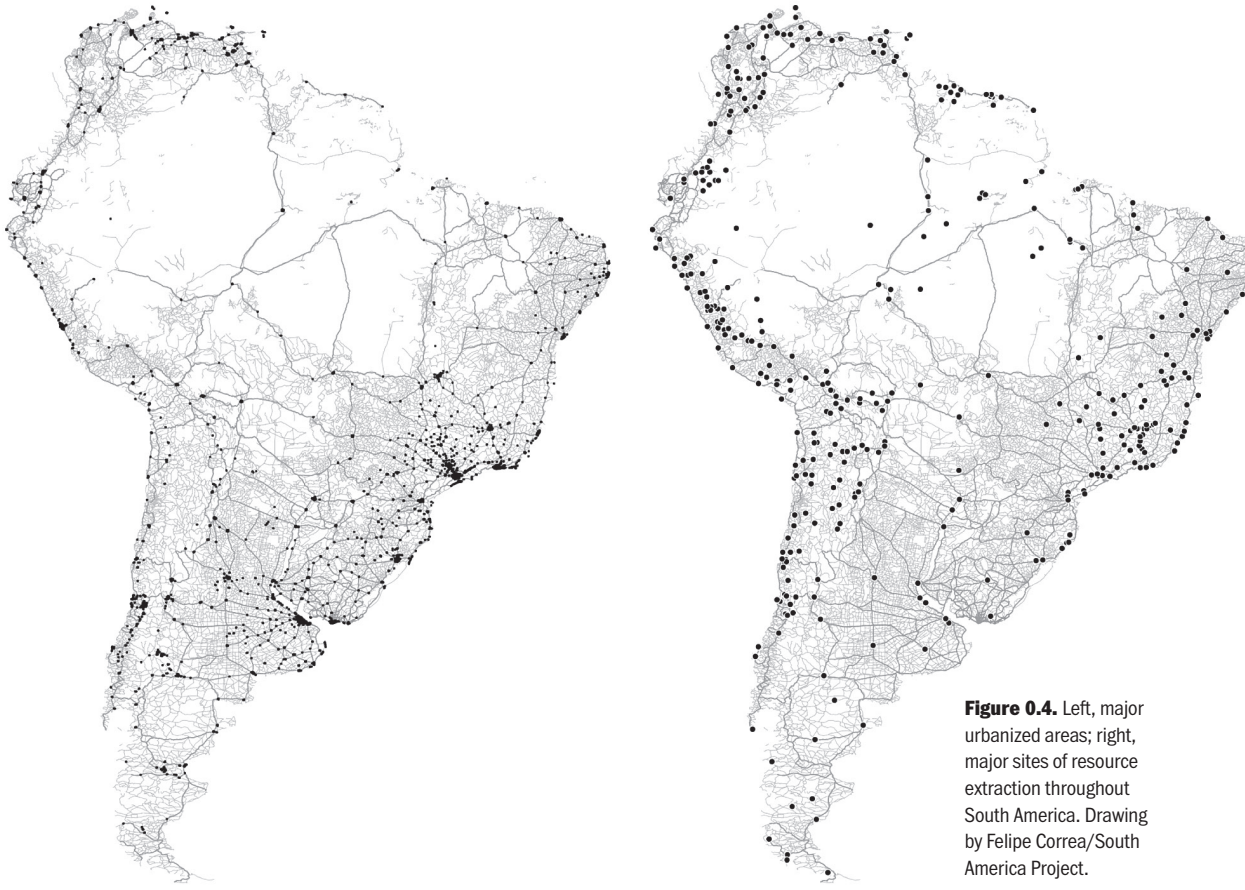
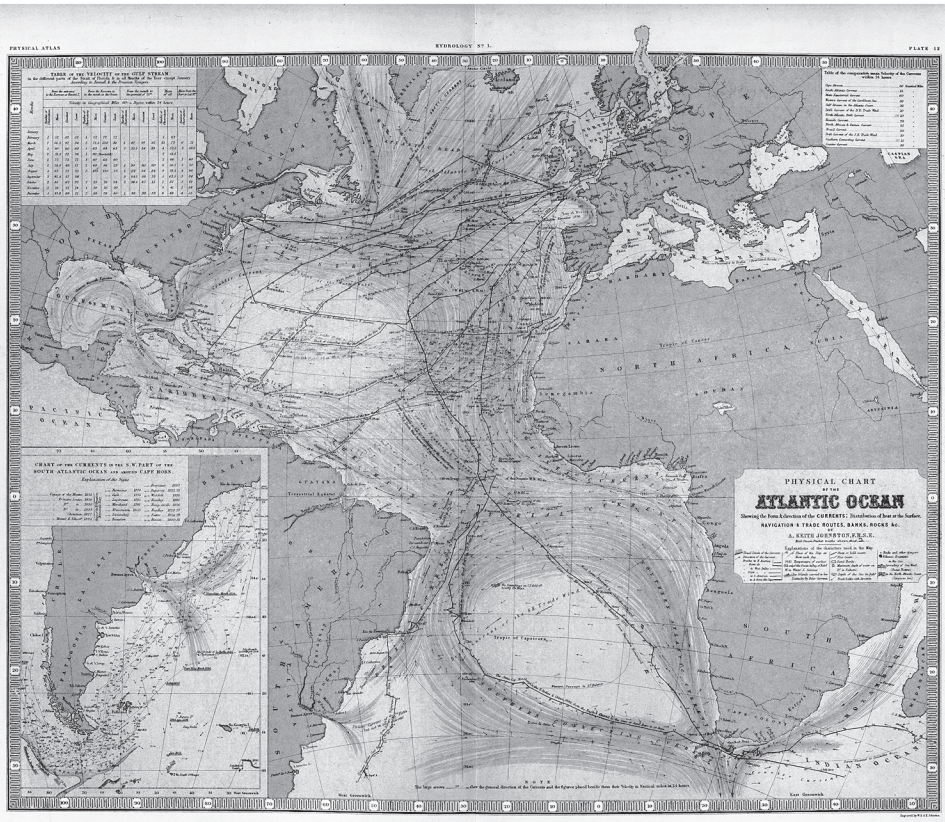
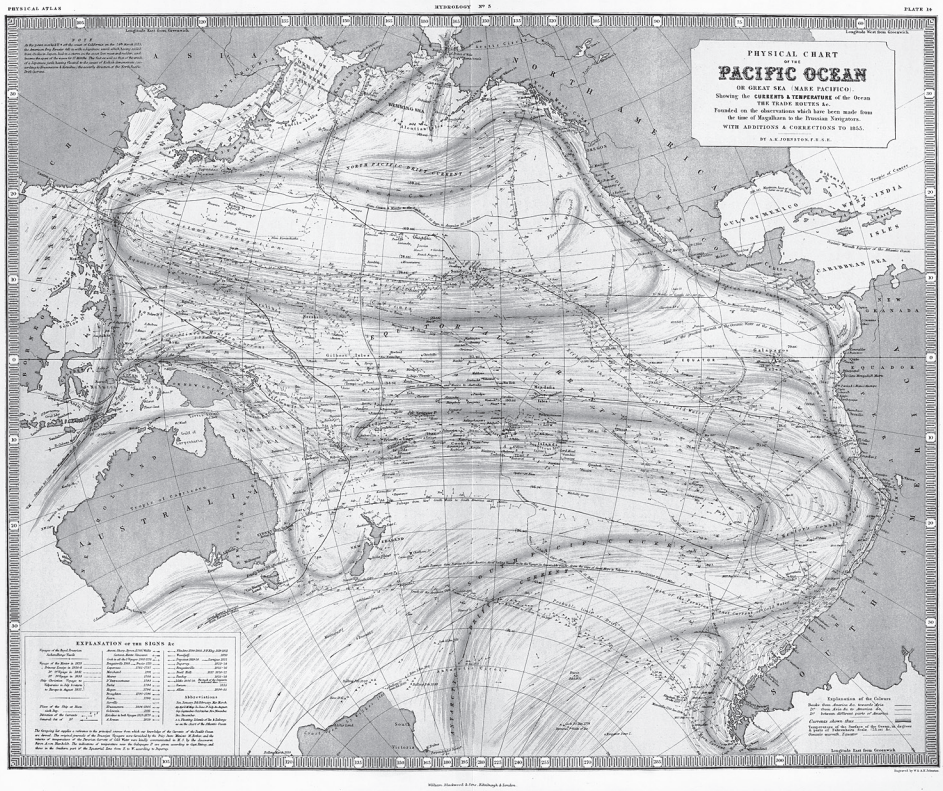


Figure 0.4. Left, major urbanized areas; right, major sites of resource extraction throughout South America. Drawing by Felipe Correa/South America Project.



William Blackwood & Sons, Edinburgh & London.



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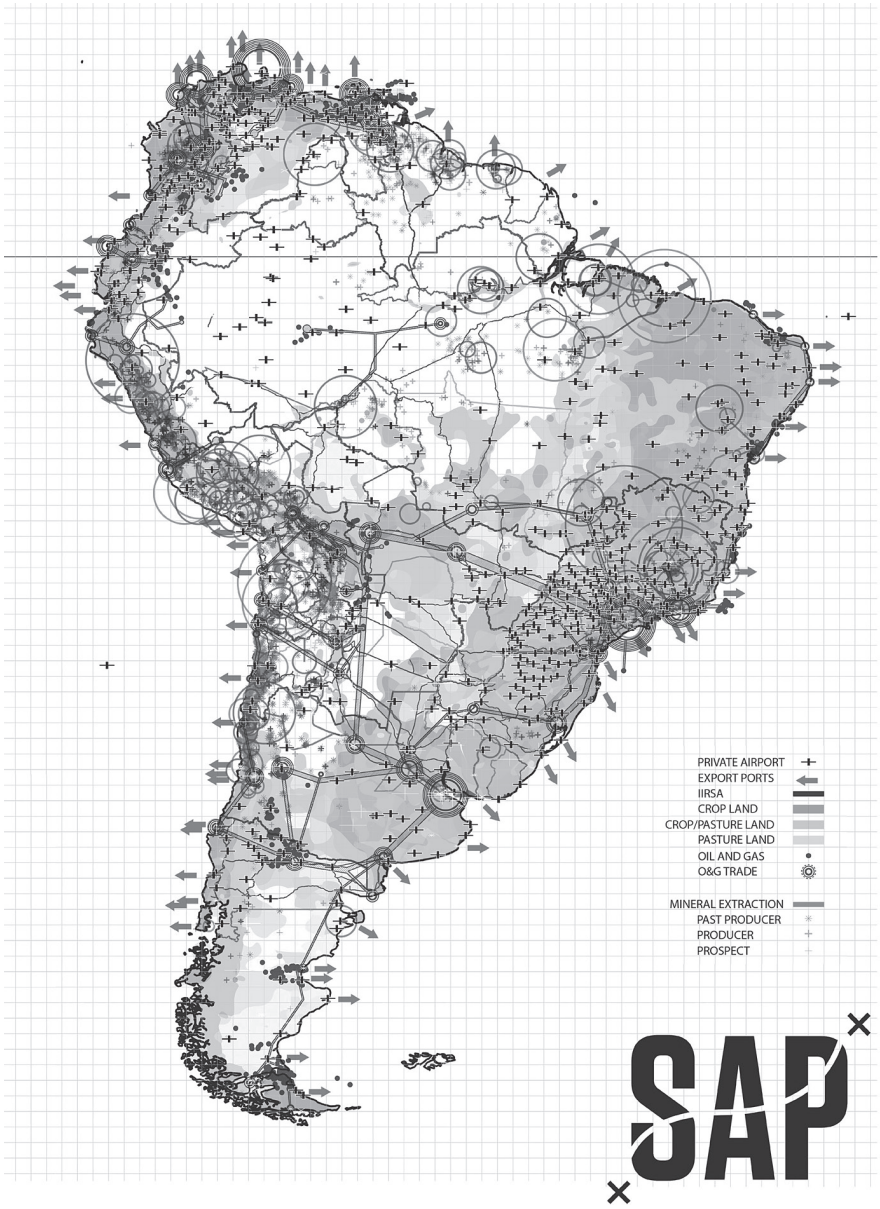

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Figure 0.5. Maps of the Atlantic and Pacific Oceans showing trading routes and direction of the current (William Blackwood and Sons [Edinburgh, 1856]). The maps visualize South America's strategic position between the two oceans and the continent's connectivity to the world. Courtesy of the David Rumsey Map Collection.

Figure 0.6. Map showing the major resources in the continent and their spatial relationships to port cities. Drawing by Felipe Correa/ South America Project.

geographer William Chandless in 1854[10] and a technical report by the Brazilian engineer José de Moraes in 1869[11] that suggested the possibility of constructing a grand commercial canal by linking the Orinoco, Amazon, and Paraná Rivers—a piece of infrastructure that would allow for continuous navigation from Buenos Aires and Montevideo to the Orinoco Delta in the northern part of the continent. A concept endorsed, supported, and studied by many throughout the nineteenth and twentieth centuries, the canal idea even drew the attention of the Argentine president Domingo Faustino Sarmiento (1811–1888), who, during his term, commissioned a feasibility study of the subject.[12] The South American counterpart to the

Erie Canal, it was to be geared toward the expeditious transportation of resources for national and international markets. While never implemented, the notion of the grand South American canal signified a major change in the perception of the continent's interior. This expansive territory gradually shifted from a land of surveys and explorations into a vast hinterland, rich in natural resources, which had to be domesticated and put to work. The five case studies selected for this book also share the spirit of modernity embedded in the idea of the canal, primarily the perception of the continent's interior as a productive hinterland that could be tamed through infrastructure and urbanization. Further, they portray an arc of diverse ideas regarding the role of the city, in a variety of experimental forms, as an essential component in the extraction of resources and the redefinition of the South American hinterland from the late 1890s until the 1960s, a period of intense nation building throughout the continent. The case studies in the volume begin with the consolidation of the Latin American republics (1880–1910), followed by the import substitution period (1930s), and the rise of developmental planning (1950–1960).

Chapter 1, "A Regional Capital: Belo Horizonte," examines the planning and construction of this late nineteenth-century interior capital city. Planned in 1893 by the engineer Aarão Leal de Carvalmo Reis and built from scratch in the Brazilian state of Minas Gerais, rich in gold and iron ore, Belo Horizonte represented a new set of social and cultural ambitions that broke away from those proffered by the established elites along the Atlantic coast. Advocated by wealthy local industrialists and envisioned as an experiment of political innovation during Brazil's early republican era, this instant capital, built over the course of four years, became a new political and economic symbol realized through a progressivist plan. In addition to extending the national rail, modern Belo Horizonte was tasked with inscribing a new administrative and commercial center within the interior of this highly productive hinterland. The first Brazilian capital to be designed and built as such, Belo Horizonte served as an incubator for many of the design ideas which would later materialize in the new national capital, Brasília.

Chapter 2, "A Mining Town Constellation: María Elena," explores the urban models associated with the extraction of natural nitrate in northern Chile in the late nineteenth and early twentieth centuries, developments which shaped a constellation of cities and towns along the Atacama, one of the driest and most barren deserts on earth. This chapter tracks the urban and infrastructural characteristics of an expansive regional network composed of port cities, mining camps, railroad towns, and oases that linked the Pacific Ocean with the western edge of the Andes mountain range so as to facilitate the extraction of nitrate and its distribution across the globe. In addition, this chapter also singles out the spatial dimension of the autonomous nitrate extraction towns, or *oficinas salitreras*, as they were known locally. Exemplified by the town of María Elena, the *salitreras* were a series of experimental resource extraction cities sited in the middle of the desert to accommodate miners and their families—a set of provisional utopias

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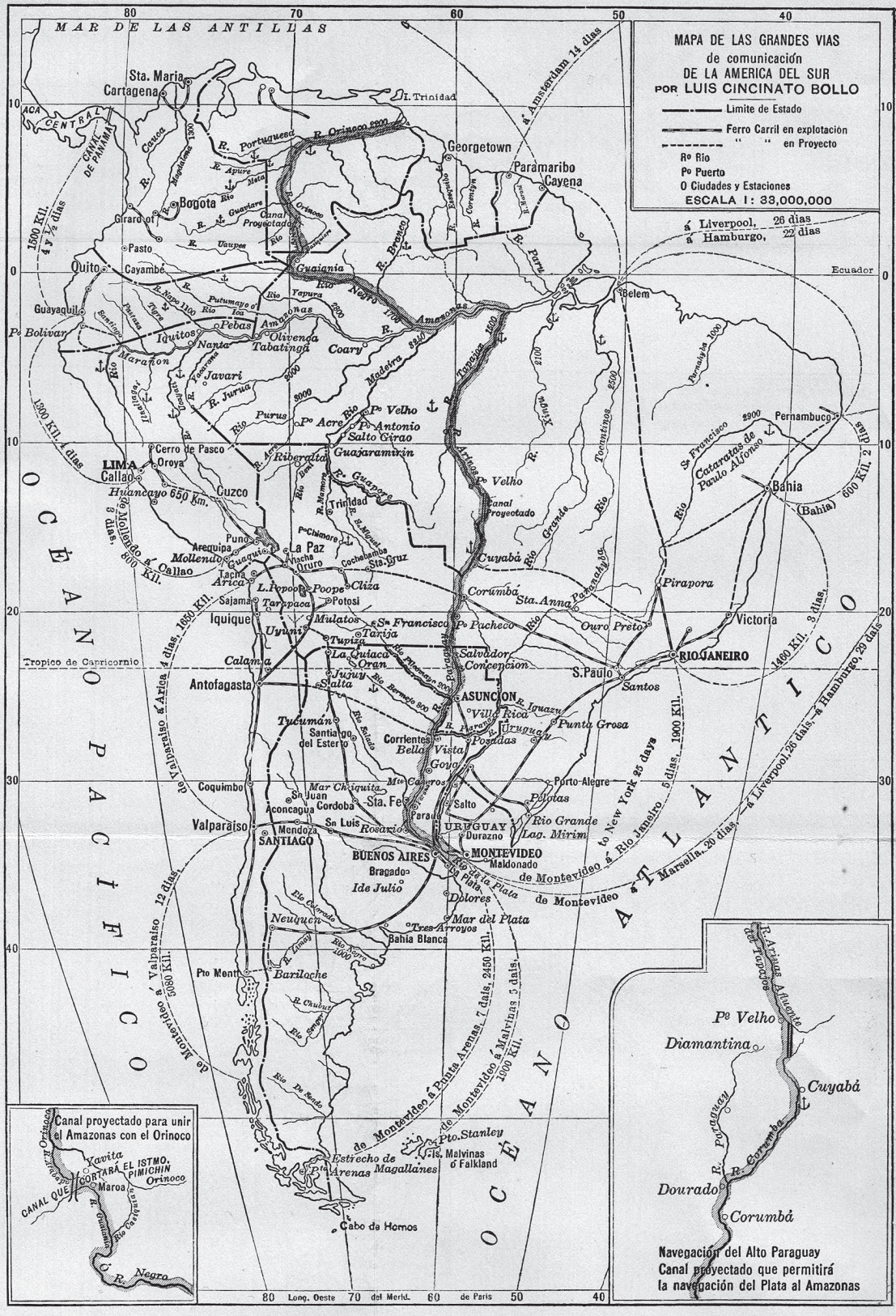
Figure 0.7. Map of the major communication routes of South America highlighting the proposed South America canal. From Luis Cincinato Bollo, *South America, Past and Present* (New York, 1919).


MAPA DE LAS GRANDES VIAS
de comunicación
DE LA AMERICA DEL SUR
POR LUIS CINCINATO BOLLO
Limite de Estado
Ferro Carril en explotación
" " en Proyecto
Rº Rio
Pº Puerto
O Ciudades y Estaciones
ESCALA I: 33,000,000
MAR DE LAS ANTILLAS
OCEANO PACIFICO
OCEANO ATLANTICO
Sta. Maria
Cartagena
I. Trinidad
Georgetown
Paramaribo
Cayena
Bogotá
Girardot
Pasto
Quito
Cayambé
Guayaquil
Iquitos
Pebas
Nauta
Olivenca
Tabatinga
Coary
Tefé
Belem
Ecuador
Perú
Bolivia
LIMA
Callao
Oroya
Cerro de Pasco
Huancayo 650 Km.
Cuzco
Puno
Arequipa
Mollendo
Arica
Tacna
Iquique
Calama
Antofagasta
Tropico de Capricornio
Valparaiso
Coquimbo
Aconcagua
Mendoza
SANTIAGO
Riberalta
Guajaramirin
Pº Velho
Pº Antonio
Salto Girao
Pº Acre
Trinidad
Pº Chimore
La Paz
Oruro
Cochabamba
Sta. Cruz
L. Popoo
Poopo
Cliza
Tarapaca
Potosi
Mulatos
Tarija
Tupiza
La Quiaca
Oran
Jujuy
Salta
Tucumán
Santiago del Estero
Sn Juan
Sn Luis
Cordoba
Sta. Fé
Rosario
BUENOS AIRES
Bragado
Ide Julio
Neuquen
Bahia Blanca
Tres Arroyos
Mar del Plata
Dolores
Maldonado
MONTEVIDEO
Durazno
URUGUAY
Rio Grande
Lag. Mirim
Porto Alegre
Pelotas
Rio Grande
Pto Monti
Bariloche
Pto. Stanley
Is. Malvinas ó Falkland
Estrecho de Magallanes
P. Arenas
Cabo de Hornos
ASUNCION
Villa Rica
Punta Grosa
Uruguay
Posadas
Corrientes
Bella Vista
Goya
Mte Caseros
Cuyabá
Corumbá
Sta. Anna
Pacheco
Salvador
Concepcion
S. Paulo
Santos
RIO JANEIRO
Victoria
Pirapora
Ouro Preto
Bahia
Pernambuco
Cataratas de Paulo Alfonso
Canal proyectado
Canal proyectado para unir el Amazonas con el Orinoco
Navegación del Alto Paraguay
Canal proyectado que permitirá la navegación del Plata al Amazonas
Pº Velho
Diamantina
Cuyabá
Dourado
Corumbá
Long. Oeste del Merid. de Paris
80
70
60
50
40
10
0
20
30

that brought a unique model of urban life to a landscape where it was once deemed impossible.

Chapter 3, "Petrol Encampments: Judibana and El Tablazo," expands on the evolution of the private oil extraction camp and its role in the urban development of western Venezuela. The material focuses on the camp as an autonomous enclave and the spatial problems and conflicts this typology created between private industry and the Venezuelan government. Further, the chapter discusses the transition from private camps to "open cities" and the diverse urban aspirations embedded in this shift that are exemplified in two key projects. The first project is the new town of Judibana, a public-private partnership between Creole Petroleum and the government of Venezuela. The second is the government-sponsored industrial town of El Tablazo, a project responsible for etching a new urban identity along the western edge of oil-filled Lake Maracaibo. Both projects exemplify crucial instances where government and industry came together to negotiate the conflicting pressures of a rapidly transforming extractive landscape.

Chapter 4, "A New Industrial Frontier: Ciudad Guayana," explores the urban transformation of Venezuela's remote Guayana region throughout the 1960s. It traces the region's shift from an economically depressed area into a new national center of industry. Fueled by the discovery of large deposits of iron ore, Guayana, south of the Orinoco River, became the most ambitious regional planning project in Venezuela's history. Crucial to the regional agenda and to this chapter is the implementation of Ciudad Guayana, a city designed by international experts from the Joint Center for Urban Studies of the Massachusetts Institute of Technology and Harvard University. The team responsible for Ciudad Guayana was tasked with elevating a fast-growing industrial town into a city that could act as a national symbol of economic development and progress. This chapter charts the affinities and incongruences between the urban vision conceived by the team in Cambridge and the implications of their actions as realized along the banks of the Orinoco River.

Chapter 5, "Pioneering Modernity: Vila Piloto," surveys the transformation of the southern Paraná River basin throughout the second half of the twentieth century into a continuous chain of dams and reservoirs intended to provide energy to a rapidly growing national industrial sector in need of a steady source of electricity. This chapter focuses on the conception and implementation of Vila Piloto, an experimental temporary city designed to accommodate workers and their families during the construction of the Jupiá Dam. It further expands on a series of projects that followed in Piloto's wake, from temporary encampments and permanent towns to the upgrade of existing settlements. In doing so, the material in this chapter positions the city at the epicenter of a much larger set of regional strategies—a collection of plans and studies across a range of scales, where architectural form was guided by territorial surveys in order to bring modernity to south-central Brazil.

Organized as discrete case studies, the five chapters examine the specific design principles and spatial aspirations behind each project, framed by a broader overview of the territorial, political, and economic contexts that facilitated or hindered their implementation. While the book is structured through its case studies, it also presents a series of themes that, in varying degrees of intensity, traverse these projects. In each case, however, the *city*, in its multiple conceptions and forms of existence, is seen as a critical site for experimentation and social improvement. From the positivist plan for Belo Horizonte to the transplantation of early American suburbs to western Venezuela, the city becomes a highly choreographed backdrop for new forms of urban life. In addition, the idea of implementation forms another important thread across the projects. From the militaristic deployment of the *oficinas salitreras* across the Atacama Desert to the limited development of the petrochemical plant component of El Tablazo, all of the examples presented herein have been executed within a variable range of completion. The book's foregrounding of built projects allows for a more intricate study of the ways in which diverse social, political, and economic pressures helped shape, realize, or restrain the concepts behind each specific urban model. This emphasis on implementation also enables an examination of the afterlives of these developments with an eye toward the future.

Ideas of reception and translation are also of consequence in this study. From the humanist utopias of the Renaissance to the social utopias of the nineteenth century, the powerful image of the city as a singular entity viewed in light of its capacity to create a new social order had a significant impact in the construction of the South American hinterland. Traits exemplified in Vincenzo Scamozzi's ideal military cities and Robert Owen's ideal village, among others, are clearly visible in Belo Horizonte, María Elena, and Vila Piloto. Yet, in the translation of these seventeenth- and nineteenth-century ideas across the Atlantic, their implementation in brand new political and economic contexts, and their cross-pollination with "garden city" concepts and planned decentralization theories, the inheritance yielded contrasting results.

The last thread shared by the projects under consideration is the exchange of concepts and technical expertise across continents and cultures. From inspirational references such as Washington, DC, in the case of Belo Horizonte to the direct involvement of the American architecture office Skidmore, Owings & Merrill in the design of Judibana, knowledge transfer and institution building was integral to the larger mission of these projects. Many such exchanges led not only to the migration of contemporary spatial and aesthetic models to South America but also to the creation of new institutions that would not only construct but also manage these new resource extraction cities and landscapes. A prime example of the latter can be seen in the Tennessee Valley Authority's role in the development of a parallel institution, the Comissão Interestadual da Bacia Paraná-Uruguai, for the construction and management of a new hydroelectric landscape in south-central Brazil. Elsewhere, in the case of Chile's nitrate

cities, the shift from British to American investment and extraction technology had a profound effect on the physical and experiential identities of these desert resource extraction towns, illustrating how global markets left a definite imprint on the built environment of the Atacama Desert. Finally, many of these projects also served as testing grounds for the incubation of urban development strategies that later could be generalized as more widespread policies and could encourage the formation of national and international development institutions. Ciudad Guayana is a case in point. There, the work developed by the Joint Center for Urban Studies alongside CORDIPLAN, Venezuela's national planning agency, was crucial to the creation of President John F. Kennedy's Alliance for Progress, an economic development program that guided the implementation of national planning agencies throughout Latin America.

The twentieth century witnessed a substantial proliferation of resource extraction urbanism across the globe, with many of the resulting towns and facilities still in operation today. Nonetheless, this phenomenon has been particularly prevalent in South America where it was long marshaled to reinforce the region's enduring tradition as a major provider of natural resources to the world. By virtue of its regional focus, the book necessarily addresses only a small fraction of this expansive enterprise. Rather than being encyclopedic, the book intends to provide a concentrated arc of examples as evidence of the richness and diversity of the spatial models brought by architects and planners in the molding of comparable state-sponsored urban development projects driven by the demands of resource extraction. This book is primarily about the legacy of urban design ideas and how these concepts confronted the pressures of governments and economies in order to shape modern life in the South American hinterland. Further, the text and images that mark the pages that follow are a reflection on a series of projects that carried the weight and responsibility of action. In revisiting their task, this book aims to identify and refine approaches through which to reposition the role of the architect-planner in the urbanization of contemporary landscapes of resource extraction.

1

A Regional Capital

Belo Horizonte

Planned in the last decade of the nineteenth century under the influence of French positivist thought and built by an elite class of miners and coffee growers right in the center of the Minas Gerais province (later state), Belo Horizonte would become one of the most visible emblems of a modern social order to which Brazil's newly established First Republic aspired. Conceived in 1893, the plan sought to conceptualize the city as a rational entity that emerged from the needs for hygiene and traffic management. The proposed city would serve both as an experimental spatial template for social and political innovation in the country as well as a symbol of economic progress that could reorganize the agricultural and mining economies of Minas Gerais. In plan and execution, Belo Horizonte ushered in—as its name, "beautiful horizon" suggests—a new model of city making in Brazil that redefined the role of the city as a political and economic staging ground for the rearticulation of the country's vast hinterland.

Briskly constructed over the course of four years, Cidade de Minas was inaugurated in 1897 (it would be renamed Belo Horizonte in 1906), replacing the quaint town of Ouro Preto as the capital of Minas Gerais. From the beginning, the city sketched the framework for a major territorial restructuring of the Brazilian interior that would set into action the most important city-building enterprise in Brazil's republican history. Endorsing the idea of the new city as a unified entity, Belo Horizonte became an eminent symbol of progress in the republican era, a vision that was later reinforced throughout the nation, most notably in the design and construction of Goiânia in the 1940s and Brasília in the 1950s. In this context, Belo Horizonte became the archetype for the second cycle of designed cities that dotted the South American landscape in early postcolonial times.[1] Along with La Plata, Argentina, its Spanish American counterpart, it set the tone for

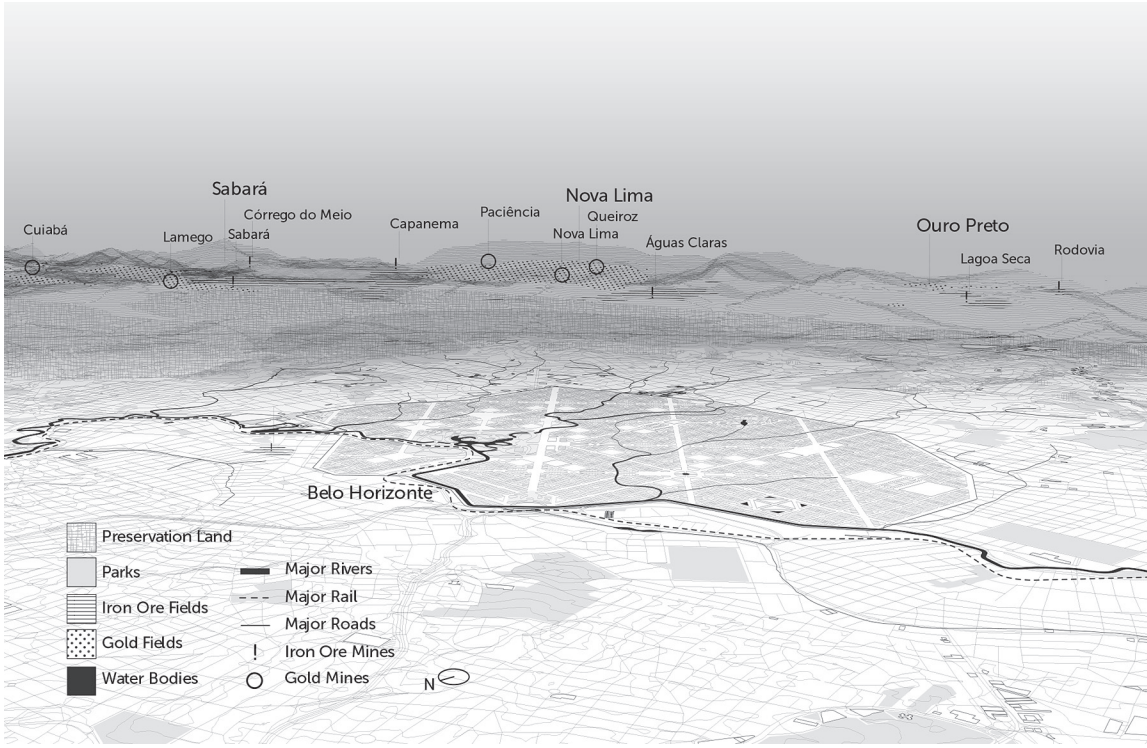


Figure 1.1. Contemporary bird's-eye view of Belo Horizonte with topography and resources on the background. Drawing by Felipe Correa.

how positivist thought[2] might be brought to bear on the conceptualization of urban plans for the region.

The Origins of a New Regional Capital

The desire to replace Ouro Preto as the capital of Minas Gerais dates back to the late eighteenth century. Founded in the late 1600s as a mining camp, this small regional capital became the epicenter of the Portuguese American gold rush. Built within a complex topography with limited connections to the rest of the province and the coast, this small capital town consolidated, throughout the 1700s, the greatest concentration of Portuguese wealth in the Americas. Across the first half of the eighteenth century, Ouro Preto, also known colloquially as Villa Rica (rich village), amassed a powerful mining elite and became a significant economic and cultural counterpoint to the littoral economies of Rio de Janeiro and São Paulo. Yet, the sudden decline of gold mines in central Minas Gerais in the latter part of the eighteenth century placed Ouro Preto in extreme economic decline, triggering a territorial disarticulation at the scale of the province that defined the need for a new symbolic center for the region. Minas Gerais, once dominated by a singular industry—gold—had throughout the 1800s significantly diversified its economy. The northern portion of the province had focused on cattle ranching while the southern regions of Mata and Sul had become substantial producers of coffee, establishing stronger connections to the Brazilian capital—Rio de Janeiro, at the time—and to the burgeon-

ing economy of São Paulo, a frontier town that was rapidly flourishing as a commercial hub for coffee growers.[3] By the 1890s, the newly minted "state" of Minas Gerais relied primarily on taxes collected from coffee revenue in the south, shifting the balance of power from the time-honored miners to a new agrarian elite. This evident slump of the state's economy paired with additional revenue brought by the proclamation of the First Brazilian Republic in 1889 instigated southern industrialists to revisit the idea of a new capital for Minas Gerais and to conceptualize the idea of a showcase city that could effectively represent a new economic and social order for the region.[4] They wagered that the formation of a new center could guarantee the unity and progress of the state by reshuffling the economy of Minas Gerais's hinterland away from the neighboring markets of Rio de Janeiro and São Paulo and into an economic hub of their own. By 1890, while arguments about location and specifics regarding a new city were at an all-time high, the mining elites of Ouro Preto and the new coffee entrepreneurs of the southern regions agreed on the need for a new state capital, paving the way for the first substantial city-making experiment in Brazilian history.

In the transition of Brazil from empire to republic, power shifted from Rio de Janeiro to the state capitals, giving Minas Gerais significant political and economic sovereignty. State governments gained the ability to control former imperial land and levy export taxes and the power to borrow and negotiate bonds overseas.[5] Paired with the desire of *mineiro* elites to modernize the region, this new access to political power and financial resources facilitated the construction of the new capital under the stewardship of Afonso Pena (1847–1909),[6] who was elected governor of the state in 1891. As Senator Gomes H. Freire de Andrade would state in a congressional address, "with these new political and economical conditions, we can create for Minas, a new model capital; a great destination in the Brazilian union, rich, populous and beautiful."[7] Through a political figure–designer alignment similar to that of Juscelino Kubitschek and Oscar Niemeyer in Brasília seventy years later, Afonso Pena and Aarão Reis were the key figures responsible for the materialization of Belo Horizonte. Pena, a lawyer by training, entered the Brazilian political scene quite early in his professional life, serving first as a representative of Minas Gerais in congress and later as secretary of war, agriculture, and justice in the decades prior to his governorship. It is perhaps during his time as part of the presidential cabinet that his obsession with a new capital that could reorganize the larger productive hinterland of Minas took shape. Upon his appointment, the new governor saw the necessity for a project that could give Minas a new lease on life, namely the construction of a city that would stand apart from the colonial overtones of Rio de Janeiro and São Paulo. Pena fully believed in the transformative effects that the inscription of a modernist plan could have in the interior of the country.

Pena recruited Aarão Leal de Carvalho Reis (1853–1936) to head the technical commission charged with advising congress on the best possible site for the new city. Reis, an engineer and mathematician raised in Rio de Janeiro, exemplified a progressive-minded urban elite committed to setting

the nation's path to modernization. Trained at the Politécnico do Rio de Janeiro, he was convinced of the unassailable power of engineering to construct the environment. Although associated with positivist thought and political reform in Rio,[8] Reis had served as an engineer in the Ministry of Agriculture under the then-minister Afonso Pena, the man who would a decade later retain him for the construction of Minas's new capital.[9] In debates that had waxed and waned for more than a century, Barbacena, Belo Horizonte, Juiz de Fora, Paraúna, and Várzea do Marçal were all sites that had been previously considered as possible hosts for a new capital. Reis immediately rejected Barbacena, Paraúna, and Juiz de Fora. The first two lacked sufficient water for a city of 200,000 inhabitants, and the third site's proximity to Rio de Janeiro was problematic from a competitive perspective. The two viable choices were Várzea do Marçal, where the state had significant landholdings, and Belo Horizonte, due to its relative flatness within the more extreme topography of the region. After a contentious vote in congress, the gently sloping hills of Belo Horizonte, then home of the remote village of Curral del Rey, became the site of choice. In less than four

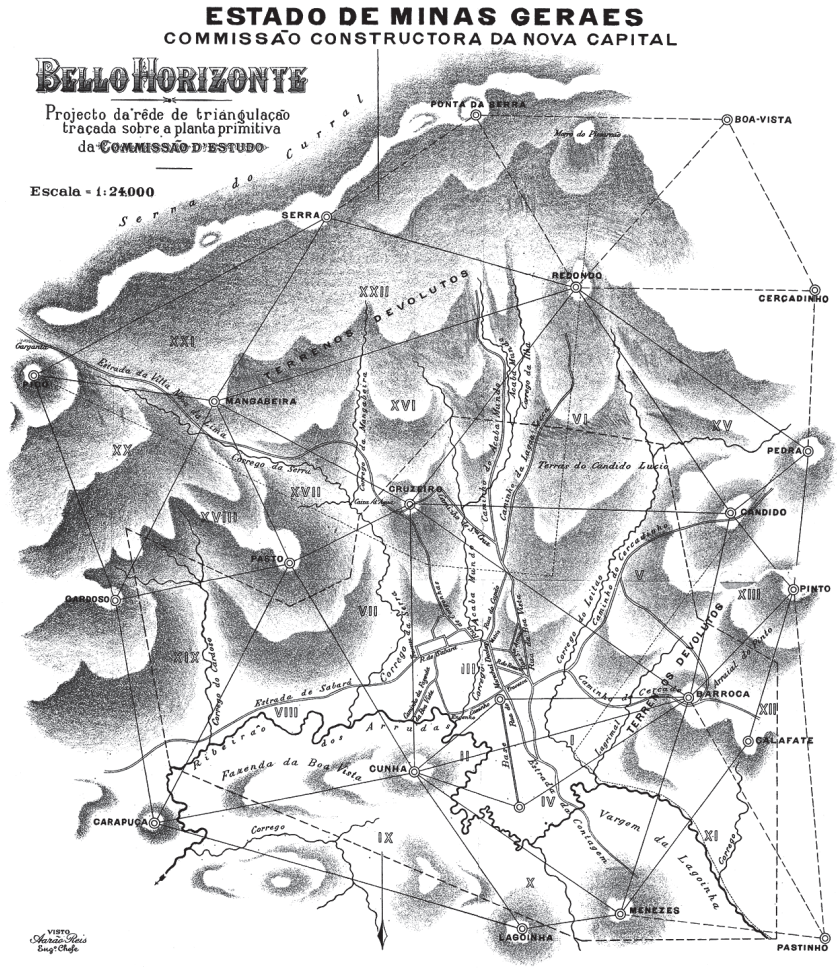


Figure 1.2. Triangulation study of the region prior to the construction of Belo Horizonte. The survey was used to calculate distances between towns, extraction sites, and the new capital. Courtesy of the Arquivo Público Mineiro.

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Figure 1.3. Plan of Belo Horizonte drawn by Aarão Reis in 1895. Courtesy of the Arquivo Público Mineiro.

ESTADO DE MINAS GERAES

PLANTA GERAL DA CIDADE DE MINAS

ORGANISADA

SOBRE A PLANTA GEODESICA TOPOGRAPHICA E CADASTRAL

DO

BELLO HORISONTE

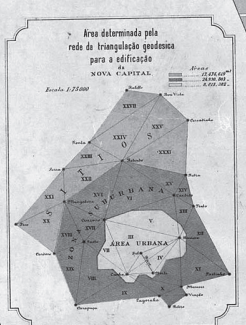
PELA

Commissaõ Constructora da Nova Capital

SOB A DIRECÇAÕ DO ENGENHEIRO CIVIL

AARAÕ REIS

e approvada pelo Decreto Nº 817 de 15 de Abril de 1895



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COMPANHIA DE ARTES GRAPHICAS DO BRAZIL-RIO DE JANEIRO.

years, and right before the end of Pena's mandate, a new monumental city was to be inscribed into the central landscape of Minas Gerais.

A Progressivist City Plan in Brazil

Faced with the challenge of designing a new city, Reis relied on a regularized urban grid enhanced with baroque city-making principles. His technical training, which forced him to rely on method, was also inspired by larger humanist utopias of the Renaissance along with the "systematic application of science to human affairs stressed by Auguste Comte," whose positivist philosophy was actively promoted in the final decades of the nineteenth century by elites in Rio de Janeiro who sought a progressive template for social order and material development. Comte, who coined the term "sociology" (social physics) in mid-nineteenth-century France, believed that all cultures advanced in three stages, namely the theological, metaphysical, and positive (provable knowledge). Positivism, with its focus on materialism and utilitarianism, gained favor at a time when the Catholic Church, the monarchy, and slavery were all seen as obstructing Brazil's social and material progress.[10] So impressed was Brazil with Comte's positivism, the country's government chose to adorn its national flag with the motto "Ordem e Progresso" (order and progress). Homologies between industrial progress, social order, and the form of the city abounded during this period of change.[11] The proposed plan for Belo Horizonte driven by traffic organization and hygiene acknowledged the efficiencies affiliated with orthogonal grids, yet it also banked on the monumentality of diagonals, the visual trope of forced perspectives, and the placement of monumental buildings along a major axis in order to construct a spatial framework of a scope and ambition adequate for a new capital.

While Reis was aware of the major urban expansion projects in Europe and the Americas throughout the nineteenth century—Baron Haussmann's avenues in Paris, Ildefons Cerdà's expansion of Barcelona, Torcuato de Alvear's construction of the Avenida de Mayo in Buenos Aires—it was Pierre L'Enfant's 1791 plan for Washington, DC, a gridiron with superimposed diagonals carefully fitted into the morphology of the Potomac River, that was the greatest reference for Reis and Belo Horizonte. While Paris, Barcelona, Mexico City, New York, and many city-building projects at the time were transformations and expansions of existing historic cores, the desires of Reis and of the First Republic resonated more with L'Enfant's tabula rasa approach. This offered a progressivist model that would yield a type of city in complete opposition to the more organic development of colonial cities along the coast.

This divide between colonial city models and the aspirations of the First Republic also relates to the different approaches to city planning in the Portuguese and Spanish Americas. The Spanish Crown made the legibility of the colonial city a priority, and the deployment of the urban grid was a crucial component of a colonization process in which almost one thousand towns, from major cities to remote villages, were founded within the tight

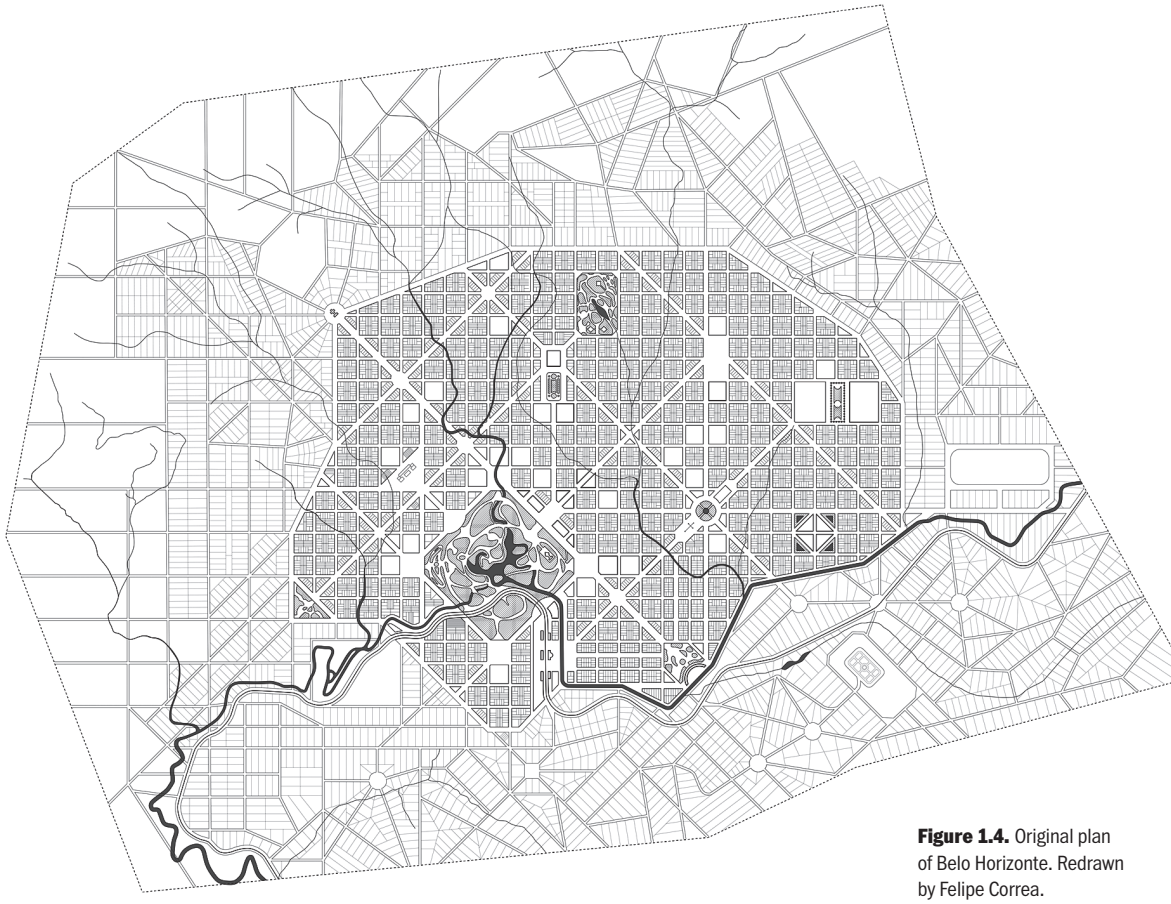


Figure 1.4. Original plan of Belo Horizonte. Redrawn by Felipe Correa.

strictures of the Laws of the Indies.[12] In opposition to the strategic inscription of the Spanish grid, the Portuguese relied more on the definition of a public space from which a more idiosyncratic network of roads extended outward, conforming to the contours of the land and establishing a less legible structure for urbanization. It is this feeble colonial city model that Reis reacted against, convinced that the power of engineering and methodical thought would give him new spatial order worthy of accommodating the ambitions of the First Republic.

Bound by the Curral ridge (Serra do Curral) and the Arrudas River, the plan drafted for Belo Horizonte was a balance between technical efficiencies and compositional beauty. Proposed as a city for two hundred thousand people, it was composed of three concentric areas: a clearly defined city center, a suburban zone, and a productive hinterland. Reis's main act in the plan, the city core, was composed primarily of two juxtaposed regular systems: an orthogonal grid with square blocks 120 meters in length, complemented by a maxi-grid placed at a 45-degree angle. This "diagrid" was meant to accommodate crosstown traffic while also serving to create the monumental effect typical of a diagonal within a gridiron. Reis set a clear hierarchy between the two grids. The orthogonal system was defined

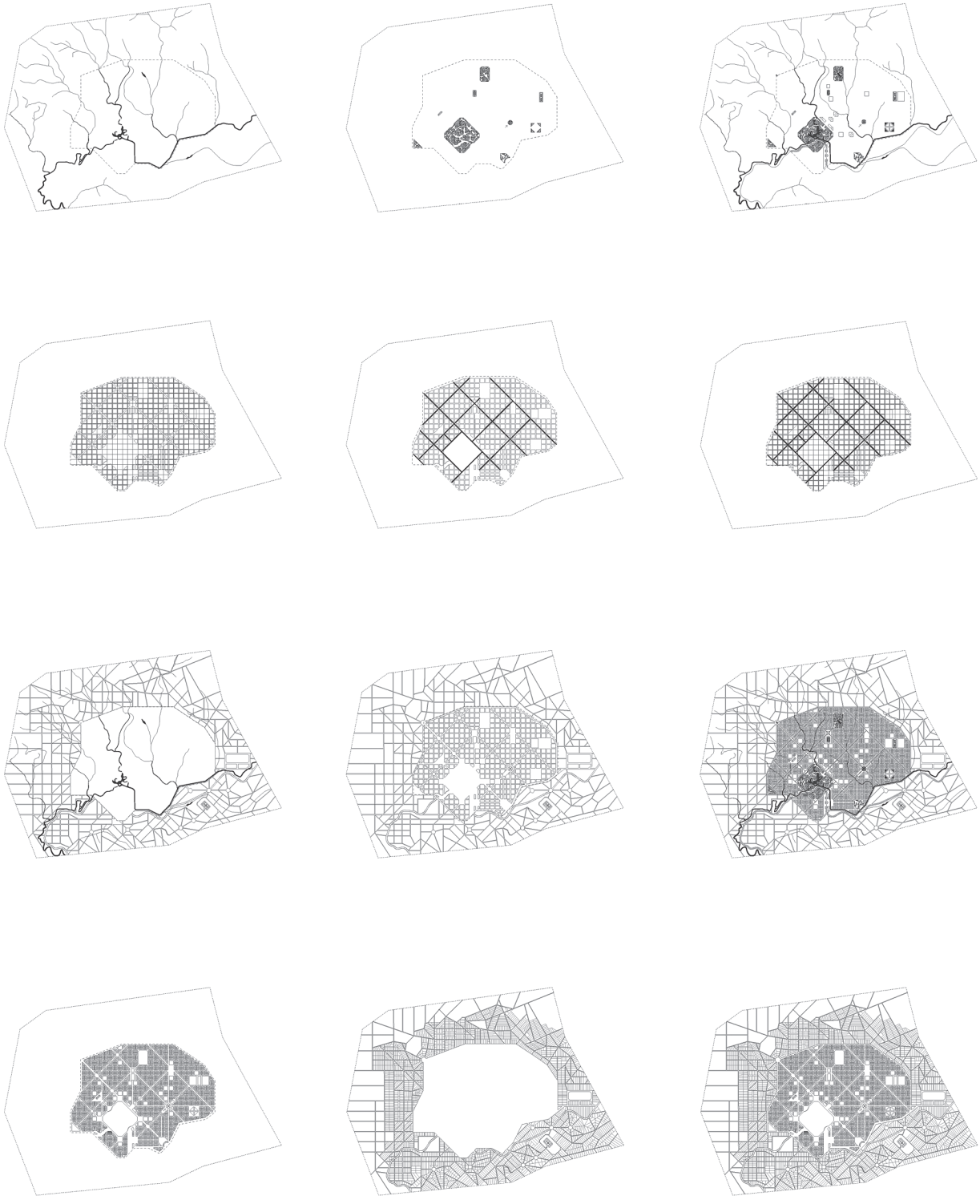
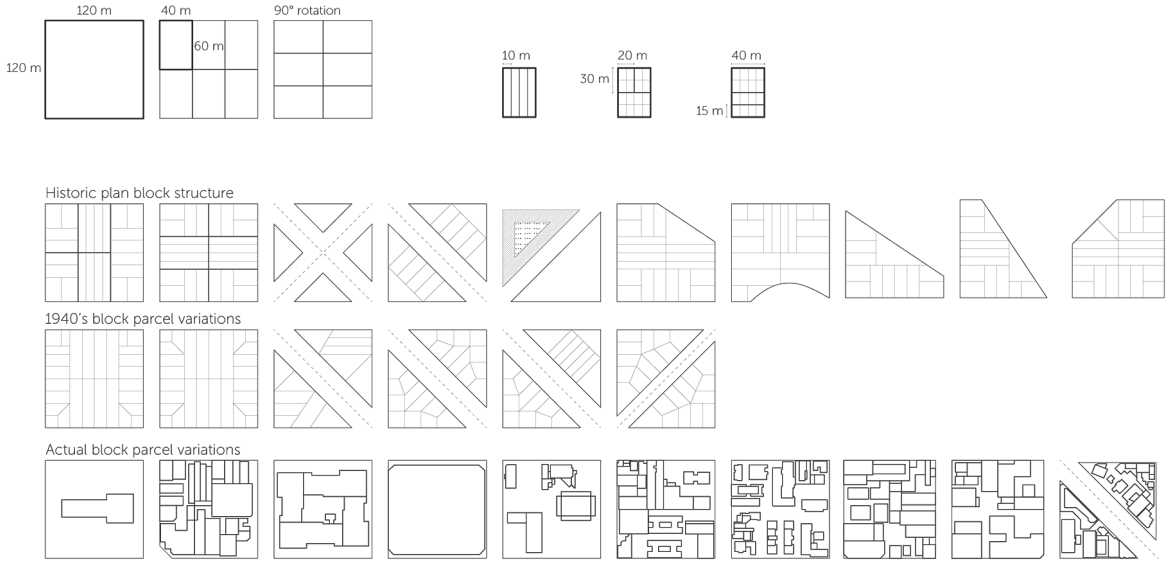
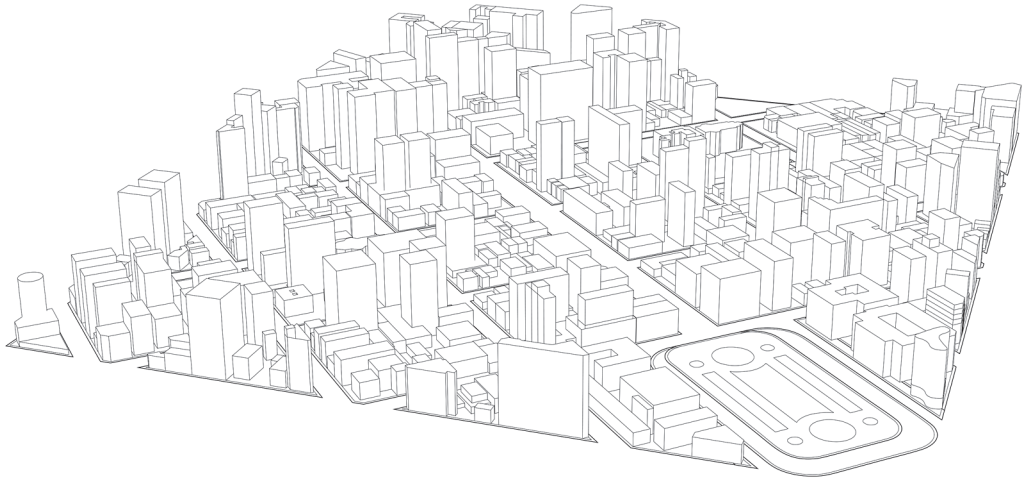


Figure 1.5. Original plan of Belo Horizonte showing the hierarchies of the grid and block structure. Drawing by Felipe Correa.





above

Figure 1.6. Study of the multiple block types that could emerge from the Belo Horizonte plan's original parcel structure. Drawing by Felipe Correa.

below

Figure 1.7. Axonometric study showing the diversity of building types that Belo Horizonte's original block and parcel structure could accommodate. Drawing by Felipe Correa.

by 20-meter intervals, while the maxi-grid was set at 35 meters, establishing a clear system of streets and avenues. A third element, a main boulevard 50 meters wide (later named for Afonso Pena), would link the city from its lowest to its highest point. The northern and lower end of the boulevard would terminate in a small park fronting the river, while the higher, southern end would house the civic center. Reis cleverly capitalized on the topographic discrepancy of the terrain in order to create a clear compositional axis and an impressive forced perspective. A collection of plazas and smaller-scaled parks further accentuated the checkerboard grid, creating secondary centralities within the plan. These points generally served as sites for important civic buildings throughout the city. In a direct manifestation of his reformist ambitions, Reis located the municipal cathedral and the congress at opposite sides of the main boulevard, asserting a clear separation between church and state.[13]

Conceived primarily as an open structure, the city grid was tightly circumscribed by Avenida do Contorno, a ring road defining the grid as an object within the undulating landscape of central Minas Gerais. Justified as an edge that would demarcate a difference in taxation rates, the perimeter road was conceived in a manner reminiscent of medieval glacis,[14] protecting the cultivated center from the lesser suburban zones and the adjacent hinterland. Only the geometries of water could bypass this formalized distinction between city and periphery. Driven by gravity, water did not respect the artificial order of the grid as it followed the path of least resistance toward the basin.

Given little attention in most literature about the city, the proposed subdivision of the 120-meter block was of critical importance to the structure and evolution of Belo Horizonte. The parcel structure designed by Reis allowed for a gradual fracturing of the block into six equal pieces measuring 20 by 40 meters. These were then further subdivided into smaller parcels with varying frontages and depths. A consistent 90-degree rotation of the basic block type throughout the plan allowed for a diversified street edge, creating nonsymmetrical rhythms along opposite sides of the streets.

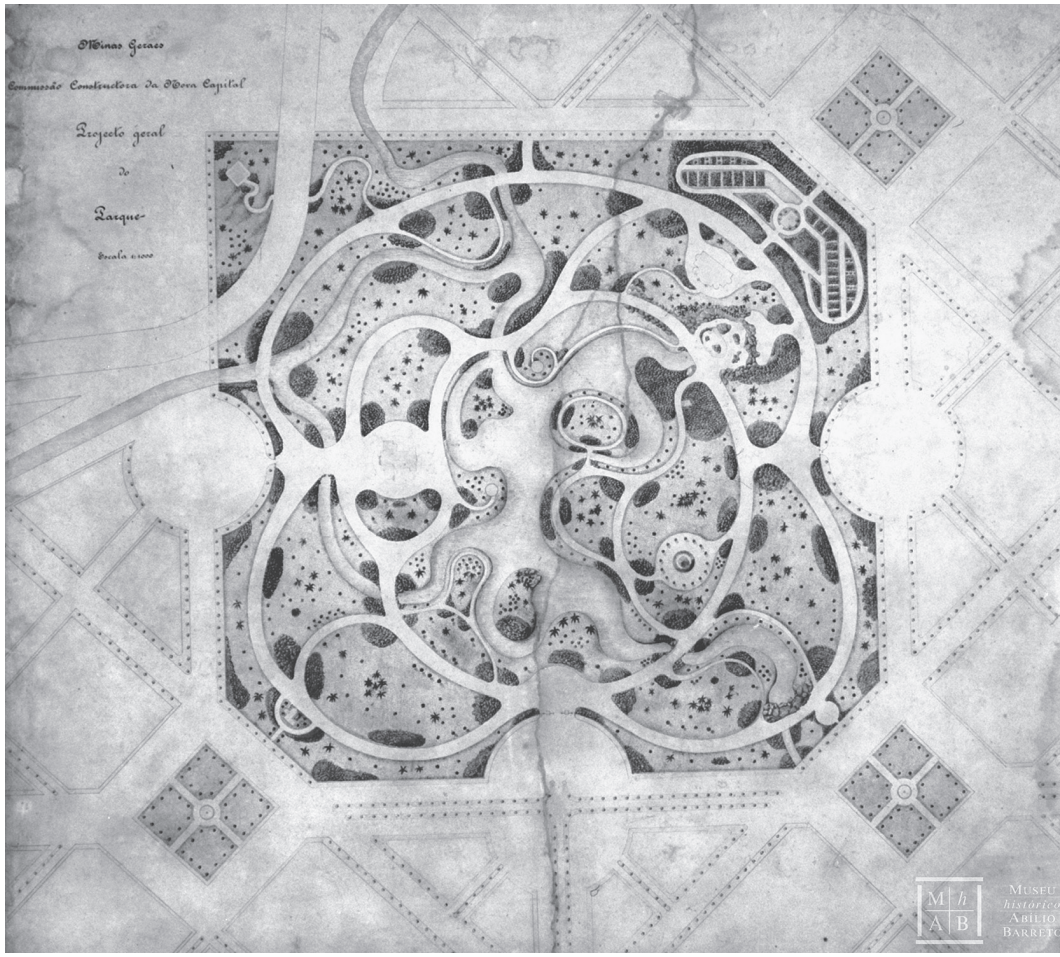


Figure 1.8. Plan of the proposed park by Reis and Paul Villon as part of the original Belo Horizonte plan. Courtesy of the Museu Histórico Abilio Barreto.

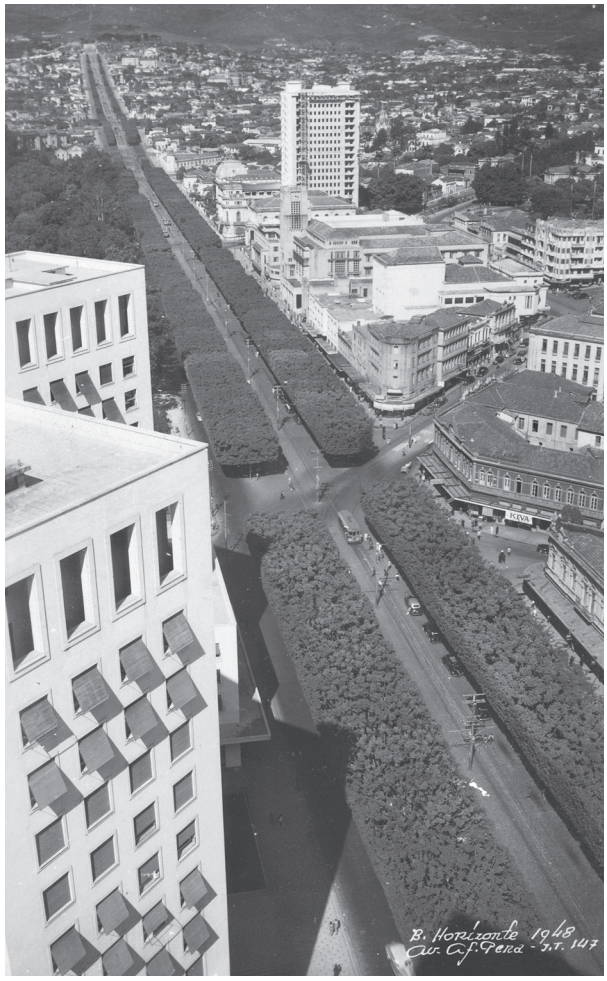


Figure 1.9. Photograph of Belo Horizonte taken above the Avenida Afonso Pena in 1948; the image shows how pollarded trees help accentuate the directionality of the diagonals. Photo owned by author.

While the subdivision template has been drastically altered over time, its elements are present throughout most of the blocks in the city center. It is only in the moments where the orthogonal blocks are cut by a diagonal that the parcel layout cannot adjust to the irregular geometry and the subdivision strategy becomes less effective.

The deliberate construction of nature played a pivotal role in the overall organization of the Belo Horizonte plan. Working in collaboration with the French landscape architect Paul Villon (1841–1905), Reis defined an 800-by-800-meter plot of land as the main city park. Located on the southeastern edge of the city in close proximity to the river, the park parcel was shifted from the diagonal grid in order to assume a position on an axis with Avenida Álvares Cabral. The proposed plan for the park existed in complete opposition to the harsh city geometries that surround it. It was conceived as a ludic space for metropolitan recreation where soft meanders paired with topographic shifts create a place in the city to escape the city. The river that for most of the plan occupies a peripheral space along the southern edge of the city was cast as a protagonist in the park. Here, the stream is pulled into

the central garden and co-opted by the drifting contours of Villon's park, then released back into its course. The role of landscape in contributing to the spatial quality of the city expanded far beyond the boundaries of the park. As in Paris, an enfilade of heavily manicured trees defined the edges of all major avenues. Over time, this element would become a significant visual landmark in the city. A 1950 article on Belo Horizonte in the *Baltimore Sun* stated, "The first thing that impresses visitors is the shape of the trees that line the avenues. Each tree is trimmed in such a way that forms a perfect square, and proud natives pointed out that this is undoubtedly the only city in the world that offers this sight."[15]

The suburban ring encasing the city center grid—a component of the plan that was less clear in its conceptual underpinnings and technical guidelines—was an attempt to create a bucolic setting that, through sharp differentiation, could highlight the primacy of the city center. Conceived as a lax mesh with selective points of contact with the core, the suburbs of Reis's Belo Horizonte were meant to accommodate country homes and small-scale orchards. This strategy followed a land use pattern that had successfully emerged in Rio and São Paulo in the early nineteenth century and would certainly have been known to Reis.[16] The plan called for nimble, irregular streets that adapted to the steeper topography outside the city core. Street widths were intentionally limited to 14 meters in order to preserve the arcadian atmosphere of the ring. Reis envisioned a series of service roads across fields, the slenderness of each road to be dissolved by the expansiveness of the open landscape. It was a concept that was rapidly abandoned due to the arrival of the car and urban migration in the first half of the twentieth century.

La Plata: Belo Horizonte's Older Sister

Of critical importance to the conception and early development of Belo Horizonte was the influence of its slightly older sister, the city of La Plata, implanted in the province of Buenos Aires only a decade earlier. Political conflict between the Argentine federal government and the province of Buenos Aires resulted in the designation of Buenos Aires as an autonomous district and the creation of an ideal city that would serve as capital for the province. Founded in 1882, La Plata became that ideal plan, located sixty kilometers from Buenos Aires in the heart of the province. Pedro Benoit (1836–1897), an architect and engineer who had previously worked for the city of Buenos Aires, led the team that would draft the plans for La Plata, a perfect square with an orthogonal grid containing thirty-six blocks on each side cut by a system of diagonals that provided the compositional framework for the disposition of institutional buildings within the general city fabric. An exercise that revisited the classic grid layout of the Spanish American city by introducing the principles of the progressivist model,[17] La Plata received incredible acclaim in Europe, obtaining the grand prix at the Paris Universal Exhibition in 1889 and being labeled as the city of Jules Verne.[18]

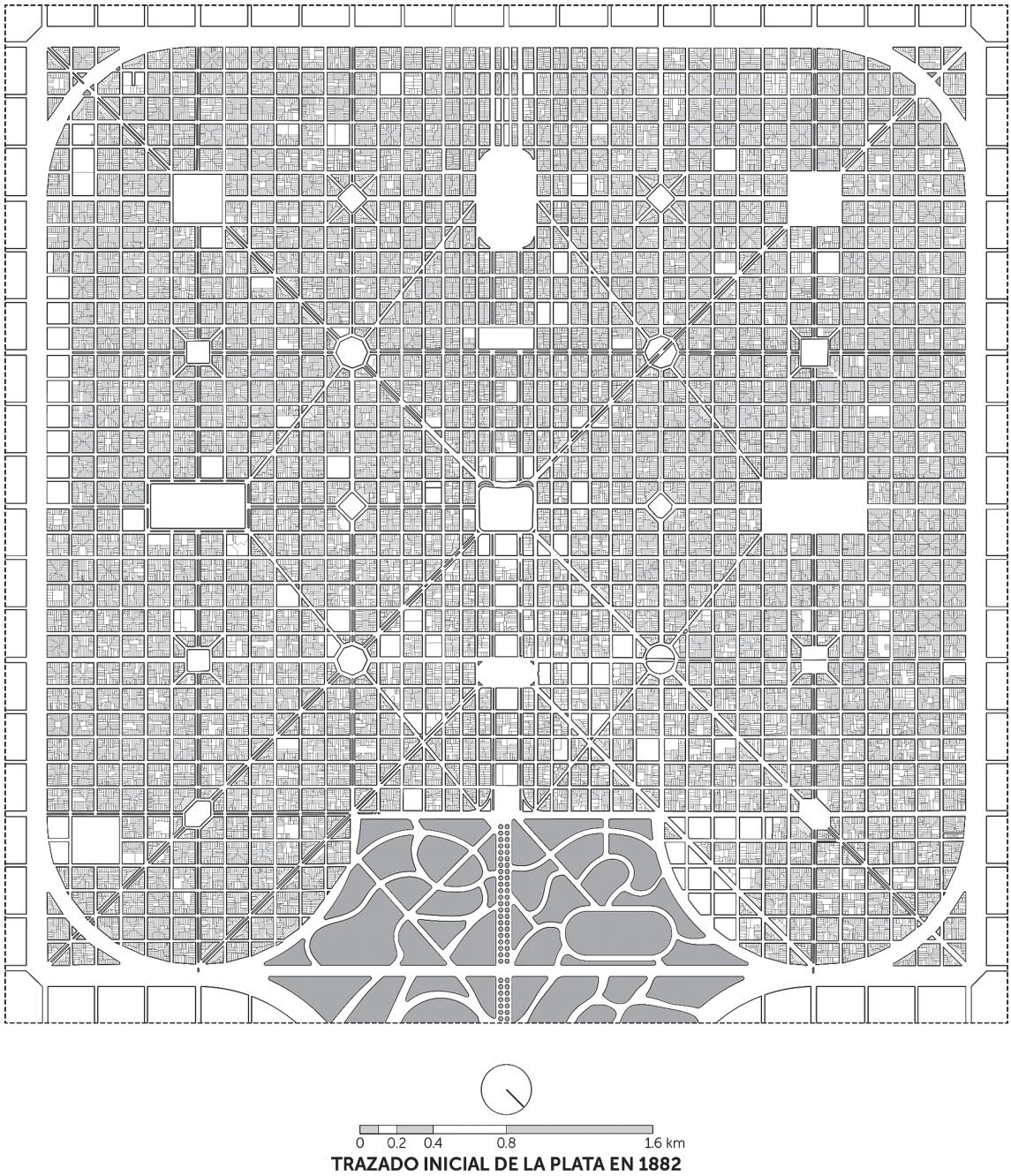
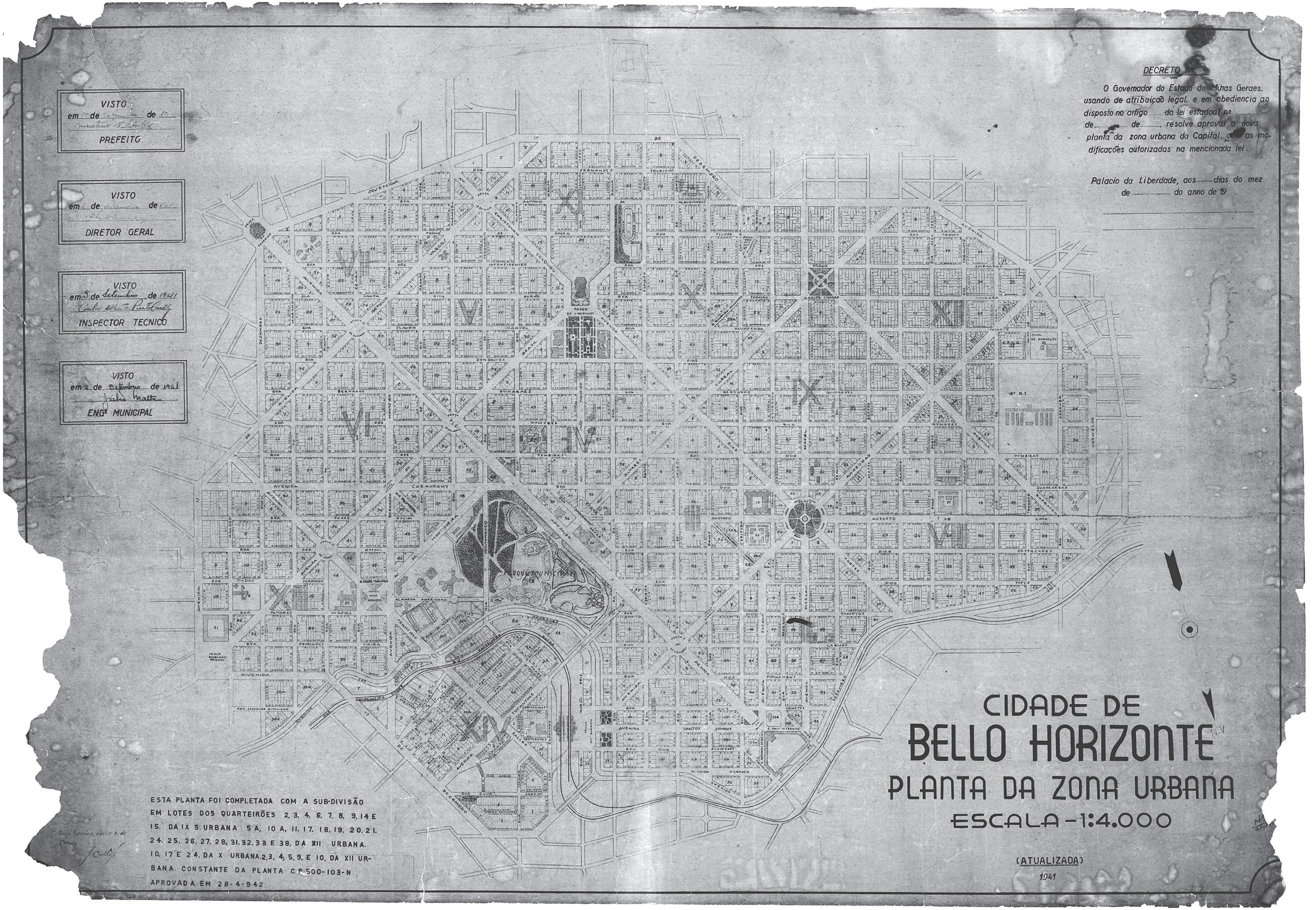


Figure 1.10. Plan of La Plata (Argentina) by Antonio Pedro Benoit, 1882. Redrawn by Felipe Correa.



VISTO
PREFEITO
VISTO
DIRETOR GERAL
VISTO
INSPECTOR TECNICO
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ENGº MUNICIPAL
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O Governador do Estado de Minas Geraes, usando de atribuição legal, e em obediencia ao disposto no artigo ___ da lei estadoal nº ___ de ___ de ___, resolve aprovar a nova planta da zona urbana da Capital, com as modificações autorizadas na mencionada lei.
Palacio da Liberdade, aos ___ dias do mez de ______ do anno de 19
CIDADE DE
BELLO HORIZONTE
PLANTA DA ZONA URBANA
ESCALA - 1:4.000
(ATUALIZADA)
1941
ESTA PLANTA FOI COMPLETADA COM A SUB-DIVISÃO EM LOTES DOS QUARTEIRÕES 2, 3, 4, 6, 7, 8, 9, 14 E 15. DA IX S. URBANA 5 A, 10 A, 11, 17, 18, 19, 20, 21, 24, 25, 26, 27, 28, 31, 32, 33 E 38, DA XII URBANA. 10, 17 E 24, DA X URBANA, 2, 3, 4, 5, 9, E 10, DA XII URBANA. CONSTANTE DA PLANTA C.P. 500-103-N APROVADA EM 28-4-942

The plan for Belo Horizonte has a striking resemblance to that of La Plata, and Reis was likely aware of the Argentine project. Both cities share the 120-meter square blocks encased in a larger system of diagonals that promise more effective circulation and a sense of axial monumentality. Yet, though both cities share the same underlying concepts, the specifics of each geography—the inherent flatness of the Argentine pampas and the aggressive topography of the Minas region—made two very different urban projects out of the same *parti*. While the tight geometries drafted by Benoit could be easily inscribed in the flat canvas of the Argentine hinterland, Reis had to confront a highly differentiated surface with drops in elevation that forced him to break away from the regularity of the former. Reis's surrender of symmetry marks the major departure from the Benoit plan. In Belo Horizonte, the siting of major public buildings and civic open spaces is informed by topography and responds to a logic of high points, low points, and visual corridors rather than to the rigidity of a symmetrical composition in plan. Avenida Afonso Pena is a key example of this adaptation. Its prominence does not rely on occupying the center of the plan, but rather it links in a straight line the plan's highest and lowest points, resulting in a heavily differentiated urban ensemble.

The Infilling of an Urban Template

In 1897, the capital of Minas Gerais was transferred from Ouro Preto to Reis's ambitious city. If indeed much of the inner ring plan had been laid out, only a small portion of its streets had been paved and a miniscule number of its buildings erected. The new regional capital, housing mostly public servants, was far too large for the mere ten thousand inhabitants it hosted at the time. The clear zoning defined by Reis exacerbated this emptiness, as the harsh demarcation of uses compelled dwellers to take long walks along a barren landscape. This quality did not escape the eye of Joaquim Nabuco—an important Brazilian statesmen and the first Brazilian ambassador to the United States—when he visited the city in 1907. As he was driven along Avenida Afonso Pena by established local residents, Nabuco candidly asked, "and when do we get to the city?"[19] The sense of monumental vacancy that characterized Belo Horizonte during its initial decades would be shared by Goiânia and Brasília in their infancies many decades later.

Two key factors shaped the slow development of Belo Horizonte. The first was the grave economic crisis that hit Brazil during the first decade of the twentieth century. Hyperinflation paired with a global fall in coffee prices hit the country's economy hard, severely affecting Minas Gerais.[20] The second and perhaps more significant constraint was that Belo Horizonte's modernization, which arrived in the form of a progressivist plan by Reis, was never followed by the technical modernization—primarily mobility infrastructure at a regional and national scale—that would allow the new city to successfully evolve as an economic hub. Despite its geometric grandeur, Belo Horizonte remained extremely remote and disconnected

facing page
Figure 1.11. Belo Horizonte as drawn in 1941, with a portion of the park already sold for real estate enterprises. Courtesy of the Arquivo Público Mineiro.

during its first decades of urban life. It was only with the investment in rail infrastructure almost three decades later that the city gained geographic relevance in the region.[21]

By the late 1920s, the ghost-town image of Belo Horizonte had been rapidly supplanted by that of a booming regional center, while the urban template provided by Reis was quickly thickening with built mass. During the 1920s, Minas became the state with the most extensive rail network in the country, as Belo Horizonte was positioned at the juncture of two major lines, Brazil's Central Railroad and the West Minas Line. An essential public works project aggressively guided by *mineiro* politicians, the West Minas Line drastically changed the role of the city vis-à-vis the territory and the nation. The implementation of rail within the larger territory broke down rural isolation, shifting Belo Horizonte from peripheral town to urban center. The new network placed the city as the main transportation and commercial hub of a large and thriving hinterland along north, west, and central Minas Gerais. The new rail infrastructure also facilitated the export of massive quantities of iron ore, turning Belo Horizonte into the epicenter of a second mining rush in the region.[22]

The new interface facilitated by rail between the city and open territory led to three transformative elements that defined Belo Horizonte throughout the 1930s and 1940s, the period of the most intense consolidation of its city center. One was the emergence of a strong and diverse manufacturing industry, heavily influenced by the extraction of iron ore, that quickly branched out into other production lines as well, including textiles, processed foods, and consumer-based industries.[23] The primarily bureaucratic function of the city became rapidly hybridized with the introduction of other programmatic uses, including warehouses, factories, and commercial areas, many of which sprung up along the edges of the main rail line. The second element was the emergence of a strong service-based economy driven primarily by a banking industry that catered to agricultural and industrial credit-seekers in the region.[24] The financial industry also began to make its mark on the city through the introduction of important banking halls erected along the city's major avenues and through its role as a key player in the financing of urban development in the city. The third and final element was the massive urban migration from the hinterland to the city. Workers from smaller and not as well-to-do municipalities left their agricultural lives behind in order to take part in the new social order offered by the resplendent new capital. These three processes rapidly shifted Belo Horizonte from a city mostly tasked with housing administrative bureaucracies into an up-and-coming regional city.

This unprecedented urban growth tested the principles of Reis's plan. The swift consolidation of the city's grid exemplified the project's ability to bring together a multiplicity of urban uses under a clear spatial framework. The plan effectively set organizational parameters while not completely defining the specificity of the city's urban form. In retrospect, the fractal subdivision of the block has proven to be the most effective tool Reis offered. On one hand, it provided for the accommodation of diverse

Figure 1.12. Aerial views of Belo Horizonte showing the densification of the grid in the late 1940s. Top, 1948; bottom, 1940s. Photos owned by author.

building footprints within a single block, helping blur the harsh boundaries imposed by the original monofunctional zoning requirements. On the other hand, it allowed for the consolidation of parcels in order to increase density through mid- and high-rise building types. This combined approach resulted in an urban morphology for Belo Horizonte not dissimilar to the one observed by Rem Koolhaas in *Delirious New York* and later proposed in *The City of the Captive Globe* (1972)[25]—an urban model where a heavily regularized urban plan yields an extreme diversity of vertical elements, making the urban section the key space of architectural experimentation in the city. This effect is further heightened in Belo Horizonte due to juxtaposition of the vertical densities with the area's extreme topography. In 1956, an article in the *New York Herald Tribune* praised the city, stating, "Although only fifty-five years old, the city today has a population of 400,000 and thanks to the careful planning of its pioneer builders it is a garden city despite its skyscrapers and ultra modern buildings."[26]

Modern Architecture Trailing the Modern Plan

While Reis's plan for a city in Minas Gerais undoubtedly contributed to the modernization of Brazil, modern architecture did not arrive to the region until much later. Only when Juscelino Kubitschek (1902–1976) became mayor of Belo Horizonte in 1940 did modern architecture met the modern plan. Born in the state of Minas Gerais into a family of modest means, Kubitschek would become a resolute admirer of modernism, testing in Belo Horizonte what he would later refine in Brasília. Kubitschek's strong belief in building as the most effective form of governing gave birth to two critical projects for Belo Horizonte, projects that utilized modernity as the

Figure 1.13. Photomontage of the Juscelino Kubitschek Residential Complex by Oscar Niemeyer. Cover image from *Conjunto Governador Kubitschek: a coletivização do confôrto* (ca. 1952). Courtesy of the Canadian Centre for Architecture, Montréal.

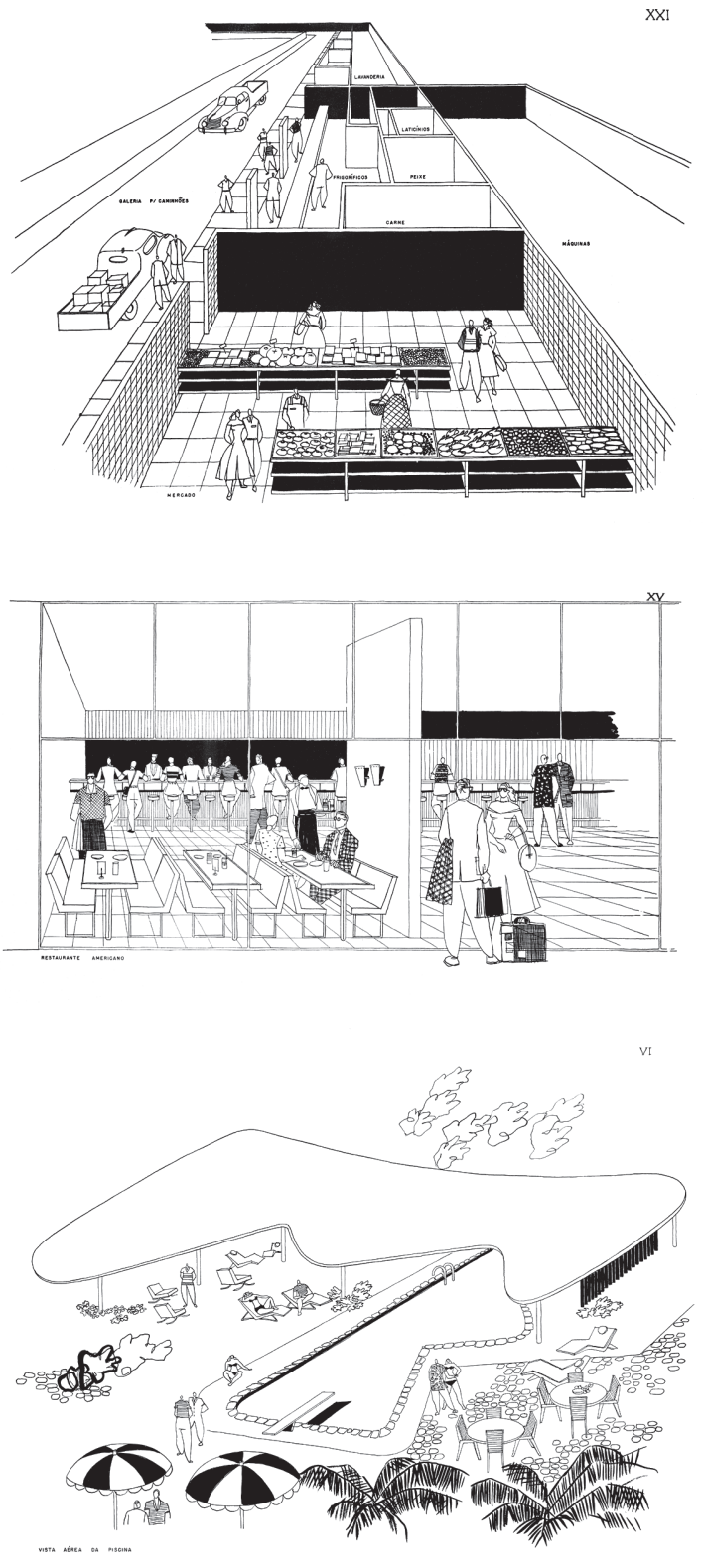

Figure 1.14. Sketches of urban life at the Juscelino Kubitschek Residential Complex by Oscar Niemeyer. Images from *Conjunto Governador Kubitschek: a coletivização do confôrto* (ca. 1952). Courtesy of the Canadian Centre for Architecture, Montréal.

purest symbol of progress and advancement in the region. Two key projects epitomized the arrival of modern architecture to the city. The first was the Pampulha lake complex, a recreational hub and tourism center sited in a man-made lake that would serve as the city's main reservoir. The second was the Juscelino Kubitschek, or "JK" complex, a two-tower condominium project that experimented with the intensity of vertical living within the context of Reis's plan.

Designed by a young Oscar Niemeyer (1907–2012)—it was, in fact, his first set of built projects—Pampulha was primarily a leisure and recreation center promoted by Kubitschek as a way to diversify the by now strong industrial economy in the region with the introduction of an emerging tourism enterprise. Located ten kilometers north of the city center, the new complex included a casino, a dance hall, a yacht marina, and the St. Francis Assisi Church. Conceived as a sanctuary—a place to escape the burgeoning city Belo Horizonte had become—the project was characterized by Niemeyer's expressive plastic sensibility and further complemented by a landscape shaped in collaboration with the father of Brazilian landscape design, Roberto Burle Marx (1909–1994).[27] Both in concept and image, Pampulha was a critical project for the development of Belo Horizonte. And though it was outside the bounds of the city center, it reenacted the success of the very center it had escaped. Over time, the facility's own success established it as an independent anchor for future urban growth, and Pampulha would soon boast a residential district and a complement of cultural and educational facilities such as the Federal University of Minas Gerais.

The JK complex, launched in the early 1950s, introduced hyperdensity into the fabric of Belo Horizonte through a large-scale mixed-use residential complex—a radical move in a sleepy city which at that time maintained a population of less than four hundred thousand. Conceived by the same politico-design duo behind Pampulha (Kubitschek/Niemeyer), the project was to be sited in Raul Soares Square.[28] Like Niemeyer's famed Edifício Copan in São Paulo (designed from 1950–1952), the project aimed to exert a broader impact on the city by extending beyond the regularizing unit of the city block. In amplitude, the JK complex was to be the Rockefeller Center of Belo Horizonte. Through the conceptualization of inventive residential types, the complex would bring a layer of innovation to a city that was already at the forefront of architectural and urbanistic experimentation in the South America of the mid-twentieth century. The project was conceived as a pair of towers sharing a mixed-use base sliced by a street. The first tower (Tower A), a twenty-three-story thin slab running 120 meters long, sat over a mixed-use base that filled an entire 120-by-120-meter block, once again testing Reis's scheme and its ability to accommodate such intense density. Tower B, on the opposite side of the street, filled an irregular block with a taller tower that stood thirty-six stories high. In total, the complex provided over one thousand residential units and had the capacity to hold approximately five thousand residents. One and a half blocks could potentially contain 1.5 percent of the city's total population.[29]

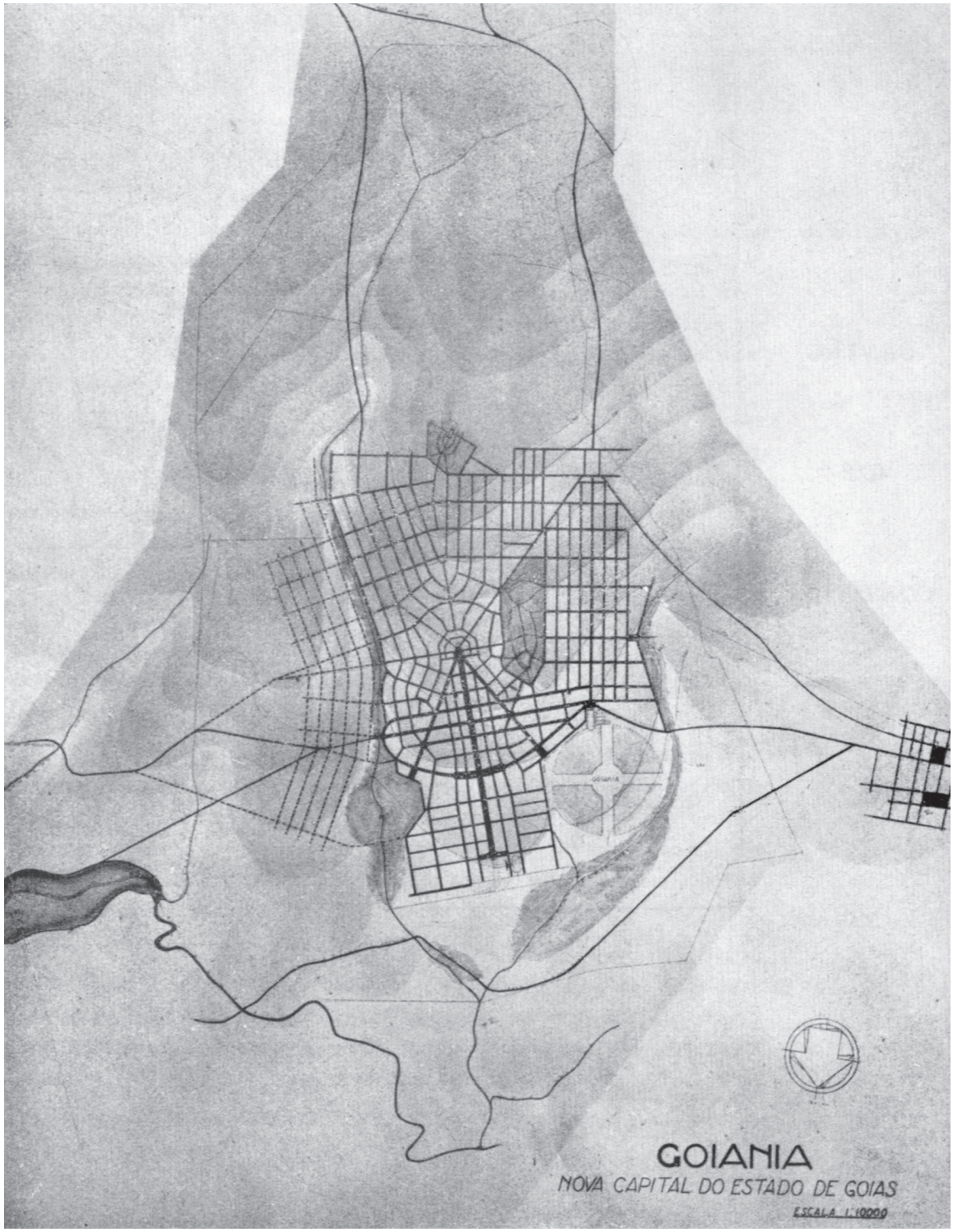

Figure 1.15. Original plan for Goiânia drafted by Attilio Corrêa Lima in 1931.

While the ambition of creating a city within a city was a noble one, the implementation of the complex did not follow as planned. Dogged by construction delays, the first units of Tower A were not delivered to their owners until the late 1970s—some twenty years after the building's conception. The completed complex, a much more rudimentary version of its original architectural model, never lived up to its initial expectations and marks an ambitious yet failed experiment in the larger urbanistic history of Belo Horizonte. While not successful in its own right, the project nonetheless introduced a scale of housing and a mode of domestic space that was unique to the state of Belo Horizonte and to Brazil and that would soon be absorbed and promulgated in projects throughout the country.

Belo Horizonte as Model

Despite initial criticisms, Belo Horizonte was generally seen as a major catalyst for the cultural advancement of Brazil's First Republic. The concept of constructing capital cities—primarily state capitals—as a way to claim and reorganize the country's interior became a priority for national and state governments throughout the twentieth century. Belo Horizonte had responded so effectively to the social and economic agenda implemented by a late nineteenth-century progressive elite that in the early 1930s Pedro Ludovico Teixeira, then governor of the state of Goiás, proposed the construction of a brand new capital for his home state, a proposal that received full federal support from President Getúlio Vargas.[30] Goiás was then suffering the aftermath of a gold rush comparable to yet much more modest than its neighbor, Minas Gerais's. Similar once again to the situation in Minas, the location of the original capital in Goiás was at odds with the flourishing agricultural economy that was emerging along the southern edges of the state.[31] In the fashion of Belo Horizonte, a plan was drafted for a new capital to be located 100 kilometers south of old Goiás, the former seat of power. The new plan aimed at eroding the decadence set in place by the foregone gold era through a precise act of modernization exemplified in the ideals of the modern city. It would encapsulate the arrival of progress and economic development to this interior state.

The original plan for Goiânia—neoclassical in spirit—was drafted by Attílio Corrêa Lima (1901–1943), one of the first architects trained in Brazil, who was heavily influenced by Versailles and nineteenth-century French planning principles.[32] Corrêa Lima's proposal was later reworked by Armando Augusto de Godoy, who altered the original plan by introducing garden city principles that in many instances were at odds with the axial monumentality of Corrêa Lima's vision.[33] The original scheme organized sectors along a monumental axis with an administrative center located at the highest point of the site. Godoy maintained the monumental axis of the original plan, but the outline of the residential quarters adjacent to it changed dramatically, primarily due to the heavy influence of Ebenezer Howard and his garden city model, in which residential sectors and neighborhood units were encased by landscapes with a soft geometry.

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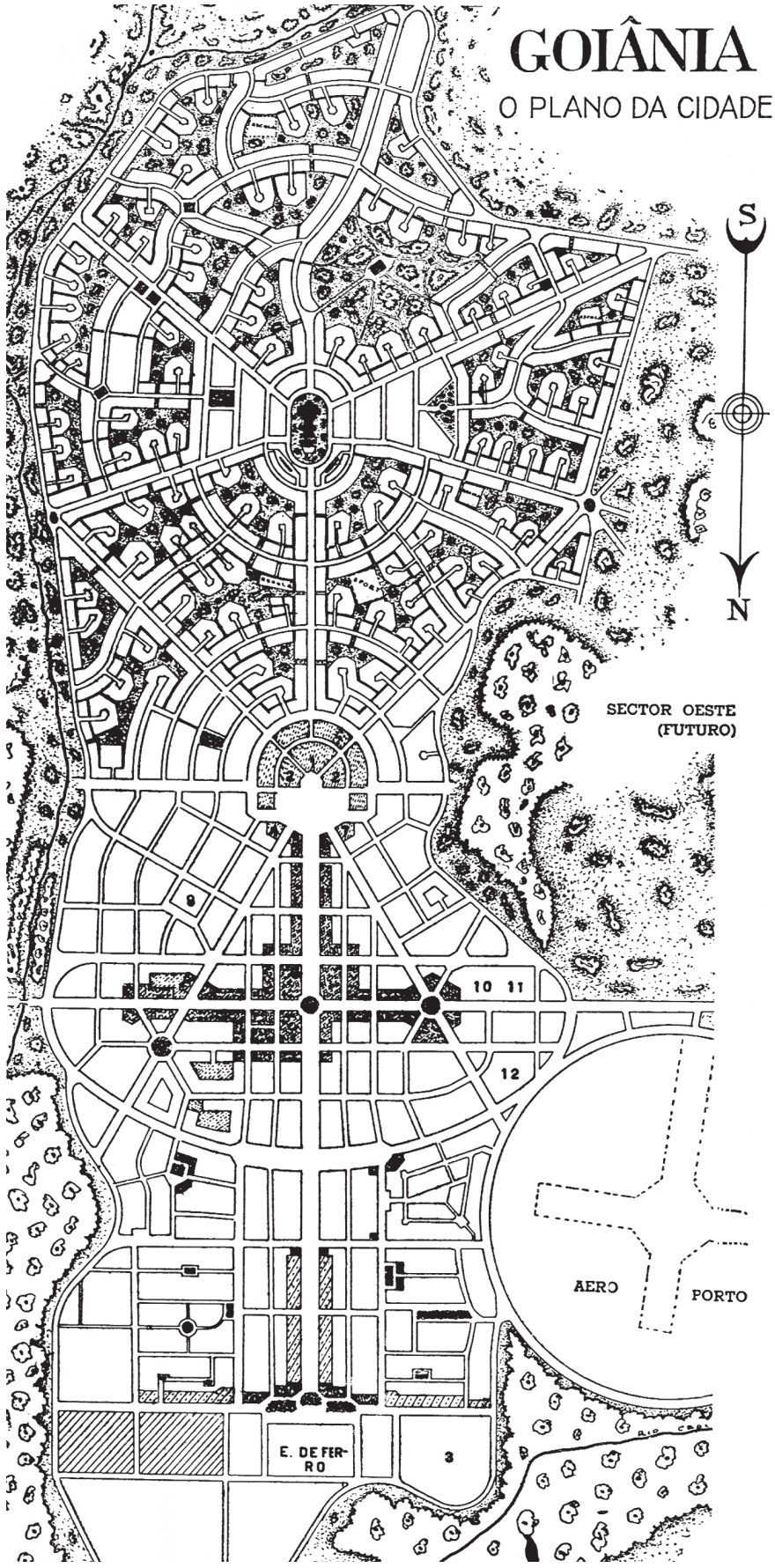
Figure 1.16. Plan for Goiânia reworked by Armando Augusto de Godoy, 1932.


GOIÂNIA
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3

One part Versailles, two parts Letchworth, Goiânia's plan presented a dual and contradictory position toward the very hinterland that it was tasked with restructuring. On the one hand, the neoclassical planning strategy clearly defined the cultivated city as something other than its adjacent hinterland. On the other, the garden city ideals opened up a more nuanced dialogue between city and productive countryside, a model that worked well given the tropical vegetation of the region. The design of Goiânia resulted in a city with the most eclectic collection of planning principles in all of South America. While the political ambitions were similar to those of Belo Horizonte, Goiânia contributed to further expanding the notion of the capital city as an experimental project, paving the way for the arrival of the new national capital of Brasília two decades later. It appears more a matter of destiny than coincidence that Belo Horizonte would be the city where Juscelino Kubitschek would first test the virtues of modern architecture as a device for nation building. In many respects, the mission of building a new capital city for Brazil emerged from efforts that had already been realized in Minas Gerais. The Brasília project put forward by Lúcio Costa with the unassailable guidance of Kubitschek and Niemeyer absorbed the lessons of Belo Horizonte and Pampulha; Brasília was to be, above all, an engineered landscape that prepared the ground for the showcasing of modern architecture. In the final estimate, the immediate symbolic weight of that effort was anchored firmly atop a broader modernity in Brazil long accrued through the urban planning and design experiments hatched in view of a new century.

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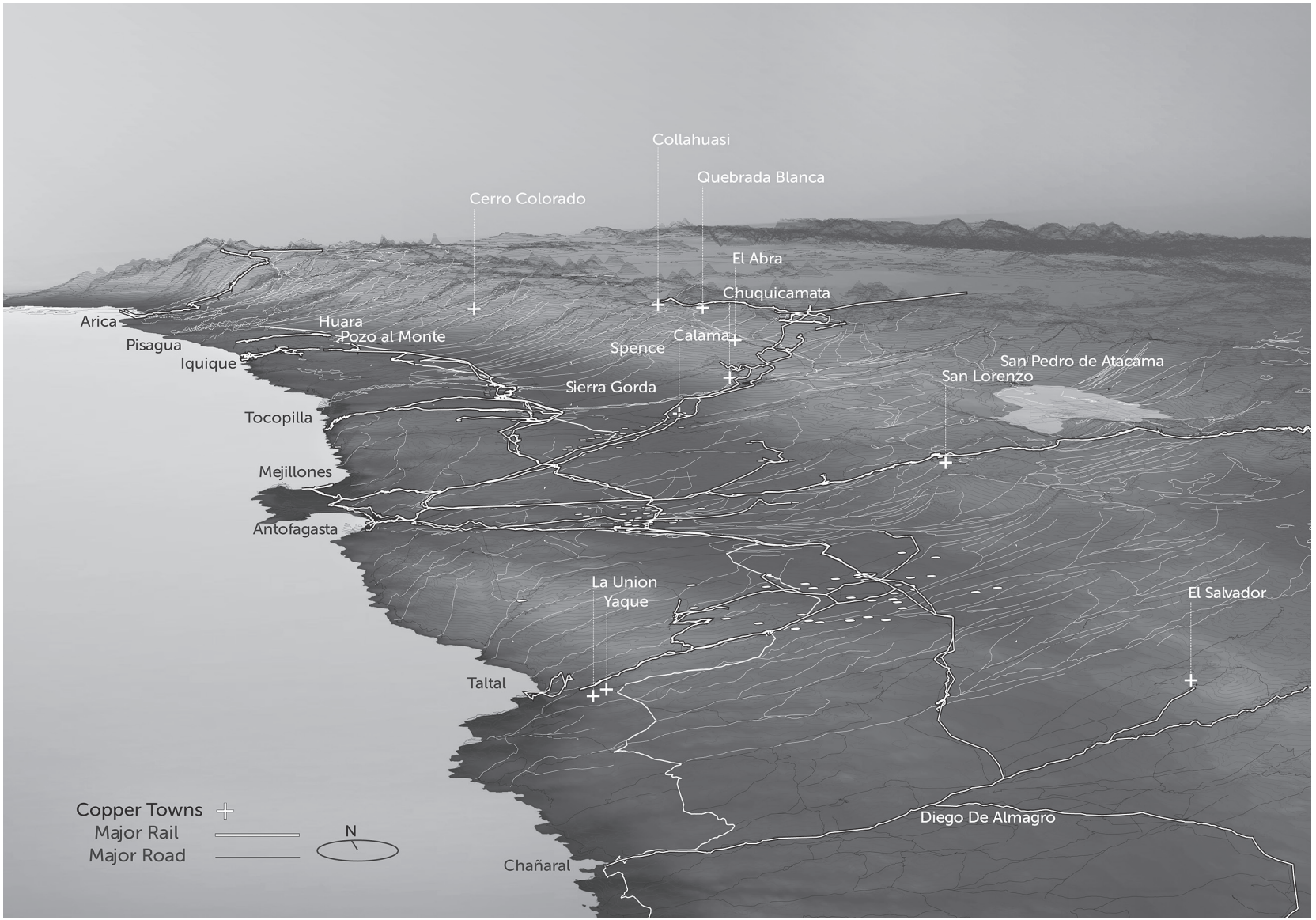
Figure 1.17. Aerial view of Belo Horizonte today with Juscelino Kubitschek Residential Complex in the foreground. Photo © Stringer/Brazil/Reuters/Corbis.


Collahuasi
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Calama
Spence
San Pedro de Atacama
San Lorenzo
Sierra Gorda
Tocopilla
Mejillones
Antofagasta
La Union
Yaque
El Salvador
Taltal
Copper Towns
Major Rail
Major Road
N
Diego De Almagro
Chañaral

2

A Mining Town Constellation

María Elena

In the clear air of the desert of northern Chile the traveler by plane sees the geography of the nitrate district as a whole in a way that is totally impossible for the observer on the ground. The setting of the nitrate *pampa*, between a low old-age mountain belt on the west, dropping precipitously several thousand feet to the ocean, and the lofty Andes with their surprisingly even sky line far away to the east, is spread out in a single comprehensive view; and directly below is revealed every detail of the nitrate diggings and the *oficinas*, or extraction plants, and of the complicated network of railroads, roads, trails, and burro paths by which all of these are tied together and to the coastal ports and the narrow, irrigated valleys at the foot of the Andes that furnish some of the supplies for the workers.

John L. Rich, "The Nitrate District of Tarapacá, Chile: An Aerial Traverse"

This chapter's epigraph is taken from an account of the intricate landscape of mines and towns photographed from the window of a Panagra (Pan American-Grace Airways) commercial flight in the late 1930s; its author, John L. Rich, sought to encapsulate the legacy of more than forty years of nitrate extraction in the Atacama. A geographer from the University of Cincinnati, Rich bore witness to the footprint of an operation driven by transnational mining enterprises—primarily British and later American—that had affirmed Chile as the global leader of the natural nitrate market. The product wrested from the earth by this network of settlements, saltpeter, was a mineral that, until replaced by a synthetic version in the 1940s, was used worldwide in many aspects of daily life: in food production through its use as an agricultural fertilizer, in war as a basic ingredient in gunpowder, and in entertainment by way of its use in magic tricks. While short-lived, Chile's nitrate boom set off an extraction and urbanization process of an unprecedented scope and scale in the Chilean desert, one that reshuffled economic, migratory, and urban patterns nationwide.

A hexagonal figure defined by a central square and crossed by two prominent diagonals makes up the plan of María Elena, the oldest surviving nitrate-mining encampment in South America.[1] At first glance, the town's image resembles the European military cities of the sixteenth and seventeenth centuries: a singular and autonomous urban model that sits in complete opposition to the landscape where it is sited. A deeper, more expansive look at the history of nitrate and copper extraction in Chile, however, frames the insular town of María Elena, founded in 1926 by Guggenheim Brothers (which later became the Anglo-Chilean Nitrate Company)[2] as a key reference point within a much larger territorial project. It stands as an emblem of a resource extraction network that throughout the first half of

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Figure 2.1. Bird's-eye view of the urbanization network along the Atacama Desert. Drawing by Felipe Correa.

the twentieth century brought an experimental model of urbanization to the remote confines of the Atacama Desert. Over the course of fifty years, from coast to mountain, the territory was peppered with such cities and towns, deposits, and railroad lines, domesticating one of the harshest and most barren landscapes across the globe.

The Desert and the Nitrate Boom

In the desert of present-day northern Chile, the confluence of extreme aridity, age-old hills, and sources of nitrogen have led to an enormous concentration of caliche, the raw material that yields sodium nitrate, or "saltpeter." Caliche occurs as one of the cementing constituents of a crust formed between two to ten feet below the earth's surface, and caused by the precipitation of salts carried upward by groundwater.[3] This sub-layer, which can range from a few inches to several feet in depth and which contains the greatest concentration of nitrate, is what becomes the raw matter that can easily be processed into marketable sacks of saltpeter. In the case of this region, nitrate deposits were found at intervals along a five-hundred-mile linear stretch in a long narrow belt known as the Chilean pampa, bound by the Andes mountain range along the east and the Pacific Ocean along the west.[4] The random presence of caliche along this middle ground between coast and mountain spawned the creation of an industrial settlement pattern through the deployment of hundreds of *oficinas salitreras*, or saltpeter mining offices, unfolding an industrial occupation of the ground that would drastically alter the pampa, the coastal towns along the Pacific, and the Andean towns east of the pampa.

While the export of nitrate in Chile dates back to the mid-1800s, it was only with the incorporation of three northern provinces—Tacna and Tarapacá, formerly owned by Peru, and Antofagasta, at one time part of Bolivia—that caliche could be extracted and processed at a scale that allowed Chile to dominate the global supply of nitrate. The Atacama Desert, which until the second half of the nineteenth century was barren land with almost nonexistent settlement, suddenly gained the attention of national governments as nitrate extraction gained momentum around 1850, when mostly European and Chilean enterprises started extracting the resource on Bolivian and Peruvian soil on a more industrial scale. As the nitrate industry expanded, Bolivia imposed a tax on all nitrate extracted by Chilean companies. This political action was backed by Peru, resulting in a tax war better known as the War of the Pacific. Chile's victory resulted in the incorporation of the two contested provinces. More importantly, the victory gave this thin, three-thousand-mile-long nation a monopoly on all natural nitrate deposits along the western coast of South America.

The consolidation of Chile's political boundaries paired with new mining technologies that increased the speed and quantity of nitrate extraction allowed the Chilean government to rely on saltpeter exports as the backbone of its national economy. With new taxes on nitrate, the government was able to completely reform its public coffers. While conservatives lob-

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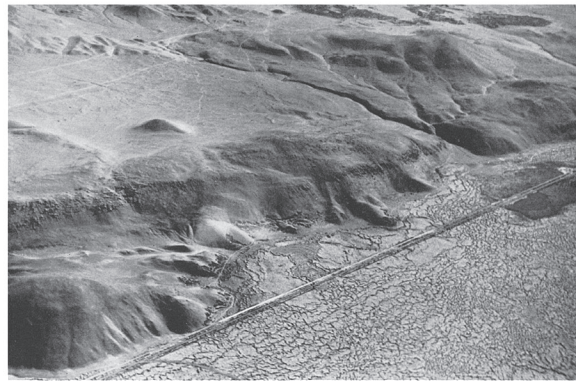
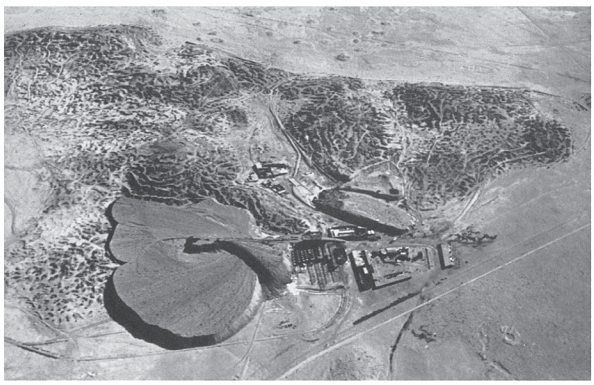
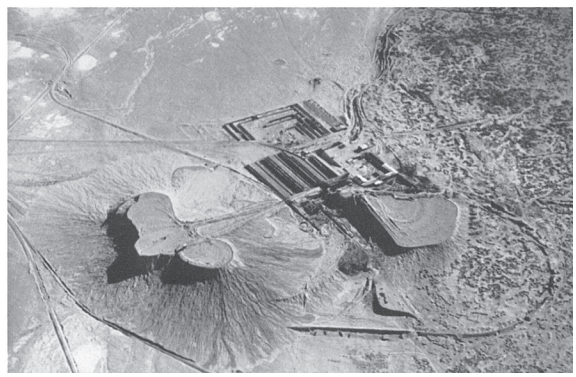
Figure 2.2. Photographs of nitrate extraction sites in the Atacama Desert; the photos were taken by John L. Rich from the window of a Panagra commercial flight in the 1930s. Courtesy of the American Geographical Society.



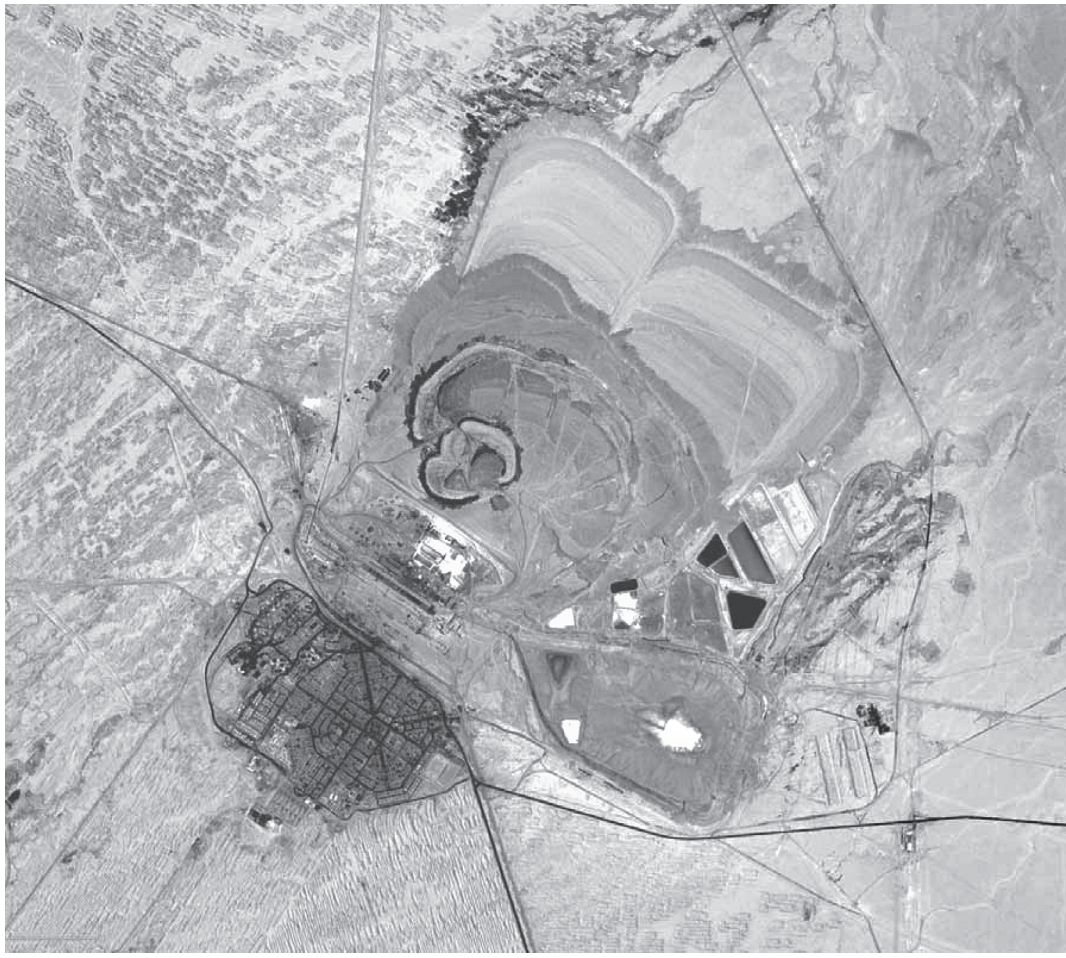


Figure 2.3. Aerial photograph of the nitrate town María Elena. Courtesy of Google Earth.

bied for a reduction in sales taxes and land rents, liberals saw in nitrate taxes a surplus with which to finance education and infrastructure.[5] Either way, nitrate was at the center of Chile's early twentieth-century economic agenda, and between 1885 and 1919 the nitrate tax provided more than half of the state's revenue, which itself skyrocketed by 500 percent over the corresponding period.[6] As the government restructured its fiscal strategy to rely on mining revenue, the desert of the Chilean north shape-shifted from barren land to nitrate Eden.

The reliance on nitrate required the implementation of new extraction technologies that could more efficiently capitalize on the riches of the Atacama subsurface. Not unlike many other South American countries in the post-independence era, Chile looked to France for art and culture and to England in regard to technology and commerce. In 1879, the British engineer James Humberstone introduced the Shanks refining process, a new system that replaced boiling caliche with a steam-based process similar to the one that was used in the production of soda, into the mining industry.[7] The Shanks system became the dominant model for nitrate extraction, further entrenching British investment in the north of Chile. This new

method not only increased the speed of nitrate production but also scaled up the spatial footprints of the mining operations. The level of investment absorbed by the newly implemented refinement system combined with the new scale of production it enabled completely transformed the landscape of nitrate production across the pampa. Whereas the more artisanal mining operations scattered throughout the desert were composed generally of a few tents and a dozen manual shovels, the *oficinas salitreras*, or saltpeter offices, produced a truly modern industrial footprint that set the basis for the urbanization of the Atacama Desert. Conceived primarily as isolated company towns sprinkled throughout the landscape of the Chilean pampas, the *oficinas salitreras* became the nodes of a constellation of cities and towns that would come together to domesticate the harshness of the Atacama and to put this parched landscape to work on behalf of nitrate extraction.

The Evolution of a Territorial Network

Patrick Geddes, the redoubtable turn-of-the-century Scottish biologist turned urban and regional planner, once said, "It takes a region to make a city." The case of the Atacama Desert is no exception.[8] Here, the spatial requirements of nitrate extraction, processing, and export defined a network of interdependent settlements that formed a new model of urbanization in the region. In an arid context where the traditional agrarian structure of the Spanish colonial latifundio had no relevance, a new industrial order prepared the ground for urbanization, constructing complex spatial relationships between town and desert, tied together by the punctual precision of the railroad. While this scarcely populated region of northern Chile had traditionally been defined by a territorial break between coastal city and Andean town, imposed by the arid band of desert between them, this rift would be quickly erased by the systematic deployment of more than seventy *oficinas salitreras* in the years between 1890 and 1920. Following the European model for the industrial town, each outpost was a ready-made city complete with mining facilities, office space, and full service residential quarters for company employees. Despite the fact that the *oficinas* were conceived as autonomous and self-sufficient spatial units under single ownership, the methodical distribution of these industrial outposts across the pampa created a new middle landscape between coast and mountain that allowed for an east–west regional network to unfold. The nitrate offices had a substantial ripple effect on the territory, defining four key settlement types—the coastal city, the railroad hub town, and the Andean oasis, along with the aforementioned *oficina*—that articulated the urban footprint of the territory. In a manner reminiscent of Patrick Geddes's "valley section,"[9] where the city is conceived as only one part of a much larger set of interrelated settlements, the nitrate cities of the Atacama revised the traditional Spanish colonial boundaries between country and town and constructed a constellation of desert communities, of diverse scale and purpose, that evolved while constantly supporting and modifying each other.

The demarcation of the canton as the main geopolitical subdivision system and the gradual expansion of rail infrastructure set the stage for the articulation of the diverse settlement types that dotted the desert. The practice of using the canton as a unit had previously been implemented in Tarapacá at the beginning of the nineteenth century while the province was still under Peruvian control.[10] The canton was once again employed in the late 1800s to define a cluster of *oficinas* in proximity to each other and connected by rail to the closest port city. A private nitrate-extraction town, then, was strategically located between a western port city that supplied raw materials for the extraction process and served as the nitrate gateway to the world and an eastern Andean oasis that served as a source of food and water for the industrial town. Through the rapid expansion of extraction sites and rail east of the Pacific, each canton was methodically arranged with at least one port city, a railroad town, caliche fields with their accompanying industrial towns, and some form of access to an agricultural oasis. Throughout the first decades of the twentieth century, approximately twenty-three cantons, two hundred *oficinas salitreras*, and twenty coastal cities comprised the nitrate extraction landscape of Chile.[11] The cantons were further organized into five districts, including Tarapacá in the north, followed by Toco, Antofagasta, Aguas Blancas, and finally Taltal on the southern edge of the Atacama. Each district had one or two primary port cities that also maintained direct interface with a point of origin for a primary or secondary rail line. The connection between seaport and rail gave cities like Antofagasta, Mejillones, Taltal, and Tocopilla a great competitive advantage, as most of their economic growth was tied to the distribution of nitrate to the world.

The Cantón Bolivia, also known as the Cantón Central, best exemplifies the articulation of this territory from ocean to mountain range. While most of the nitrate extracted in the 1800s came from the Tarapacá district, it is the Cantón Central, south of Tarapacá in the Antofagasta region, that became the epicenter of the region in the early decades of the twentieth century. The area was known for having caliche of lesser quality than Tarapacá's; the exploitation of its subsurface became feasible only with the advancements of the Shanks system and the arrival of British capital. This canton, located in a valley ninety kilometers northeast of the city of Antofagasta, benefited from the early construction of a rail line that linked the port of Antofagasta to the town of Las Salinas approximately 130 kilometers inland from the Pacific Ocean. Construction started in the early 1870s with predominantly Chilean capital in what was at the time Bolivian soil, reaching Las Salinas in 1887. The corridor was further expanded in the years after the War of the Pacific to reach present-day Bolivia, making this one of the few rail lines in South America to cross an international border. Following the thalweg of a narrow valley, the rail line became the main infrastructural spine of the industry. As oficinas *salitreras* proliferated from west to east, they each built private branches that tapped into the main line.

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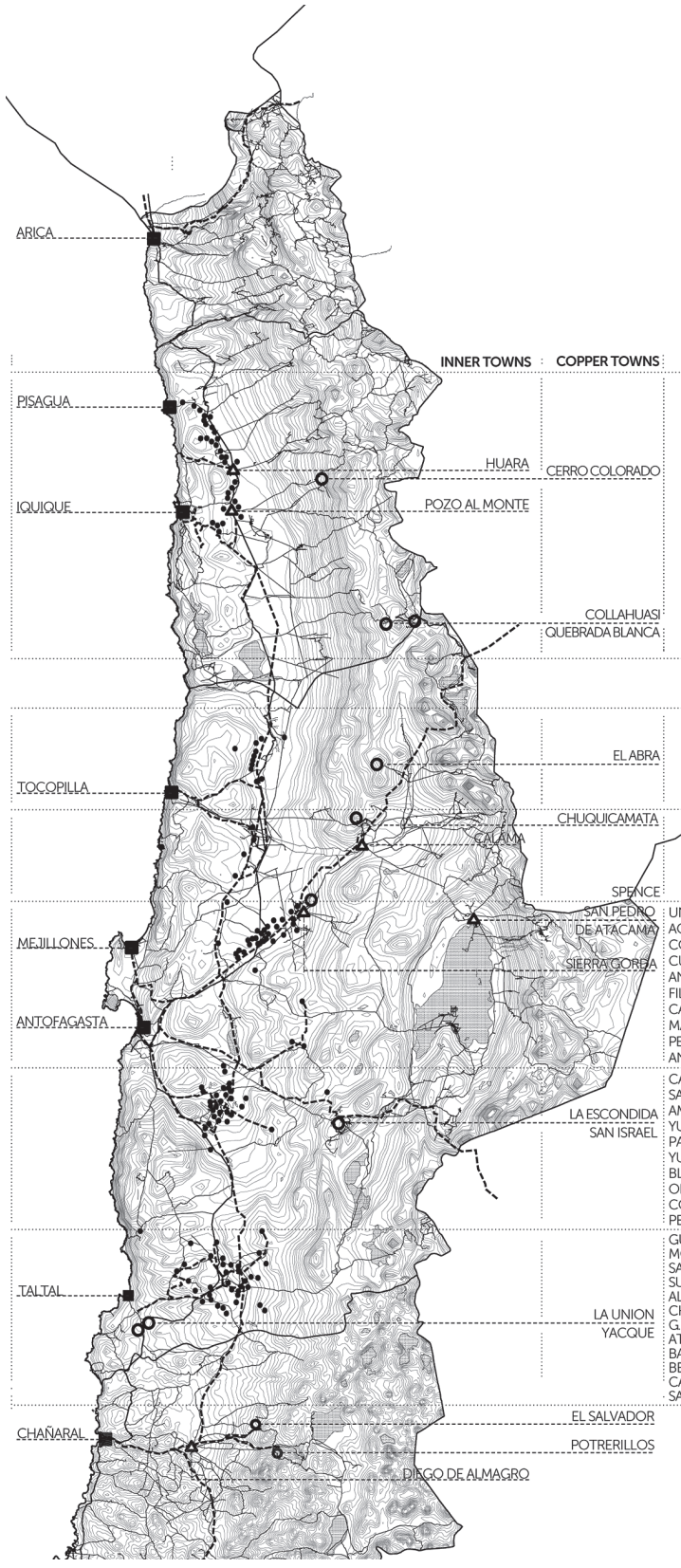
Figure 2.4. Map showing the relationships among port cities, nitrate offices, railroad towns, and oasis towns defined by cantons and districts. Drawing by Felipe Correa.

The port of Antofagasta, the intermodal rail town of Baquedano seventy-two kilometers inland, and the oasis town of Calama became three key elements in the formation of this new frontier. The city of Antofagasta was



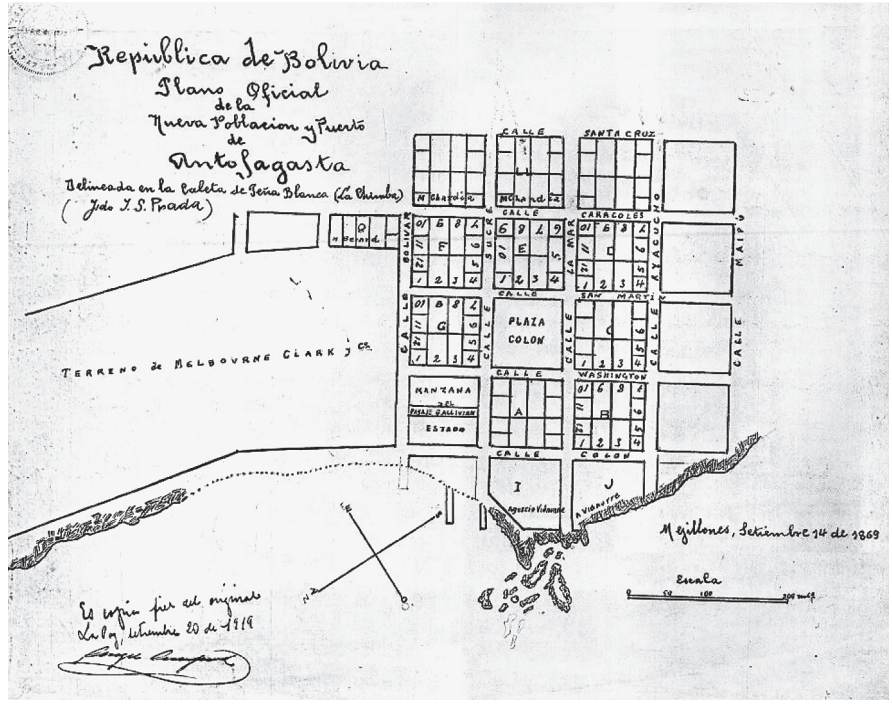
INNER TOWNS	COPPER TOWNS	MAIN NITRATE TOWNS			CANTON	DISTRICT
				S. ANTONIO	ZAPIGA	TARAPACA
				COMPANIA	SAL DE OBISPO	
				ROSARIO	PAMPA NEGRA	
				SACRAMENTO	DOLORES	
				JUAN	CHINQUIQUIRAY	
				AGUADA	NEGREIROS	
				CARMEN	HUARA	
				AURORA	LA PEÑA	
				AMELIA	INDEPENDENCIA	
				MERCEDES	SAN ANTONIO	
				DEMOCRACIA	COCINA	
				TARAPACA	ARGENTINA	
				PRIMIIVA	YUNGAY	
				HUARA	SOLEDAD	
				LIVERPOOL	DEL SUR	
				PENA GRANDE	LAGUNAS	
				PENA CHICA		
				CALACALA		
				BUEN RETIRO		
				RINCON		
				MERCEDES		
				STA. LAURA		
		TRANQUE SLOMAN		ABRA	EL TOCO	
		SAN ANDRES		R. AVENTURA		
		SANTA FE		B. ESPERANZA		
		IBERIA		EMPRESA		
		GRUTAS		PEREGRINA		
		PROSPERIDAD		SANTA ISABEL		
				MARIA ELENA	EL LOA	ANTOFAGASTA
				COYA SUR		
				F. VERGARA		
				P. DE VALDIVIA		
				LOS DONDES		
				ALGORTA		
		UNA	CECILIA	A.PINTO	CENTRAL	
		ACONCAGUA	LEONOR	A. EDWARDS		
		CONCEPCION	PAMPA UNION	J.S. OSSA		
		CURICO	ARAUCANA	CONDELL		
		ANGAMOS	AUSONIA	S. ALDEA		
		FILOMENA	CARMELA	CELIA		
		CANDELARIA	AURELIA	B. ENCALADA		
		MARIA	CHACABUCO	DOMEYKO		
		PERSEVERANCIA	F. PUELMA	SAVONA		
		ANITA	ARTURO PRAT	COCHRANE		
		CASTILLA	LEON	RENACIMIENTO	AQUAS BLANCAS	AQUAS BLANCAS
		SANTA ANA	EUGENIA	SAN MARTIN		
		AMERICANA	ESMERELDA	FLORENCIA		
		YUGOSLAVIA	PETRONILA	ROSARIO		
		PAMPA RICA	AVANZADA	AURORA		
		YUNGAY	SANTIAGO	DOMINADOR		
		BLANCA ROSA	MARIA TERESA	B. ENCALADA		
		ORIENTE	BONASORTE	A. VICTORIA		
		COTA	SAN RAFAEL			
		PEPITA	PETUNIA			
		GUANACO	LAUTARO	UNION	TALTAL	TALTAL
		MORENO	SANTA CATALINA	BALLENA		
		SALINERA	DELAWARE	FLOR DE CHILE		
		SUDAMERICANA	JERMANIA	JULIA		
		ALEMANIA	PORTEZUELO	ESMERALDA		
		CHILE	PORVENIR	SAN JACINTO		
		G.MATTA	LILITA	MIRAFLORES		
		ATACAMA	ESPERANZA	CATALINA SUR		
		BASCUÑAN	TRICOLOR	SEVERIN		
		BELLAVISTA	GHIZELA	JOSEFINA		
		CAUPOLICAN	BRIMANIA	COPIAPINA		
		SANTA LUISA	LOS AMIGOS			

KEY

- COPPER TOWNS
- NITRATE TOWNS
- INNER DESERT TOWNS
- COASTAL CITIES

above
Figure 2.5. Panoramic view of Antofagasta's bay in the 1920s. Photo by W. Paton y CIA.

right
Figure 2.6. The foundational plan for the city of Antofagasta, by José Santos Prada, 1869. Courtesy of Eugenio Garcés.



founded in 1866 shortly after José Santos Ossa Vega (1827–1878), a well-to-do Chilean banker and saltpeter entrepreneur, discovered deposits in the Antofagasta Bay. These deposits were rapidly claimed by the Melbourne Clark and Company, a British and Chilean partnership that would later be known as the Compañía de Salitres y Ferrocarril de Antofagasta, the enterprise that ultimately would inherit Ossa's extraction rights.[12] Construction of Antofagasta began in 1869 following a plan drafted by José Santos Prada[13] that followed a conventional gridiron layout with a central plaza, reminiscent of most Spanish American grids. What was new in the context of the plan was a large parcel of land, almost the same size as the original checkerboard, which was labeled "property of Melbourne Clark and Co." This plot of soil soon became the point of origin for the Antofagasta–Las Salinas rail line. These yards, paired with the adjacent cove, soon to be a port, set up the infrastructural dyad that accelerated the enlargement of the

town. Four revised city plans in the course of seventeen years—by Francisco Vidal Gormaz in 1880, Nicanor Boloña in 1895, Abd-el-Kader in 1903, and Ramón Zúñiga in 1907[14]—demonstrate the speed at which Antofagasta expanded. These plans show urban development in a direct relationship with the extension of the rail lines into the pampa and the exploitation of deposits in Cantón Central. This harbor–hinterland dialogue formed the basis for the development of most water's-edge cities in the region. Cities such as Coloso, Taltal, and Tocopilla also expanded in a similar manner. As more deposits were exploited inland, more port cities reaped the rewards.

The railroad town also became a significant type of settlement in this desert-industrial landscape. Constructed as regional capitals of the railway network, these intermodal hubs brought discrete moments of urban development into the emptiness of the desert. The station towns of Baquedano and Pampa Union are the most compelling examples of railroad-based urban life in Cantón Central. Ninety kilometers northeast of the port of Antofagasta, Baquedano was originally only one more point along the Antofagasta–Bolivia line. Its prominence emerged from the construction of the 1,800-kilometer *ferrocarril longitudinal*, an early twentieth-century railway system that ran north–south along the pampas and linked the newly acquired territories of Tarapacá and Antofagasta with central Chile.[15] Baquedano became the main node between the two lines, serving as the primary hub connecting nitrate country in all directions. Defined by a single street less than one kilometer long adjacent to the rail yard, the town became a significant staging ground for the nitrate industry and for the future development of rail infrastructure in the region. In addition to its status an important maintenance hub for both lines, it was also characterized by large warehouses that consolidated basic supplies such as coal, mining machinery, and everyday essentials that could then be distributed to each *oficina*. Further, the hub accommodated rail passengers overnight, which required the opening of a number of rail motels.[16] In the case of Pampa Union, the town evolved out of the need for a service outpost that would provide basic goods and entertainment. Founded as part of a hospital complex that would provide medical services to the canton, Pampa Union became more famous as the main center for nightlife and prostitution in the region.

The importance of the oasis town as a support settlement for the nitrate industry cannot be overstated. From the foggara-based oases in Fezzan, Libya, to Reyner Banham's mechanized "America Deserta," the oasis has, across space and time, acted as a magical threat capable of unfolding the promise of settlement in an arid terrain that by definition resists domestication. The case of the Atacama Desert and the extraction of nitrate recalls this timeworn pattern. Here, settlements in close proximity to limited sources of water became urban centers in parched valleys along the Andes mountain range, serving as the main providers of water and food to *oficinas* and the railroad. The city of Calama is a case in point. The introduction of mining drastically changed the scope and role of this remote urban town, whose population grew from fewer than one thousand inhabitants

at the turn of the twentieth century to about forty thousand in the 1940s.[17] A point along the Camino del Inca, Calama gained relevance during the nitrate boom. Not only did its close proximity to water and rail make Calama an archetypal agricultural town, but it also became an ideal location to accommodate the large numbers of migrant workers who were indirectly related to the mining industry. The strategic role of Calama in the physical footprint of nitrate extraction went beyond its usefulness as a quaint oasis town. Calama and the larger Río Loa valley became the site of a series of hydrological projects that would provide water to the railroads and mining sites. The first pipeline, built in 1888, tapped into the Loa River in San Pedro, thirty-eight kilometers north of Calama.[18] The aqueduct, running for more than three hundred kilometers parallel to the Antofagasta–Bolivia rail line, became the first large-scale waterworks project in the region built primarily to fill the water tanks of vapor locomotives.

Despite the periodic fluctuations of the global nitrate market, the Chilean saltpeter industry and its affiliated infrastructures saw unassailable growth throughout the first two decades of the twentieth century—development due in no small part to the accelerated demand for nitrate during the First World War, which gave Chile a natural global monopoly on the mineral. In 1913, an article in the *New York Times* extolling the value of Chilean nitrate in the global economy commented on a recent investment by the Schwab Company in Chilean iron ore. John Barrett, described by the newspaper as "an encyclopedic man on facts and figures of the kind," stated

Figure 2.7. Contemporary photograph of the turntable at Baquedano Station. Photo by Alejandro Rojas Arancibia. Courtesy of Alejandro Rojas Arancibia.

Figure 2.8. Aerial view of the oasis town San Pedro de Atacama. Photo by Mary Meader, 1937. From the American Geographical Society Library, University of Wisconsin–Milwaukee Libraries.

that "the phenomenal thing to him in Chile was her nitrate deposits. . . . 'This nitrate zone is as barren as any place on earth. It is one of the paradoxes of nature's laboratory, because no living thing can find nourishment here, although from these very nitrates nourishment is given to impoverished soils all over the world.'" The global market's reliance on Chile for nitrate paired with the Chilean government's mineral-dependent tax revenue structure encouraged development in all of the other nitrate-rich districts of the Atacama Desert. They all followed a model of urbanization similar to that of Antofagasta and the Cantón Central where the technological improvements of the Shanks system further expanded the constellation of extraction offices, ports, and support towns. The *oficina salitrera* and its kit of parts provided an instant city model that became the most salient archetype of industrial urbanization in the Atacama.

The Superblock in the Desert

The proliferation of *oficinas salitreras* throughout the Chilean desert is one of the most expansive and radical experiments in modern industrial town planning. As Eugenio Garcés Feliú has argued in *Las ciudades del salitre*, both the Renaissance military cities of the sixteenth and seventeenth centuries—Scamozzi's Palmanova or Vauban's Neuf-Brisach—and the town models of nineteenth-century social utopias such as Robert Owen's ideal village are clear precedents for the formal structure of the nitrate extraction

camps.[19] The systematic construction of a seemingly self-sufficient urban unit lends itself quite easily to this analogy. At first sight, the deployment of a walled city—designed and built in a single phase—strikes a remarkable resemblance to the geometric forms of the Renaissance city plans. Furthermore, the formation of an urban colony for a population between five hundred and 1,500 inhabitants, far removed from any established urban setting where people could work at mechanical and manufacturing jobs, had clear parallels to the social utopias that reacted against fast-paced industrialization in nineteenth-century Europe.[20] Yet the translation of these ideas across the Atlantic Ocean and under quite distinct political and economic models resulted in an urban experiment that was distinct from the ideal cities of Scamozzi or Owen. While the reference cities and the nitrate towns relied on single, large-scale pieces of real estate, the *oficinas* were primarily organized and financed as private entities with a singular purpose, with no distinction between the public and private realms. In this manner, nitrate towns along the Atacama resonate more with Alan Colquhoun's description of the superblock as an institutional construct, where large urban fragments are built under unified financial control and consciously designed as single entities.[21] Advancing from west to east, following the discoveries of new nitrates and serviced by the expanding rail infrastructure, the figural imprints of these experimental superblocks expanded along desert sand. The architecture of the *oficinas salitreras* was not about providing a new spatial model for a more just society but rather served as a device to improve productivity and profit. Heavily driven by a large-scale symbolic form and built through the relentless repetition of architectural types, the *oficinas* became the most visible emblem of capitalist progress in northern Chile.

Most if not all of the *oficinas* built within the Cantón Central shared a similar spatial structure. The industrial plant, the rail yard, the social and administrative center, the residential quarters, and the residue mound were the staple components that made up the nitrate superblock. The plant contained the Shanks machinery for the extraction of nitrate from the caliche and was generally housed in a tall, steel-frame warehouse. The warehouse was directly adjacent to the railway that contained loading tracks, locomotive depots, and maintenance facilities. These private tracks built within the ground of the *oficina* then linked to the main line that ran through the center of the canton. The social and administrative center made up the epicenter of urban life inside each complex. Most of the *oficinas* offered the same basic services, chief among them a school, a supermarket, an infirmary, a library, and public bathrooms. Most of these services tended to be grouped together along a central plaza, activating the space and making it the focal point for social interaction. This central plaza was also the site of more informal gatherings such as concerts and cards games. The residential quarter, generally disconnected from the social area, was the largest single component of the *oficinas*. This quarter was organized in compact rectangular blocks that formed a gridiron, the geometry derived from the systematic aggregation of a limited number of unit types, guided by efficiencies in construction methods and use of materials. Two block types

facing page
Figure 2.9. Scalar comparison of the nitrate offices along the Cantón Central that operated with the Shanks system. Drawing by Felipe Correa.

FRANCISCO PUELMA

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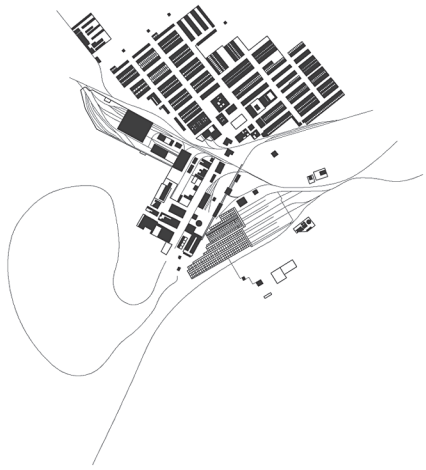

ACONCAGUA

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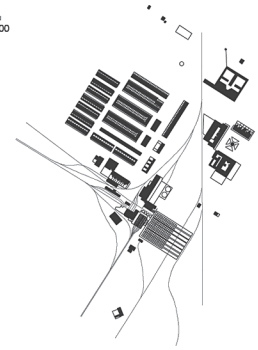

JOSE SANTOS OSSA

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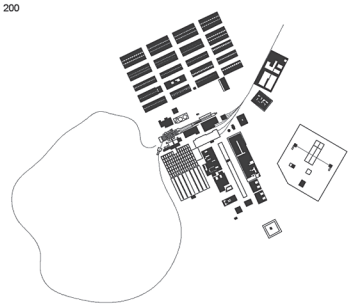

CHACABUCO

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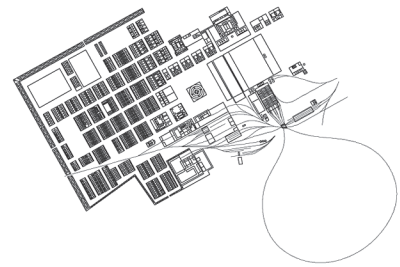

ANIBAL PINTO

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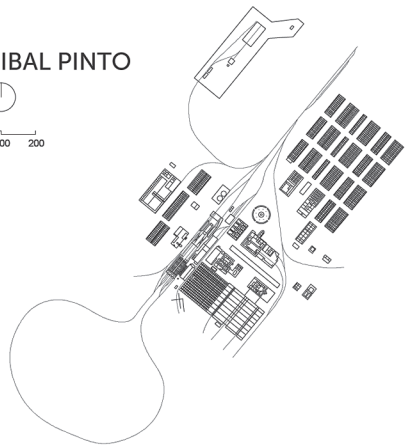

ARTURO PRAT

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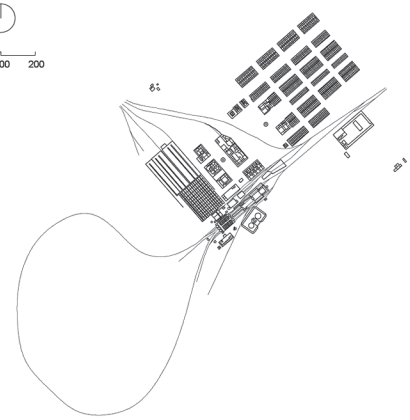

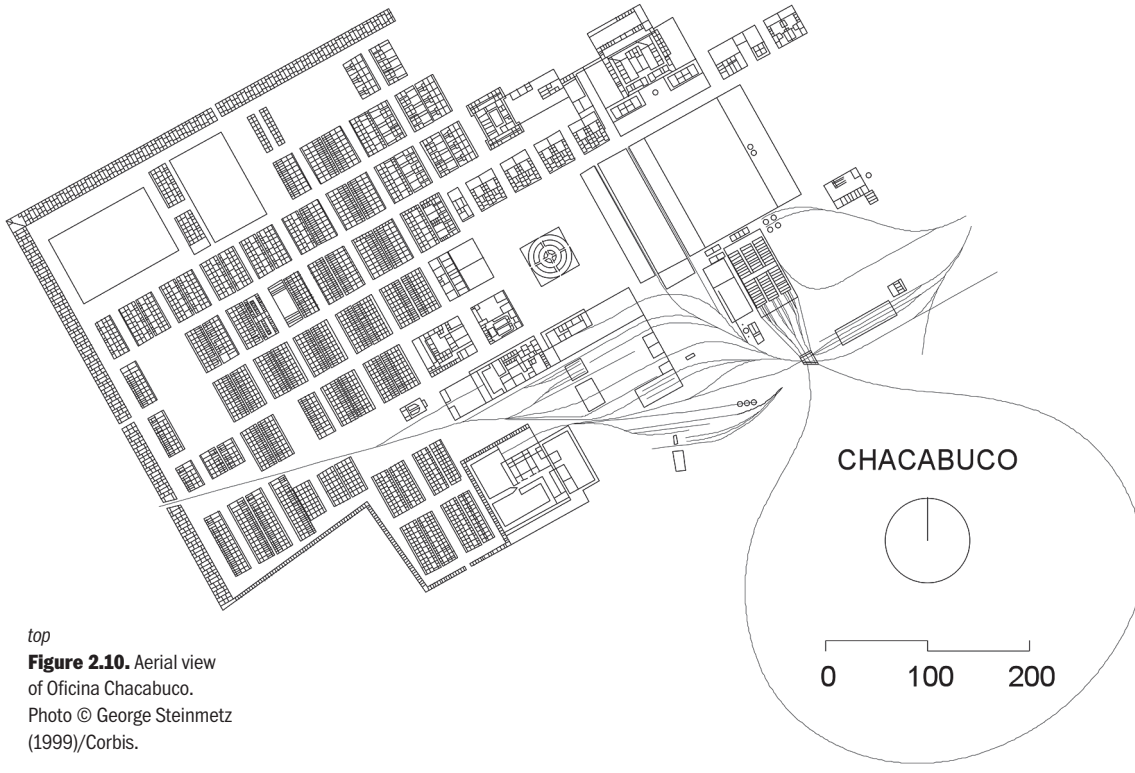

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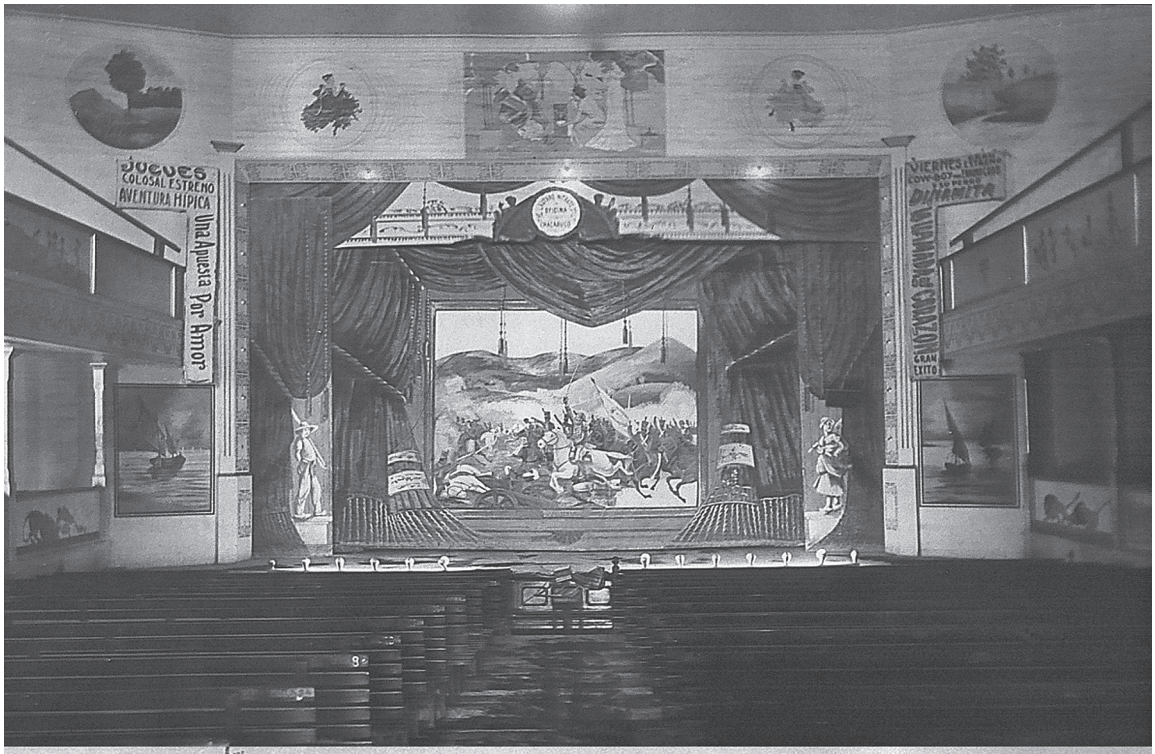
Figure 2.10. Aerial view of Oficina Chacabuco. Photo © George Steinmetz (1999)/Corbis.

bottom
Figure 2.11. Plan of Oficina Chacabuco. Drawing by Felipe Correa.

became the most commonly used across the *oficinas*. The first was composed through the aggregation of long, narrow units that formed a double row, with each unit having direct access from the street. The second block type, a variation on the first, introduced a thin passageway inside the block that linked all the inner patios. While the second block type was less compact, and therefore less efficient to build, it was much more desired by residents. The passageway provided a new scale of collective space that offered very different amenities than did the more formal plaza in the town's center. Finally, the artificial mountain created by the piling up of processed soil also became a ubiquitous element of these camps. Over time, these mounds would achieve substantial heights and become important iconographic elements in the landscape. Francisco Puelma (1907–1932), Aconcagua (1908–1931), José Santos Ossa (1910–1926), Arturo Prat (1912–1931) and Chacabuco (1924–1938) were among the most important saltpeter camps within Cantón Central. They all relied on the Shanks processing system and were built following the model of components described above. Of the list of *oficinas* within Cantón Central, Chacabuco was the most ambitious in production volumes and civic aspiration.

Sited approximately one hundred kilometers inland from Antofagasta and built as a walled citadel bounded by arid emptiness, Chacabuco exemplified the notion of an autonomous physical entity sitting in complete contrast to its surrounding landscape. Opened in 1924 when the nitrate industry had just taken a hit from the economic turmoil caused by the First World War, its construction resulted from the consolidation of smaller *oficinas* owned by the Lautaro Nitrate Company, which would later become the Anglo-Lautaro Nitrate Company. Many of the materials used by Chacabuco were recycled from the smaller *oficinas* that had closed due to the consolidation process. Similarly, much of the labor from the recently shuttered camps also migrated to Chacabuco, concentrating most of the nitrate extraction from the canton in a single larger facility. By 1930, the complex covered a surface of 350,000 square meters and had a population of workers, administrators, and families equaling about seven thousand inhabitants.

Conceived and implemented by William J. Clayton—a Chilean engineer of British descent who had overseen the construction of many other *oficinas* in the region[22]—Chacabuco was charged with displaying a carefully choreographed image of urban life and progress for those who were part of this great mining enterprise. The organization of the town revolved around a large, 100-by-100-meter open plaza. The northern and western edges were flanked by housing and basic services, respectively, while the east and south sides were defined by industrial facilities. The plaza was not just the main focal point where city met industry but also the only point of controlled access into the gated enclave. While most services along the western edge of the plaza were predictable—a supermarket, the infirmary, a church—it was the construction of an elaborate theater with a capacity of over one thousand seats that was a peculiar characteristic of this town. Rising three stories high, the auditorium was one of the tallest structures in the complex. On one hand it portrayed an unprecedented level of urbanity


JUEVES
COLOSAL ESTRENO
AVENTURA HIPICA
Una Apuesta Por Amor
VIERNES
DINAMITA
GRAN ÉXITO


JUEVES
VIERNES

for such a remote region; on the other, it reminded the town dwellers that even entertainment was in the hands of corporate management.

The organization of the residential blocks followed the patio-row house configuration seen in previous *oficinas*. Most units, for both workers and administrators, shared a similar layout, but differed in the amenities offered within. Those assigned to workers were rather rudimentary, with no private bathrooms or running water and in some cases no kitchen. Workers would generally have to use the public bathrooms located at the center of the residential quarters and in some cases would have to start a corner fire in the patios in order to cook. The administrators' units were appointed with all the amenities that the workers' housing lacked and later even included hot running water through a pipeline that was connected to the processing plant to take advantage of the heat generated in the nitrate extraction process. While the separation between the two social groups was not distinguishable in the urban form of the town, the housing units were clearly zoned, with the higher-end housing occupying blocks adjacent to recreational fields.

The late 1920s and early 1930s saw the heyday of Chacabuco. Its life as a nitrate town was short-lived, and all production abruptly ceased by 1938. A new nitrate processing technique invented in the United States known as the Guggenheim system—named after the family enterprise that funded the first mines using this new technology—rendered the Shanks system obsolete and uneconomical, forcing Chacabuco to shut down. The closed plant's future was as grim as that of its predecessors; following a familiar pattern, it would soon be abandoned, looted, and turned into a ruin. In 1971 the ghost town was designated a historic landmark, and two years later it was reopened during the military dictatorship of General Augusto Pinochet. From 1973 to 1975 the Chilean armed forces appropriated the town and used it as a detention camp for left-wing leaders and other subjects who posed an alleged threat to the totalitarian regime. The same small-gauge line that once transported nitrate riches down to Antofagasta now carried political prisoners up to Chacabuco, and the perimeter wall originally erected to separate economic progress from wilderness would, decades later, separate hostages from freedom. These years marked the darkest period in the history of this remote enclave.

A Shift in Scale: María Elena and the Guggenheim System

The injection of US capital into the struggling nitrate industry of Chile in the 1920s was a major catalyst for the urbanization of the Atacama Desert and for the production of natural nitrate overall. Investments made by Guggenheim Brothers, who already had stakes in the Chilean copper industry, along with the development of a new and more mechanized processing technique known as the Guggenheim system, drastically changed the financial, technological, scalar, and social dynamics of the *oficina salitrera*. With the opening in 1926 of the Oficina Coya Norte—later renamed María Elena in honor of Mary Ellen Condon, the wife of Elias Anton Cap-

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Figure 2.12. Interior and exterior views of the Chacabuco Theater. Photographer unknown, 1929. Courtesy of Album Desierto, Chile.

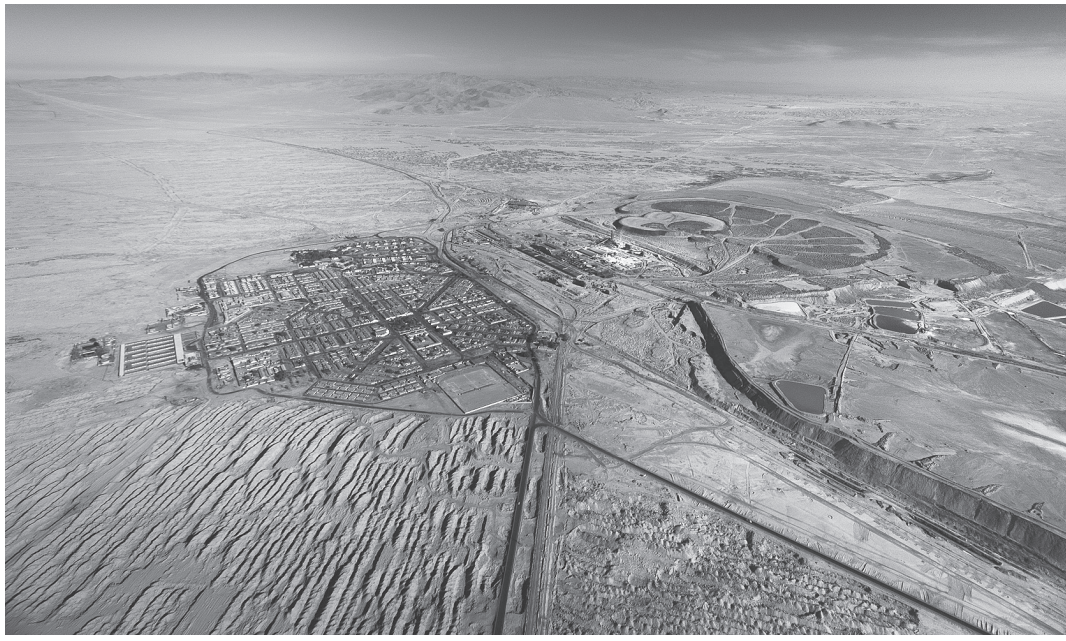

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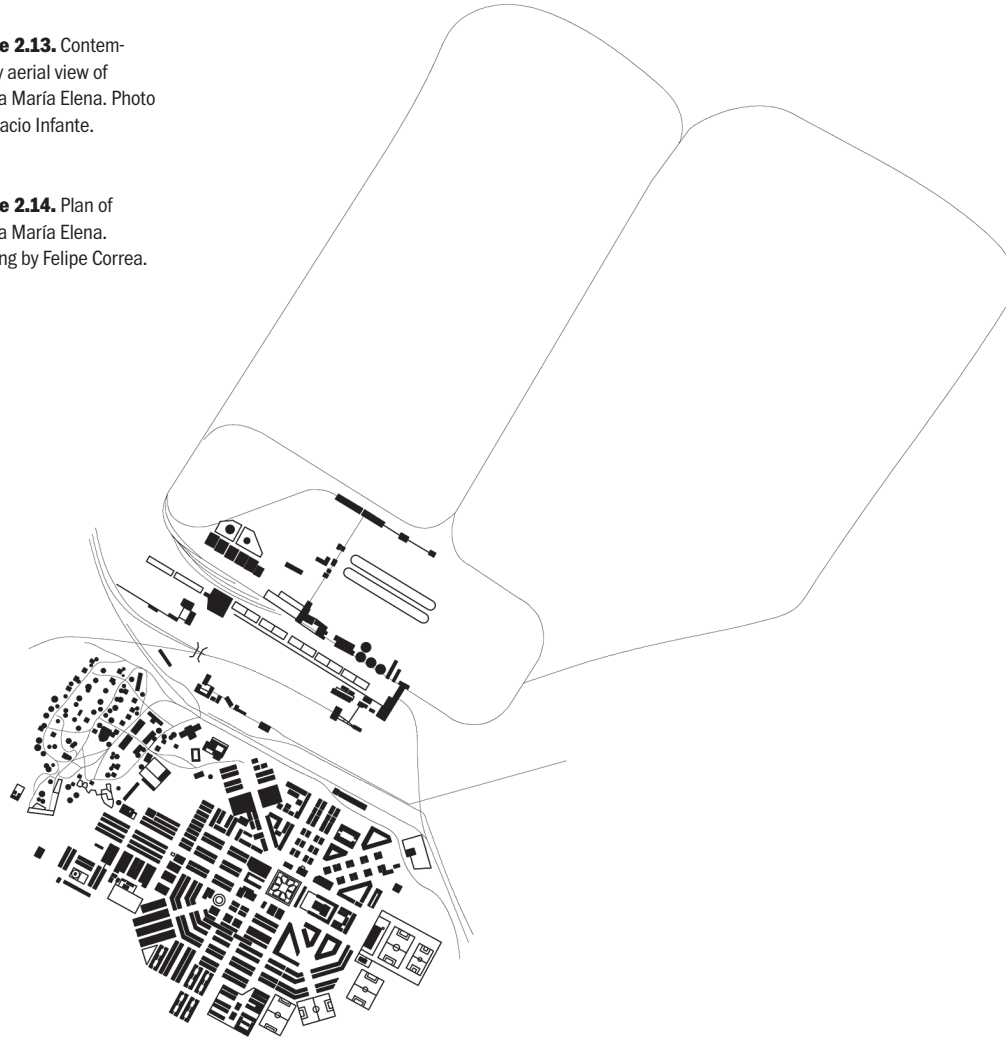
Figure 2.13. Contemporary aerial view of Oficina María Elena. Photo by Ignacio Infante.

right
Figure 2.14. Plan of Oficina María Elena. Drawing by Felipe Correa.



pelen Smith who was attributed with inventing the Guggenheim system—Chile saw the largest and most ambitious *oficina* built to date. Its plant was expected to produce six hundred thousand metric tons a year, four times more than Chacabuco, and the industrial facility was to be paired with a new high-profile town that could attract and retain 7,500 workers and their families in the middle of the desert. Sited seventy kilometers inland from the port of Tocopilla within the Toco district, María Elena was to provide a new lease on life to a decaying industry that could no longer compete with its synthetic counterpart.

The Chilean government, whose nitrate tax was at risk due to the competitive disadvantage of natural nitrate, opened a dialogue in the early 1920s, via Washington, DC, with Guggenheim Brothers, the firm that had patented Cappelen Smith's method for extracting nitrate a few years prior. The original intention of the Guggenheims after these conversations was to serve as consultants to the nitrate industry, helping existing *oficinas* shift from the Shanks to the Guggenheim system. The efficiencies in production costs and the economies of scale offered by the new, mechanized system could make natural nitrate once again cost-effective enough to compete in the global market. As Daniel Guggenheim stated on the virtues of his new method:

> Our firm after many years of research in our New York laboratories, has developed a new process for the extraction of Chilean nitrate from the Chilean nitrate rock, known as Caliche. Our engineers have also developed a new system for mining the Caliche employing mechanical methods instead of old hand mining methods hitherto employed. With these two developments, both radical in their departure from previous methods, a new era has opened up for the Chilean nitrate industry.[23]

Central to the Guggenheim system was a new extraction process based on leaching at or near atmospheric temperatures and on a crystallization process through refrigeration that guaranteed greater results. While the old Shanks system could extract only 50 or 60 percent of the nitrate in the caliche, the Guggenheim system could extract up to 95 percent. In addition, the new system could also process caliche with only 6 percent of nitrate—the previous method had a threshold of 14 percent—drastically increasing returns in existing deposits.

The Guggenheims' proposal encountered significant resistance from both the British-dominated private industry and the Chilean government. While in general both sectors agreed on the benefits that new extraction technology would bring to the industry, they were also skeptical about how it would restructure the industry. The private sector felt threatened by Guggenheim Brothers, who had previously demonstrated interest in nitrate mining. The government was nervous about the impact the new, mechanized method would have on the already soaring unemployment rate across the desert, an issue that had already plagued the government, lead-

ing several times to violent confrontations between the owners of the *oficinas* and the labor force that had migrated to the desert.[24] The resistance they encountered to the technology transfer led Guggenheim Brothers to secure a Chilean patent for their extraction process, and they tested the technology in which they had invested by forming their own *oficina*. In September 1924 the Chilean government sold a large amount of its holdings in unworked nitrate grounds. The Guggenheims took advantage of the sale and purchased a significant amount of nitrate-rich land. Further capitalization occurred when they purchased the Anglo-Chilean Nitrate and Railway Company and organized the Coya Norte syndicate, establishing the necessary relationship of deposits, labor, and transportation to make of the soon-to-be Oficina María Elena a success.

The technological shift from the Shanks to the Guggenheim system, in conjunction with the conflicts between the Chilean government, Guggenheim Brothers, and the struggling nitrate industry, had a direct impact in the reshaping of the physical and experiential identity of the Chilean nitrate town. Three elements became crucial in this rebranding. First, the new extraction method drastically altered the image of the nitrate miner, changing him from an artisanal laborer who processed caliche with his bare hands into a white-coated technician who pressed buttons on a control panel. The aspirational lifestyle of this new type of worker demanded living and working accommodations that were much less rudimentary than those of their predecessors. Second, the general discontent of laborers in previous *oficinas* and the perception that the Guggenheim system would further escalate unemployment in the region were seen as risks that had to be mitigated by way of a new industrial complex and town that could showcase an unassailable rebirth of Chilean nitrate through US capital. Third, while the number of employees needed per metric ton of nitrate was much lower than it had been with the previous system, the vast scale of this new enterprise required at least 2,500 workers,[25] many of them at higher ranks than before, making the new Guggenheim enterprise a highly desirable source of employment. The town of María Elena, designed in New York and interpreted by local engineers in Chile, was tasked with embodying this new aura of progress, and in so doing it had to reassert an image of economic progress in nitrate country.

The plant at Coya Norte, later María Elena, was built in an architectural style reminiscent of a Mexican Spanish mission[26]—an image borrowed from the American Southwest that perhaps the authors associated with the aridness of the Chilean pampa—and opened its doors in the fall of 1926.[27] The town plan was drafted in early 1924 by the architect Harry Beardslee Brainerd (1887–1977) in collaboration with the engineer Hjalmar Ejnar Skougor (1884–1932) as part of an architectural partnership that would continue after María Elena to become responsible for important town plans, including one for the Canadian company town of Arvida, Quebec, for the Alcoa Aluminum Company.[28] Brainerd and Skougor brought to South America the ideals of the "city beautiful" movement emerging in early twentieth-century North America, along with a sound desire to

facing page, top
Figure 2.15. View of the larger-scale Guggenheim processing equipment at Oficina María Elena, 1930. Courtesy of the Museo de Antofagasta.

facing page, bottom
Figure 2.16. View of Oficina María Elena from outside the gates, 1930. Courtesy of the Museo de Antofagasta.

Figure 2.17.
Contemporary aerial view of María Elena's central plaza. Photo by Ignacio Infante.

improve the quality of life in industrial towns. Brainerd, whose interests spanned architecture and city planning, was educated in architecture at Columbia University and later joined the firm of Harvey Wiley Corbett and George S. Koyl. His expertise in urban planning came from his training with Robert D. Kohn, a prominent architect and city planner in New York who would later join the team that conceived the canonical garden city plan for Radburn, New Jersey.[29] Skougor, also based in New York and known for his interest in housing design, had in 1921 developed a plan for La Rosita, a company town built in the state of Coahuila, Mexico, commissioned by the American Smelting and Refining Company. La Rosita was also built in a Mexican Spanish mission style and it is from Skougor's experience in Mexico that the team adopted this architectural style to redeploy in the southern hemisphere.

From the start, the plan for the Guggenheims' town was a radical departure from its predecessors. It abandoned previous towns' singular footprint, in which workers and administrators coexisted in the same urban area, separated only by zoning, in favor of a new, highly differentiated two-piece composition. A dual configuration that included one town center flanked by workers' housing, amenities, and industry and a second, more beleaguered garden city for administrators, evocative of the early North American suburbs. This more secluded enclave was known as the *barrio americano* (American neighborhood), as most of its dwellers were high-ranking foreign administrators. The town's core was conceived as an octagonal superblock with four long and four short sides. Two diagonal streets that crossed each other at the center plus two parallel streets that defined

two edges of the central square made up the main armature of the town, subdividing it into smaller quarters. As expected, the central square contained the most common collective services, including a school, a supermarket, the workers' union, a theater, a museum, and a library, once again making the central square the heart of the town. While this configuration had existed in previous *oficinas*, the difference in María Elena was the cost, quality, and diversity of the products and services offered. These facilities went well beyond basic subsistence, offering goods and services that would be comparable to or better than those offered in cities along the coast at a fragment of the price. As a longtime resident of María Elena recalls, "Everything outside was unaffordable, it would cost four to five times more."[30] Sports facilities, also a crucial component of social life in María Elena, were placed along the eastern and western edges. The facilities along the east were assigned to the workers, while administrators used the western sports fields, which also served as a buffer between the town and the suburban enclave. The industrial facilities were placed to the north of the rail yards, establishing a complete separation between city and industry.

While María Elena provided an overall improvement in quality of life to the *pampino*,[31] the provision of housing was the complex's greatest shortcoming, where the differences among social groups were most noticeable. Three main types of housing were available. Most workers lived in long, thin blocks of attached patio houses adapted to the angles of the octagonal town shape. While these units did have private kitchens, they still lacked bathrooms, making the public bathrooms the key shared amenity within each block. The second type was a long and thin residential dorm, generally called a *buque* (ship) because of its resemblance to a large cargo ship. These strip buildings made up of double-loaded bedrooms housed mostly single workers, although many were later converted to family units due to the high demand for family housing. In stark contrast to the workers' housing was the third type, the single-family home in the *barrio americano* along the eastern edge of the town. Different not only in location but also in morphology, the administrators' villas came with a wide host of amenities including private bathrooms. Sited on a hill, these residential units took advantage of topography and views to create a more idyllic suburban landscape. Even vegetation was introduced into this area in order to create a gated residential oasis on a hill overlooking the town center below.

Daniel Guggenheim's hypothesis about the capacities of his new method to extract nitrate proved to be true. The economies of scale and processing efficiencies introduced by the Guggenheim method allowed natural nitrate to compete with its synthetic counterpart across global markets, primarily until the nationalization of the María Elena plant in 1968.

Still open today, María Elena is the last surviving *oficina* in Chile, even though the last four decades have been harsh economic times for its residents. Changes in ownership—María Elena was privatized again in 1980—along with a much stronger interest in copper extraction from the public and private sectors have drastically changed the physical imprint and social dynamics that once gave life to this model town in the desert. Owned by the

Sociedad Quimica y Minera (SQM), the industrial town of María Elena continues to operate today, yet in an effort to survive, corporate management has eradicated many of the programs and services that instigated urban life in the town, causing a radical change in identity and modus operandi for its residents. One of the biggest modifications to María Elena has been the introduction of weekly work shifts, where employees work for twenty continuous days and then receive ten days off. As a result, many families have moved to nearby towns like Antofagasta or Tocopilla that offer better services and amenities, drastically reducing the population of María Elena itself and turning the town into a temporary dormitory for bachelors in a manner far removed from its original mission as a hub for city life in the desert. Today María Elena is a typical example of an industrial town where urban life has outlived the resources that prompted its generation. It sits now as a derelict private town with a desperate need to become an independent municipality where the citizens who remain can forge the town's future without the constraints imposed by its corporate patron.

The Fall of Nitrate and the Rise of Copper

Two main factors contributed to the end of the Chile's natural nitrate monopoly during the late nineteenth and early twentieth centuries. One is the invention of artificial nitrates in Germany, which slowly took over a market that previously was dominated solely by natural nitrates. The other factor is the shift in the Chilean government's focus, heavily influenced by US capital, from nitrate to copper during the second and third decades of the twentieth century. The Haber-Bosch process, a German method invented in 1910 by Fritz Haber and later perfected by Carl Bosch, rapidly emerged as the preferred method for nitrogen fixation, and by 1918 it was a method of choice for producing ammonia-based artificial nitrate.[32] Yet due to the high demand for nitrates in the Americas and Europe during the two world wars, Chile did not feel the effects of synthetic nitrate on the global market until the mid-1940s. The survival of Chilean nitrate was also due to a major marketing campaign sponsored by Guggenheim Brothers that promoted the superiority of natural nitrate versus its synthetic counterparts. Once the Second World War ended, the saltpeter industry in Chile came to a standstill and all of the *oficinas* that had implemented the Guggenheim system—with the exception of María Elena—eventually shut down. Furthermore, the rapid electrification of the world in the early decades of the twentieth century, which saw the United States rise to prominence in the global copper market, brought to Chile, also via the Guggenheims, a significant amount of capital for the extraction of copper, another abundant resource found throughout the Atacama Desert. With the aid of British investment, Chile had served as the world's top exporter of copper during the mid-1800s. The national reemergence of that industry further accelerated the decline of the nitrate industry as the government saw greater promise in copper as a source of income to replenish its public coffers.

The reemergence of copper extraction in Chile, initially as a parallel economy to nitrate and later as the sole major economic engine of northern Chile, had a significant effect on the territorial dynamics of the region. The copper industry capitalized enormously on the transportation networks that had already been put in place to the service of nitrate exports. Copper extraction sites such as Chuquicamata—established in 1915 and today the largest open mine pit in the world—for many years tapped into the Antofagasta–Bolivia rail line, until highway infrastructure supplanted rail service and also kept the port cities of Antofagasta, Mejillones, and Tocopilla active. Additionally, the copper industry continued to explore the spatial dimension of the desert mining town through the implementation of new company towns, such as El Salvador and El Pabellon del Inca, that relied on the lessons learned from the experimental towns built in the region by the nitrate industry. The former, built in 1959 by the Andes Mining Copper Company, was conceived as a full-service town on the premises of quality of life, health, and recreation. More recently, El Pabellon del Inca, built by the Compañía Minera Doña Inés de Collahuasi in 1999, exemplifies the notion of a temporary camp.[33] Generally viewed as a "hotel" for miners, residences built on this new model rely on regional cities to accommodate families and provides a much lighter footprint at the mining site by offering only temporary accommodation for seasonal workers. Today, the mining industry continues to drive the economy of northern Chile, a territory that relies heavily on the agricultural production of southern Chile in order to sustain a desert population that has made a unique cultural landscape out of mining the desert.

Post-extractive Urbanization

Due largely to the continued extraction of copper in the region, northern Chile today continues to be a robust arm of the Chilean economy. And, even though rail has been rapidly replaced by highway infrastructure, the copper industry continues to vigorously sustain the interdependent relationship between port cities, extraction sites, and Andean oasis towns. Yet the historically rich footprint of the late nineteenth- and early twentieth-century nitrate industry continues to exist in an extremely derelict state and is in desperate need of strategies that can guarantee a comprehensive conservation of this landscape over time. The designation of Chacabuco as a historical monument in 1971, followed by the Baquedano railway station in 1983[34] and the civic buildings of the town of María Elena in 1999,[35] has encouraged a series of nationally sponsored preservation initiatives in the region. This need for a preservation strategy has also been recognized internationally with the inclusion of Oficinas Humberstone and Santa Laura on UNESCO's list of world heritage sites.[36] While these initiatives have been crucial in fortifying the legacy of nitrate towns in the region, most instances are isolated and focus primarily on the material restoration of select buildings that are later designated as "must-see" tourist

attractions. Although these conservation approaches are of immense value to the region, they must also be reinforced with a larger management strategy that can help rethink not only the historical relevance of the *oficinas* but also new uses and programs for these abandoned spaces—across multiple scales, from the individual building to the territory—in order to give this landscape a new lease on life.

The many challenges posed by this derelict industrial landscape go far beyond the preservation of historical buildings and include aging mobility infrastructural networks, lack of basic services, and depopulation of post-nitrate zones, among many others. Within this context, the most salient issue concerns the large number of *oficinas salitreras* that exist today in complete disrepair. With an overwhelming assortment of historical assets in the middle of a barren desert and limited resources for preservation, there has been a tendency to save only select architectural pieces from the larger nitrate industry landscape to serve as memorabilia of an age gone by. Instead, however, a more sustainable, long-term recovery strategy for these towns requires the introduction of a new set of economies and uses that will not only restore the physical appearance of the *oficinas* but also give them a new reason to exist within the territorial dynamics of the Atacama Desert. In this case, art, entertainment, and tourism could play a pivotal role in reinventing nitrate country. Projects such as Emscher Park in Germany are relevant references for the future of the nitrate cities of Chile. Made up of seventeen independent municipalities across over eight hundred square kilometers, the park resulted from the transformation of dilapidated coal mines, abandoned steelworks, and a contaminated river into a new recreational amenity at a regional scale. The crux of its success was the rebranding of an industrial landscape through the introduction of high-profile art installations, turning it into a major tourist attraction that received worldwide media attention.[37] A strategy similar in scope and ambition to Emscher Park could help preserve Chile's nitrate legacy as a global tourist destination in South America, framing not only the *oficinas* but also the entire nitrate network—port cities, rail infrastructure, extraction sites, and Andean oases—as the object of transformation. As both Reyner Banham and John Van Dyke have claimed, the desert is a space for illusion and fantasy. It is essential now for northern Chile to once again project a new fantasy upon its desert, a sustainable fata morgana that reimagines these derelict extraction sites as the scaffolding of an ethereal landscape.

3

Petrol Encampments

Judibana and El Tablazo

The modest Venezuelan municipality of Judibana,[1] a mid-twentieth-century model city built by the Creole Petroleum Corporation (a subsidiary of Standard Oil) outside the gates of its refinery in Amuay on the Paraguaná Peninsula, presents a case study of an urban project that occupies a critical space between the corporation that constructed the town and the broader society that ultimately inhabited it. A partially implemented plan designed by the Chicago-based architecture and urban planning firm Skidmore, Owings & Merrill (SOM) in the mid-1950s, it was modeled on postwar suburban neighborhoods in the United States and showcased a new company-town model for the Venezuelan oil industry that could be adopted across South America. Conceived as a municipality rather than a gated corporate enclave, the plan envisioned an open city for about fifteen thousand residents.[2] The layout, composed primarily of single-family homes with private lawns, was anchored by a school, hospital, church, sports club, and commissary and was banded together by extraordinarily lush, artificially irrigated vegetation. Judibana allowed its foreign and local residents to purchase property directly from the municipality, establishing new social and financial relationships between the town and its citizenry and between Creole Petroleum and the state of Falcón.[3] Despite the town's open configuration, its initial occupants were primarily high-level oil executives. Yet if one visits Judibana today, long after the patrimony of Creole Petroleum, the city can be seen as an urban pilot project that took on a life of its own. As the original urban structure evolved, the municipality has added many social structures and groups to the town fabric. These have transformed this garden city into a robust object lesson for future cities.

While geographically removed from Lake Maracaibo—the oil epicenter of Venezuela—Judibana, with its expansive mid-century-oil-town history, is a pivotal piece within the larger history of crude oil production in Ven-

ezuela and the continent as a whole. Its physical aspirations, both in the original design project proposed by SOM and in the abecedarian version built by Creole Petroleum, exemplify many of the ideals of urbanization and the struggles of the oil industry and the national government during the country's black gold rush. A singular example of the effects of oil in the Venezuelan savanna, the city serves as a gateway to a much larger roster of urban projects conceived by the government and the industry to address the unprecedented migration and urbanization of western Venezuela that followed the oil boom.

Lake Maracaibo: From Village to Campground

The dotting of the earth's surface with extractive grids has, over time, transformed pristine landscapes into environmental war zones. The case of Lake Maracaibo is one of the most extreme versions of this story. While the existence of petroleum in northern South America has been known since the colonial period—the first recorded oil export in Venezuela dates back to 1539 when a barrel was sent to King Carlos V of Spain under the belief that it would alleviate him of gout symptoms—it was not until the early twentieth century that Venezuela was altered by the trappings of oil. In 1905, Cipriano Castro (1858–1924), then president of Venezuela, approved a new mining code that granted him full authority to administer and concede oil extraction sites without approval from congress.[4] This law, which helped grant extraction rights to many foreign corporations, set the stage for the most aggressive spatial transformation of northern Venezuela in its history.

Lake Maracaibo—the largest lake in South America, with the city of Maracaibo as its regional capital—had traditionally been disconnected from Caracas and eastern Venezuela. Benefiting from rich agronomy along nearby Andean slopes, Maracaibo capitalized on its fertile ground with the cultivation of coffee, becoming a strong commercial hub for agricultural products. The town's geographic location at the northeastern edge of the lake with direct access to the Gulf of Venezuela allowed for strong trading ties with Curaçao. From this Caribbean island, eastern Andean products from Colombia and Venezuela gained access to global shipping routes and the advantages of oceanic trade.[5]

Until the first three decades of the twentieth century, Maracaibo had acted as the critical point of interface between the lake and open territory. Small townships and precincts that dotted the lake's edge provided basic services and rudimentary boat transportation to an open and dispersed network of *háticos*. The *háticos* were clearings in the landscape located approximately one mile from each other that included a patch of land for cultivation, a small house, and a water reservoir.[6] These defined the basic unit of property ownership and the organizational structure for subsistence agriculture. Artisanal agronomy was complemented by divi-divi lumber sales that served as a secondary source of cash. The connection of Maracaibo to the Caribbean made the lake the best possible conduit for the provision

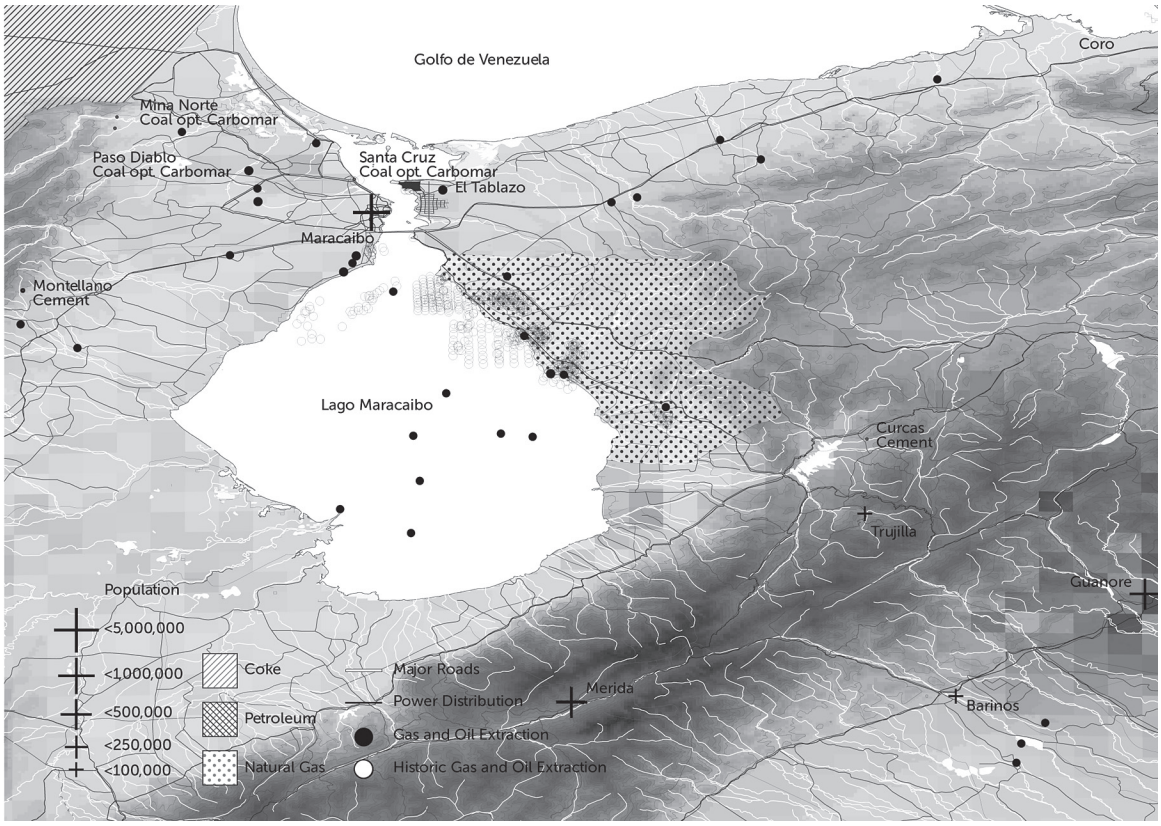


Figure 3.1. Current bird's-eye view of Lake Maracaibo and the Gulf of Venezuela, showing active and decommissioned gas and oil extraction sites. Drawing by Felipe Correa.

of goods into the belt of lowlands that encased it, a landscape defined by a thicket of sporadic forests and scrub woods. This open system of villages and clearings would soon be replaced by the closed figure of the corporate campground—a new spatial model that would splinter the operative structure and spatial identity of the region.

While the country's history of oil exploitation by national enterprises goes back to the turn of the twentieth century, it was the eruption of the Barroso 2 well in 1922, near Cabimas, that marked the beginning of the global export industry.[7] Following the emblematic discovery of the well, the Venezuelan government granted three large-scale international extraction contracts. Standard Oil with its two subsidiaries, Lago Oil and Creole Petroleum, Gulf Oil with its subsidiary Mene Grande, and Royal Dutch Shell Oil Company became the three key actors in the construction of Venezuela's oil landscape.[8] Uninhibited by any natural feature, thicket, or ground condition, the relentless grid of oil wells transformed the eastern edge of Lake Maracaibo into an even forest of towers. A lattice of roads, power conduits, and telephone lines rapidly thickened this ephemeral grid. The pre-oil lakeside villages were soon replaced by another village of shacks with wooden walls and zinc roofs that housed the large bachelor population that worked the oil fields. The proliferation of wells, tanks, and rudimentary camps remodeled the coastal area around Lagunillas into the first major oil hub of the region.

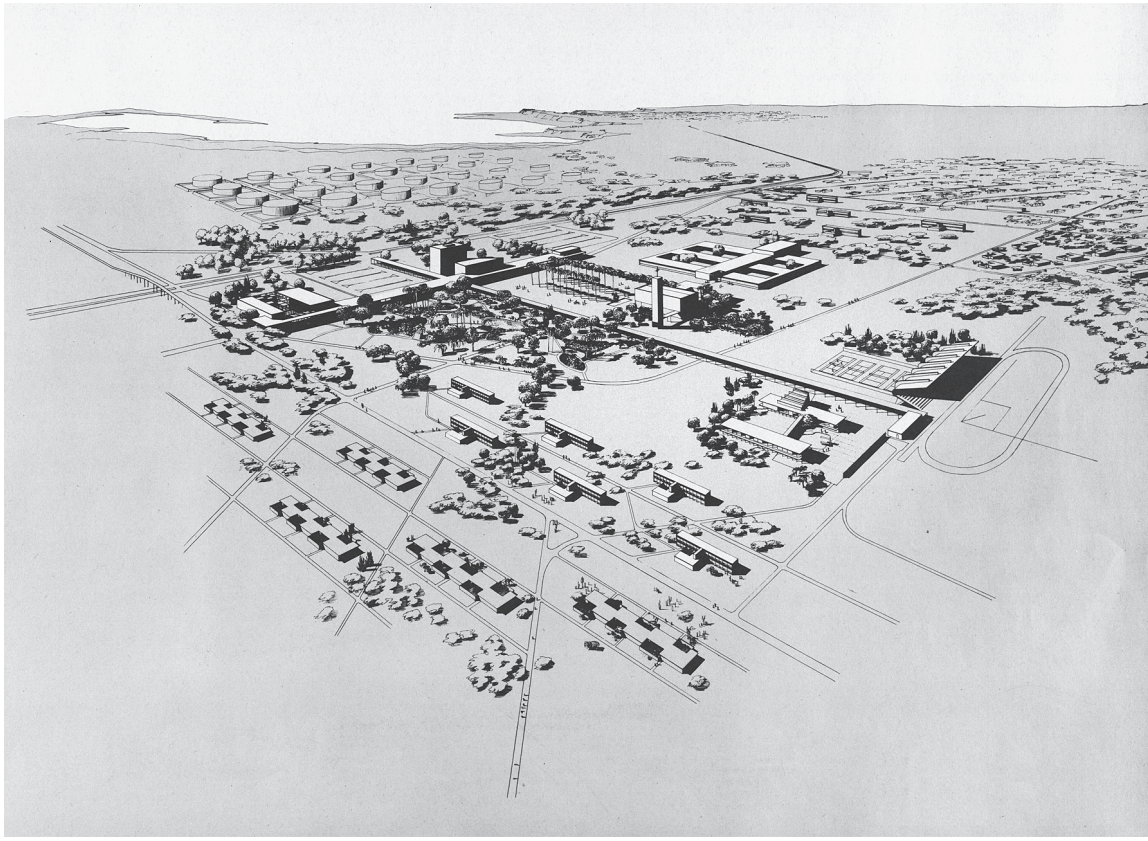


Figure 3.2. Bird's-eye perspective of the Creole Petroleum town (Judibana) proposed by Skidmore, Owings & Merrill, 1946. Courtesy of Skidmore, Owings & Merrill.

The growth of the oil sector around Lake Maracaibo and western Venezuela generated a polarized urban condition with two opposing city types. The increasing demand for labor by the oil companies expanded the nature and scale of the oil camp, constructing a corporate walled city that aspired to an early suburban North American lifestyle. Outside the encampment walls, however, another kind of city formed. Here was a set of entropic settlements generated by regional migration, resulting in a patchwork of formal and informal businesses that supported the booming oil industry. The incongruous relationship between gated, patron-sponsored settlements and self-built towns with minimal or no basic services became a major point of conflict between oil corporations and the Venezuelan government. The majority of housing compounds and urbanization projects that made up the urban imprint of the oil industry in the region—these being public, private, or public-private partnerships—were characterized by this bipolar urban condition.

The rapid growth of the oil industry meant an unprecedented demand for workers' housing. In an effort to attract and maintain better-skilled oil workers, generally called *obreros*, the companies built large numbers of barracks made of wood siding with zinc roofs and lacking any means of ventilation. Extremely poor in spatial organization and construction quality, these huts, which aggregated serially, severely underperformed in the extreme heat of the region. The lack of domestic comfort only compounded

the stresses associated with laboring in the oil industry, resulting in a general dissatisfaction with the quality of life in the camp.[9] This persistent complaint translated into new labor laws that required oil companies to significantly improve living conditions for oil workers. New employment regulations passed in 1936[10] paired with an increase in the number of more demanding senior staff, both foreign and Venezuelan, paved the way for a second-generation oil camp with spatial aspirations that went far beyond the basic provision of *obrero* housing.

The 1930s and 1940s witnessed renewed camps around Lake Maracaibo that were much grander in both scope and spatial ambition. These new settlements more directly followed the patron-sponsored company-town model, where maximum productivity and social behavior were directly intertwined and guided the lifestyle of the compound. Their designers were heavily influenced by the principles of efficiency and order promulgated by many of the company and industrial towns that had revolutionized industry in the United States and Europe a few decades prior, such as Pullman, Illinois, and the Bata company town in Zlín.[11] More self-sufficient in nature, these new camps were designed for workers—mostly foreign—to move into with their families, creating a gated city with a full roster of services and amenities for everyone who was on the payroll of the corporate sponsor.

The second-generation oil camps became messengers of modernity within a mostly rural environment. These full-service enclaves, organized primarily as buildings dispersed in the landscape, embodied a new lifestyle that exercised a significant social and cultural change in the region. Remote localities along the lake such as Cabimas, La Rosa, La Salina, Mira-

Figure 3.3. Lake Maracaibo Oil Derrick Harbor. Photo 1952. Courtesy of Felipe Correa.

flores, and Tía Juana became the main sites for new campgrounds sponsored by the three oil giants operating in the region. The housing, its complementary amenities, and the general spatial disposition of these towns aspired to the comforts of a pre-war North American suburb. Completely isolated from the realities of their context, these camps afforded the illusion of a car-oriented middle-class lifestyle, constructed through the provision of semi-detached or single family homes supported by schools, recreational centers, and commissaries spread over a vast landscape. And, while the provision of modern amenities offered some tangible and much-desired improvements to the quality of daily life within the camps, the imported image was ambivalent in its effect. As a dweller of one the camps described them, "no one ever walks here. It seems as though people have lost the use of their legs. The automobile has made us lazy. . . . I sit here looking out on an empty street, the only movement being the wind pushing the trees towards the north."[12] Despite such misgiving, the suburban image rapidly permeated the compound gates and became the lifestyle to which Venezuelan migrants to the region aspired. Yet this idyllic garden could become a reality only to those who were part of the limited group that worked for the foreign oil enterprises.

Marked by clear physical and administrative barriers, the abyss between the camps and the outside world was particularly harsh in Hollywood and Las Cupulas, two full-service camps built by Creole Petroleum in the Cabimas area. Adjacent to the oil tank farm and with limited points of contact with the existing village, these compounds were developed as citadels around which impoverished, informal settlements rapidly began to congeal. This clash between corporate enclaves and self-built settlements provided tangible evidence of the most vivid problem created by the oil industry. As a capital-intensive enterprise with highly automated processes, oil production generated large amounts of revenue for a small percentage of society and could offer very limited employment for the lower socioeconomic groups in Venezuela.

Throughout the 1960s, the Lake Maracaibo region and western Venezuela were the sites of housing and urbanization policies that sought to renew the area. Two pressing issues guided the transformation. The first was the Venezuelan authorities' effort to address the disparity in living standards inside and outside the company camps and, in doing so, redress the social disparity created by the oil industry. The government argued not only that the country had to improve the quality of the urban landscape outside the camps but also that it had to diversify the economy of the region in order to improve the median income of those not directly affiliated with the oil industry. The second issue came from the oil industry itself, which no longer wanted to pay for the social overhead of the camps. The corporations argued that while it was essential for them to provide housing in the initial period of oil exploitation when housing, schools, medical services, and stores were nonexistent in the region, it was no longer a necessity. As western Venezuela had developed rapidly during the oil boom, they argued, it was now the government's responsibility to provide adequate urban envi-

Figure 3.4. Aerial view of La Salina, a private oil camp owned and operated by Creole Petroleum at Lake Maracaibo, 1949. Courtesy of Felipe Correa.

ronments.[13] Furthermore, they claimed that the paternalistic model of the company town was distracting from their main business purpose, since employee complaints over basic services affected extraction performance. A grievance about a schoolteacher or overpriced merchandise at the commissary went directly to the employee's supervisor, creating an undesirable merger between domestic affairs and business. The desire for strong government intervention in future urbanization plans combined with the industry's desire to relinquish some of its social responsibilities to the com-

munity resulted in two pivotal projects for the region. One of these developments was a new, government-sponsored petrochemical growth pole[14] in El Tablazo near the town of Altagracia on the eastern edge of the lake, and the other, a private initiative by Creole Petroleum, was the aforementioned oil city of the future, Judibana, encrusted in the Amuay Bay.

El Tablazo: The Grid at the Scale of the Territory

In the spring of 1968, an interdisciplinary British team composed of Forestier-Walker and Bor as architects and urban planners and Nathaniel Lichfield and Associates as economic consultants, were hired by the Venezuelan Ministry of Public Works to plan a regional growth pole on the eastern edge of Lake Maracaibo, opposite the city of Maracaibo. This new city, called El Tablazo, revolved around the construction of a new petrochemical plant and was one of three planned new cities aimed at diversifying the oil-centric Venezuelan economy. The two other cities were Muy Tuy—a satellite an hour away from Caracas planned with the objective of alleviating pressure on the capital city from the unprecedented migration from the countryside—and Ciudad Guayana at the intersection of the Orinoco and Caroní Rivers, a major national growth pole tasked with reactivating the economy of southern Venezuela.[15] The planning team was tasked with the conceptualization of an urban structure that could effectively accommodate growth over time. The plan for El Tablazo was based on a series of variables that involved the changing rates of migration to the region, the future performance of the oil industry in international markets, and the overall success of the petrochemical plant. The team was given an initial target population of twenty-five thousand inhabitants and an initial public works budget of approximately one hundred million pounds (roughly US$2 billion in today's currency).[16] This target represented the base population that the petrochemical plant as a singular industry was expected to support. It was expected that the city would then expand in order to accommodate a population of three hundred thousand by 1990.[17]

Forestier-Walker and Bor, who were later directly involved with the design of the nonhierarchical super grid for the new town of Milton Keynes in England, proposed a similar abstract grid concept for El Tablazo. Arguing for flexibility and efficiency in routing patterns, they conceived of the grid as a network of primary and secondary roads, anticipating the street hierarchy that would be built into Milton Keynes. For El Tablazo, the team proposed a maxi-grid based on a one-square-kilometer agro-urban unit that would hold approximately ten thousand people. These units would gradually expand over time, allowing for multiple degrees of design control. Most of this control, however, would be exercised within a high-density superblock band running adjacent to all primary roads that would accommodate housing and nonresidential uses.[18] The soft center of each cell was less planned and allowed for densification through self-built programs. Most urban activities would be placed along the periphery of the superblock and these would align with the projected bus service along the one-square-

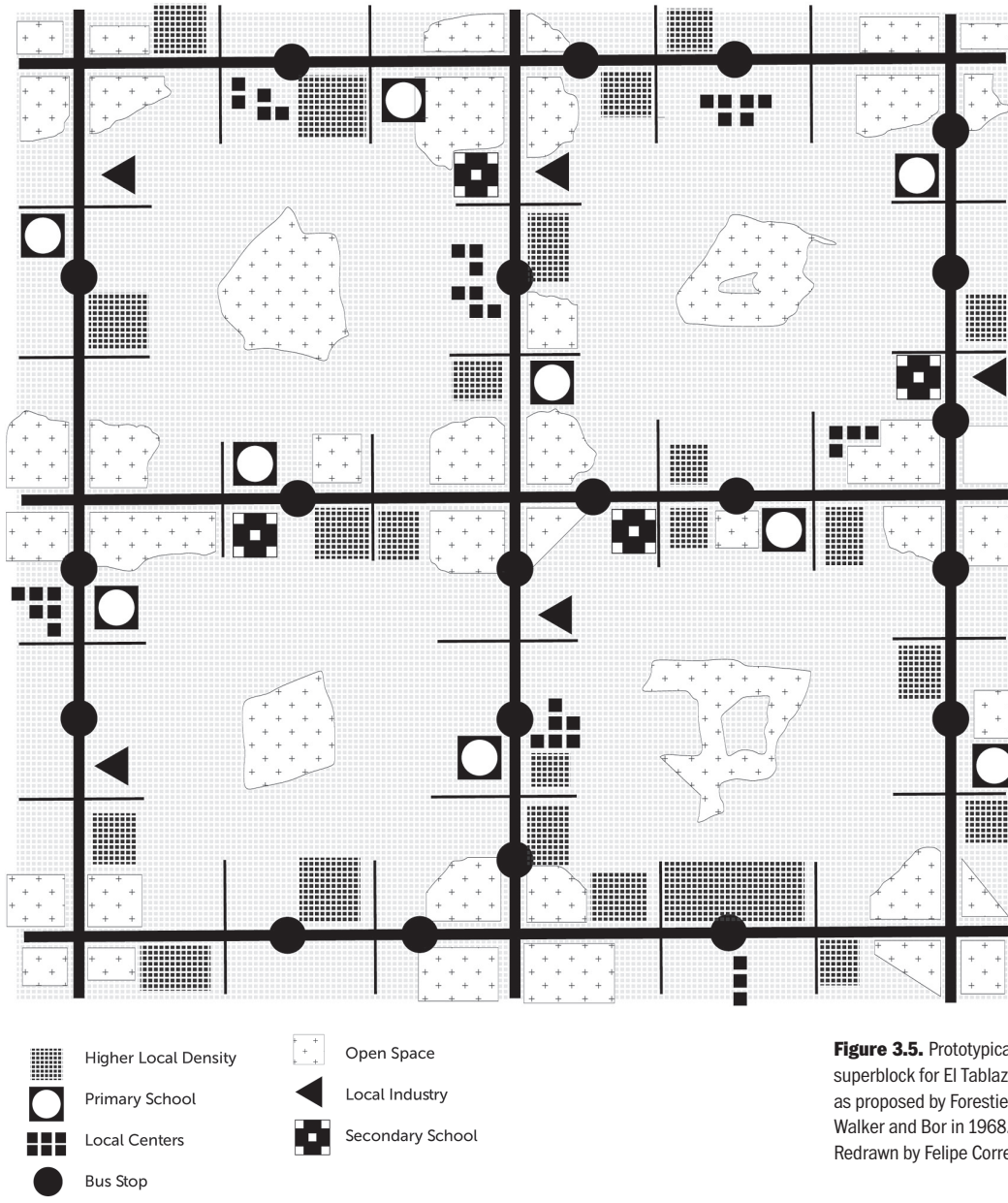


Figure 3.5. Prototypical superblock for El Tablazo as proposed by Forestier-Walker and Bor in 1968. Redrawn by Felipe Correa.

kilometer grid. More residential and private in character, the interior of the block would accommodate open spaces for sports and recreation. Select portions of the grid were reserved for future industrial uses that would further diversify the petrochemical business. From a series of aggregation studies, three alternative configurations for the city were drafted for the Ministry of Public Works: a linear plan, a gridded plan, and a T-shaped plan.[19] All three strategies connected the petrochemical plant on the northern edge of the city to the small town of Altagracia about fifteen kilometers south of the plant. In the end, the T-shaped plan was recommended

as most effective in terms of both growth flexibility and mobility efficiency. This configuration made sense, as it allowed for a greater density along the water's edge with a gradual decrease in urban growth as the city moved into the hinterland. Described in 1969 by the *Washington Post* as an industrial supercity where modern buildings would transform the skyline of the landscape,[20] the British design relied heavily on the abstract organizational strength of the territorial grid. The project was set to bring a new form of urban growth into this oil Eden, one that could accommodate a diversity of economies.

Construction of the new town of El Tablazo was expected to begin simultaneously with the assembly of the petrochemical plant. Developed concurrently in London and Caracas, the urban plan took approximately ten months to complete. Upon delivery of the final report, the Ministry of Public Works opened a small office in Altagracia. The post was tasked with overseeing the development and implementation of the El Tablazo plan over the course of five years. Yet, in the absence of institutional mechanisms that would guarantee the implementation of the project, its effective realization was rendered impossible from the start. Representing the national government, the ministry was too overloaded and understaffed to advance a project of this scale, while agencies at the municipal level did not have the political clout nor the administrative know-how to incorporate into their workbook the execution of the proposed plan. And though the private interests behind the construction of the petrochemical plant pulled enough weight to see that project through, the ambitious plans for the accompanying city slowly lost steam and vanished into thin air.[21]

Judibana: The Oil City of the Future

On the opposite side of the public-private dyad from El Tablazo, in 1948 Standard Oil, through its subsidiary Creole Petroleum, sponsored a private architectural competition to design the oil city of the future. What today is the quaint municipality of Judibana evolved from the winning proposal submitted by the architecture office of Skidmore, Owings & Merrill (SOM), in which many of the ideals of high modernism were consolidated into a planned community for approximately ten thousand oil workers and their families across all social and economic strata. The epitome of what architectural historian Henry-Russell Hitchcock in 1947 called "bureaucratic architecture," SOM was an office where design did not depend on "the architectural genius of one man" but on the "organizational genius which can establish a fool-proof system of rapid and complete plan production."[22] At this time, SOM was one of a small but growing number of US-based firms that could offer such organizational expertise. Having already developed a similar system of arterial roads for their design of Oak Ridge, Tennessee—built in 1942–1949 for the Tennessee Valley Authority and the US Atomic Energy Commission—SOM deployed a similar system and hierarchy in its plans for Judibana. While designed using many of the organizational premises of the company town, the project was conceived as a test

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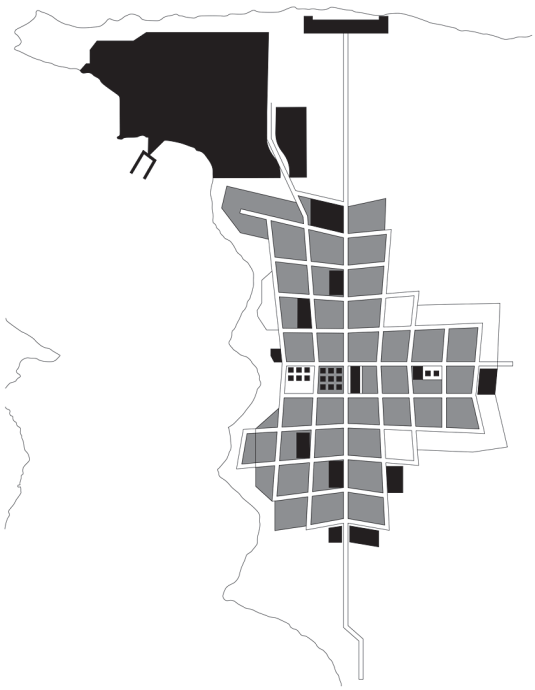
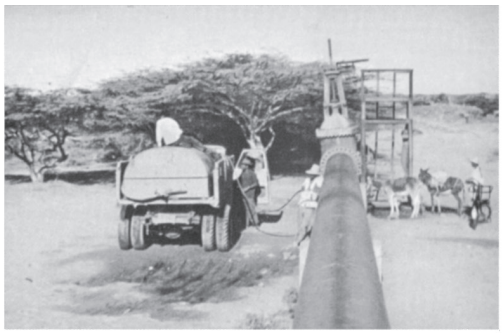
Figure 3.6. Proposed regional growth diagrams for El Tablazo as proposed by Forestier-Walker and Bor in 1968. Redrawn by Felipe Correa.





WATER, nearly five million gallons daily, reaches Paraguana through this pipeline, from which a truck is drawing supplies for the hamlet of Tacuato. Creole, Shell and the government jointly built the seventy-two-mile line, essential for development of this desert area

THE TOWNSITE, seen from the top of the bell tower overlooking the plaza, still looks new and raw. The shopping center flanks the plaza at the left. The movie theater is at the right. Straight ahead are residential streets and, in the distance, some of the refinery tanks

TOPSOIL prepares the ground in the Plaza Bolivar for planting grass and shrubs in front of the eye-catching church and its bell tower

Judibana–a New Kind of Oil Town

CREOLE'S best chance to put the new ideas about oil communities into practice came when it had to create an entirely new community. This took place—is still taking place—at Amuay Bay, on the arid, windy and sparsely inhabited Paraguana Peninsula, where the company decided, soon after World War II, to build a refinery and a deep-water marine terminal. Though these installations were operating by 1950, the making of Judibana as an "open" town instead of an old-style "closed" camp has necessarily proceeded more slowly. In the process, the company has had to win acceptance for a lot of novel proposals and to solve a lot of human problems. Though still unfinished, Judibana today is a going concern.

TREES, hauled in by truck, lend shade and grace to residential areas. There is little natural vegetation except scrubby bush and cactus

site for a community integration plan in which the corporation's managerial strategy sought to drastically lighten the corporation's role as landlord and provider of basic services. Connected to Maracaibo by the Pipeline Road, Judibana's strategic location served as a nodal point between oil production centers along the lake and global trade routes through the Caribbean Ocean. Labeled by its sponsors as an "open city," Judibana was a significant counterpoint to the closed oil camp predominant in the Maracaibo landscape, and was presented as a unique asset to the oil worker. Describing the Judibana plan, the *New York Herald Tribune* stated, "the company worker will lose nothing by this arrangement. In fact, he stands to gain, for under the plan he can buy his own home with no down payment and ridiculously low annual payments on a low price. And his house, under the new plan, will be in a completely developed integrated community instead of being in a company town."[23] The plan for Judibana aimed at breaking down the barriers between the oil camp oasis and the strata of Venezuelan society, in addition to reducing the dependency of employees on the company.

Skidmore, Owings & Merrill's original plan proposed a broad array of housing facilities organized in multiple configurations and spanning three neighborhoods—the workers' neighborhood, the junior staff neighborhood, and the senior staff neighborhood—each offering separate accommodations to bachelors and married couples. While the housing configuration was not that dissimilar to other oil camps in the area, the way in which units were aggregated around collective services and recreational programs made Judibana distinctive. Communal facilities organized around centers of commerce, education, recreation, health, and religion became key components of the urban plan. It was expected that most of these urban amenities would be managed by third-party companies or directly by the Venezuelan government and accessible to all city dwellers. With these arrangements, the plan for Judibana extended well beyond the forty-year lifespan of an oil well and set the foundations for a city that would survive the built-in expiration date of the extraction site itself.

Initially, SOM proposed two different plans for Judibana. The first plan, extensively detailed in its accompanying report, proposed three discrete neighborhoods that shared services and amenities.[24] The plan placed workers' housing toward the southern edge of the site, junior staff housing right above it, and senior staff housing further north, bordering the water. The main amenities were sited between the workers' housing and the junior staff quarters. These included civic functions (fire station, police headquarters, customs office, post office, and banking services), a union hall, a community auditorium, restaurants, a school, a Catholic church, a social club, recreational fields, and the larger general commissary. In between the junior staff housing and the senior staff district another set of amenities were planned which included the hospital, additional playing fields, and a second commissary. The collective amenity hubs were always organized around a civic square linked to the primary buildings by an arcade. The civic area was flanked by bachelor housing, followed by single-family homes, diverse in type and size, that extended over the semi-arid landscape. The

facing page
Figure 3.7. "Judibana—A New Kind of Oil Town" spread from *Venezuela: Land of Oil* (1960).

next spread, left
Figure 3.8. Proposed town plan for Judibana (Creole Petroleum housing) submitted by Skidmore, Owings & Merrill in 1946. Courtesy of Skidmore, Owings & Merrill.

next spread, right
Figure 3.9. Alternative plan strategy for Judibana (Creole Petroleum housing), submitted by Skidmore, Owings & Merrill in 1948, that suggested a higher-density configuration. Courtesy of Skidmore, Owings & Merrill.


SITE PLAN
AMUAY PENINSULA
A M U A Y B A Y
POINT CULATA
POINT JUDIBANA
BATHING BEACH
BOAT BASIN
GOLF COURSE
LAS PIEDRAS
SENIOR STAFF HOUSING
TANK FARM
REFINERY
JUNIOR STAFF HOUSING
OBRERO HOUSING
LEGEND
1 ENTRANCE GATE, CONTROL & EMPLOYMENT OFFICE
2 COMMUNITY SERVICE GROUP
LAUNDRY & DRY CLEANING PLANT
BAKERY
COLD STORAGE & ICE MFG.
WAREHOUSES
3 GAS & SERVICE STATION
4 EMPLOYEES ENTRANCE
5 ARMY BARRACKS
6 COMMUNITY COMMISSARY & MARKET
7 CIVIC FUNCTIONS
FIRE STATION
POLICE
CUSTOMS OFFICE
POST OFFICE
BANK
8 UNION HALL
9 COMMUNITY AUDITORIUM
10 COMMUNITY RESTAURANT
11 JUNIOR STAFF & OBRERO SCHOOL
12 CATHOLIC CHURCH
13 JUNIOR STAFF & OBRERO CLUB
14 STADIUM
15 RECREATION FIELD
16 JUNIOR STAFF COMMISSARY
17 GENERAL COMMISSARY
18 SENIOR STAFF RESTAURANT
19 HOSPITAL
20 NURSES' HOME
21 REFINERY MANAGER'S RESIDENCE
22 DISTRICT MANAGER'S RESIDENCE
23 SENIOR STAFF SCHOOL
24 FUTURE PROTESTANT CHURCH
25 BRANCH FIRE STATION
26 SENIOR STAFF CLUB
27 RESERVOIR
28 CEMETERY
29 INCINERATOR
30 CHICKEN FARM
31 SLAUGHTER HOUSE
32 PLANT NURSERY
33 SEWAGE DISPOSAL PLANT
THE COORDINATES SHOWN ARE 1000-METER COORDINATES
THE ORIGIN IS THE ENSLEN - ROSS IN PUEBLO NUEVO,
ESTADO FALCON: NORTH 900,000 - EAST 900,000


SITE PLAN
LEGEND
1 ENTRANCE GATE, CONTROL & EMPLOYMENT OFFICE
2 COMMUNITY SERVICE GROUP
LAUNDRY & DRY CLEANING PLANT
BAKERY
COLD STORAGE & ICE MFG
WAREHOUSES
3 GAS & SERVICE STATION
4 EMPLOYEES ENTRANCE
5 ARMY BARRACKS
6 COMMUNITY COMMISSARY & MARKET
7 CIVIC FUNCTIONS
FIRE STATION
POLICE
CUSTOMS OFFICE
POST OFFICE
BANK
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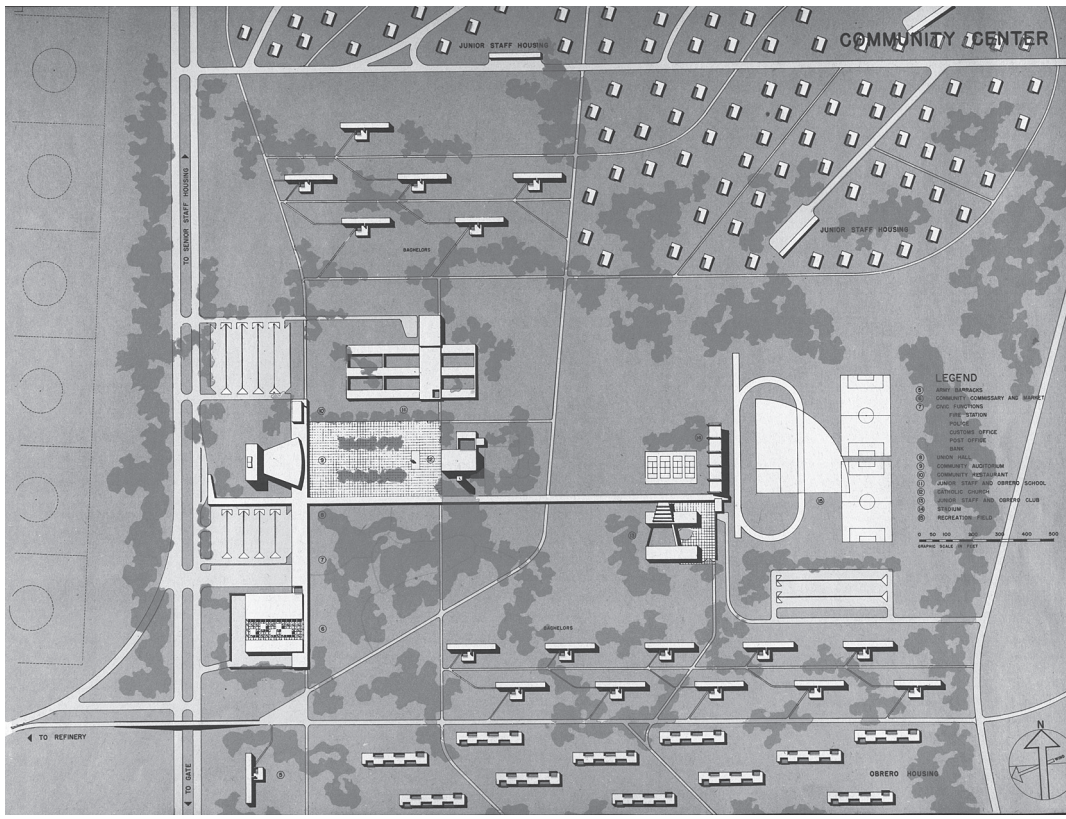
14 STADIUM
15 RECREATION FIELD
16 JUNIOR STAFF COMMISSARY
17 GENERAL COMMISSARY
18 SENIOR STAFF RESTAURANT
19 HOSPITAL
20 NURSES' HOME
21 REFINERY MANAGER'S RESIDENCE
22 DISTRICT MANAGER'S RESIDENCE
23 SENIOR STAFF SCHOOL
24 FUTURE PROTESTANT CHURCH
25 BRANCH FIRE STATION
26 SENIOR STAFF CLUB
27 RESERVOIR
28 CEMETERY
29 INCINERATOR
30 CHICKEN FARM
31 SLAUGHTER HOUSE
32 PLANT NURSERY
33 SEWAGE DISPOSAL PLANT
AMUAY PENINSULA
A M U A Y B A Y
POINT CULATA
POINT JUDIBANA
BATHING BEACH
BOAT BASIN
GOLF COURSE
LAS PIEDRAS
REFINERY
TANK FARM
BACHELORS
BACHELORS
SENIOR STAFF HOUSING
JUNIOR STAFF HOUSING
OBRERO HOUSING
THE COORDINATES SHOWN ARE 1000 METER COORDINATES.
THE ORIGIN IS THE ENGLISH CROSS IN PUEBLO NUEVO.
CEYMOT FALCON - NORTH 250,000 - EAST 200,000.



above
Figure 3.10. Plan of the Judibana (Creole Petroleum housing) community center as proposed by Skidmore, Owings & Merrill in 1948. Courtesy of Skidmore, Owings & Merrill.

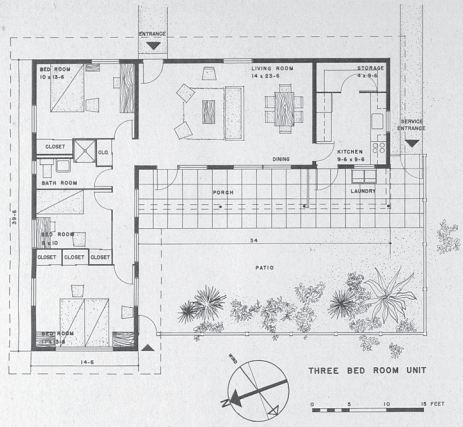
facing page, top
Figure 3.11. Junior staff housing prototypes for Judibana (Creole Petroleum housing) as proposed by Skidmore, Owings & Merrill in 1948. Courtesy of Skidmore, Owings & Merrill.

facing page, bottom
Figure 3.12. Workers' housing based on a courtyard scheme for Judibana (Creole Petroleum housing) as proposed by Skidmore, Owings & Merrill in 1948. Courtesy of Skidmore, Owings & Merrill.

material of choice was concrete blocks cast from aggregates found in the area. Larger infrastructures were placed along the periphery. To take advantage of natural topography, a water reservoir and nursery were placed in the northeastern corner and a communal cemetery located in the southeast corner, while the southwestern edge took advantage of the bay for boating, golf, and the placement of other large-scale recreational facilities. The second plan, found in the back pocket of the SOM report, proposed a higher-density variation of the original plan. This alternative came with a letter signed by Louis Skidmore (1897–1962) that advocated for a more compact community with taller buildings and less ground coverage. The plan proposed a similar overall allocation of programs but suggested that workers' bachelor quarters be conceived as dense, mid-rise slabs.[25]

While the construction of Judibana did not immediately follow the delivery of the SOM plan, a more watered-down version of the original lower-density plan began construction in the late 1950s with an assigned budget of 37,500,000 bolívares (roughly US$98 million today).[26] The town's implementation was achieved through a public-private partnership whereby the national government would contribute 35 percent of the total costs and Creole Petroleum would front the remaining 65 percent.[27] Built as a showpiece that would exemplify a different kind of oil city than the gated corporate camps or the informal settlements around them, Judibana became

JUNIOR STAFF HOUSE



THREE BED ROOM UNIT

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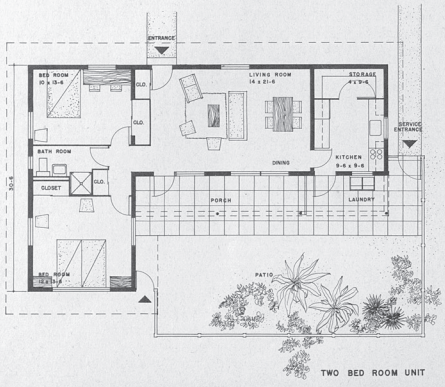
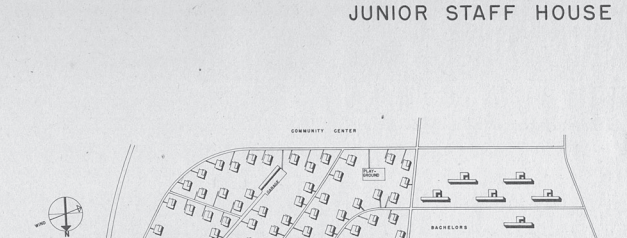


TWO BED ROOM UNIT



PLOT PLAN

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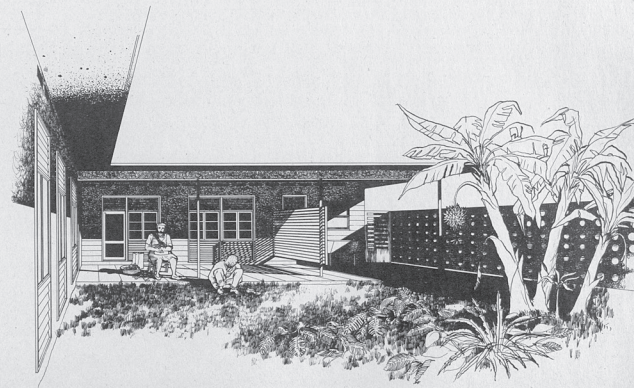
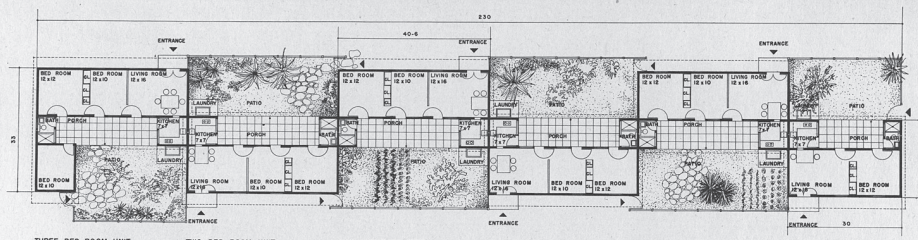


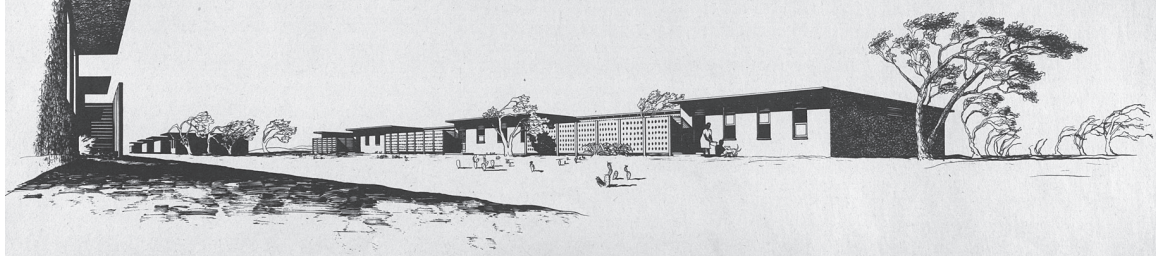
OBRERO HOUSES



THREE BED ROOM UNIT | TWO BED ROOM UNIT | TWO BED ROOM UNIT | TWO BED ROOM UNIT | TWO BED ROOM UNIT | ONE BED ROOM UNIT

SIX FAMILY OBRERO HOUSING UNIT

0 5 10 15 20 25 30 35 FEET



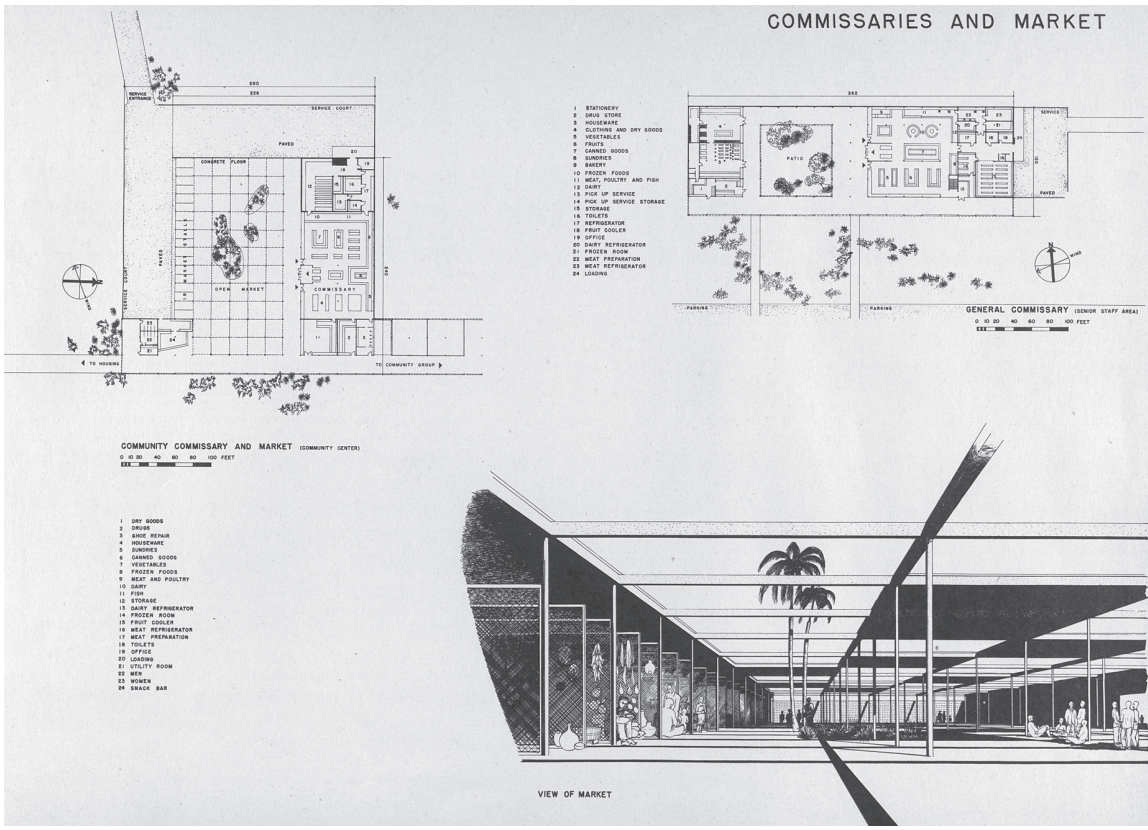


Figure 3.13. Prototype for commissaries and markets for Judibana (Creole Petroleum housing) as proposed by Skidmore, Owings & Merrill in 1948. Courtesy of Skidmore, Owings & Merrill.

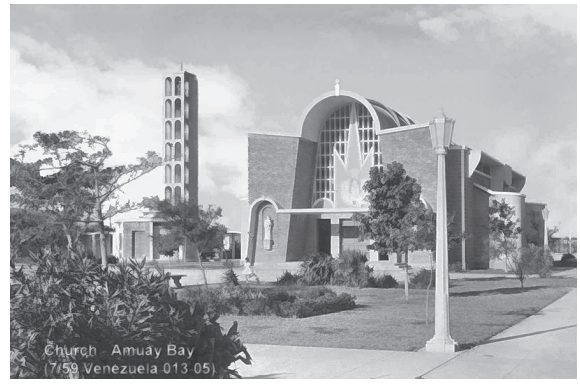
facing page
Figure 3.14. Multiple views of Judibana in the 1960s. Photo of church courtesy of G. Andrew Reti. All other photos courtesy of Alberto Beuses.

an emblem of progress achieved through a more socially attuned management of oil revenue. More importantly, the North American suburban lifestyle introduced in private quarters by the oil companies would be shared, at least in theory, in a more democratic manner by Venezuelan society in the form of a new municipality, one that would dissolve the highly contentious gates of the corporate camps.

The Non-planned Oil City

Even though Judibana aspired to be a new form of public-private partnership that would invest in a more sustainable future for oil cities in the region, the model did not expand beyond this singular project. As the number of oil wells increased in the region, the oil companies' interest in providing housing and basic services drastically diminished, creating an even greater set of urban and environmental problems. A case in point is Ciudad Ojeda, located along Lake Maracaibo's northeastern edge. For decades, this town has been at the epicenter of an oil-driven urbanization process. Founded by presidential decree in 1937, Ojeda was the first formal city to be established by the Venezuelan state outside of the private oil camps as a response to massive migration to the area due to the emerging oil industry.[28] Designed by the architect Cipriano Domínguez (1904–1995), the city was conceptual-


SUPERMERCADO CADA

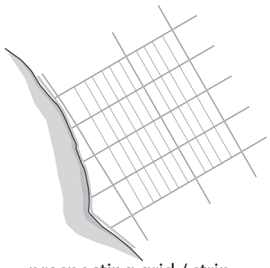
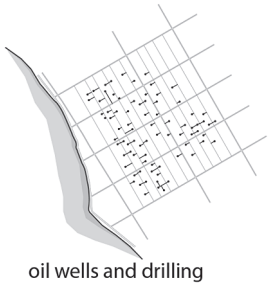
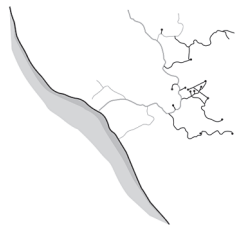
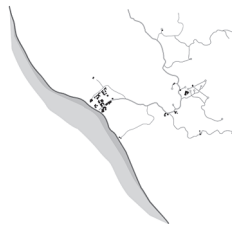
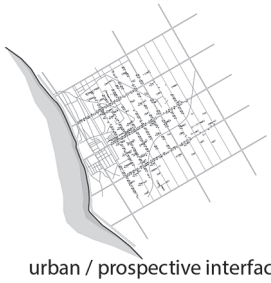
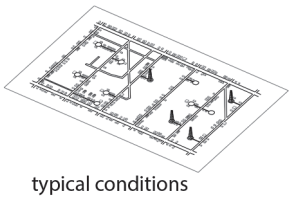
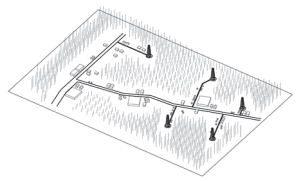
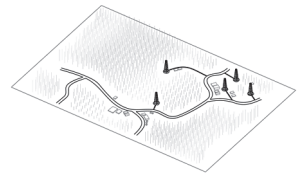
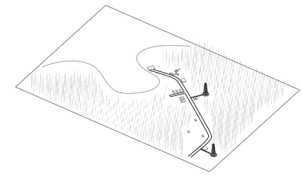

Church - Amuay Bay
(7/59 Venezuela 013.05)

ized as a series of concentric rings that circled a central plaza.[29] Throughout the height of the oil boom in the 1940s, '50s, and '60s, derricks—clearly visible over water and land—filled the landscape outside the figure of the planned city as far as the eye could see. Today, Ciudad Ojeda is nothing more than a few blocks lost in a thinly woven urban carpet that has consolidated the northeastern portion of the lake into a continuous system of urbanization that has subsumed the abandoned oil fields. Generated in the wake of a relentless process of exploration and extraction, this system continues to evolve with little recourse for sound planning or design. As new wells are discovered and exploited farther inland, with urbanization steadily afoot behind, companies decommission portions of the prospecting strip that serves as the leading spatial metric of urban development, continually shaping the form of the expanding city. This sequence creates a unique overlap between city and extraction infrastructure, where subsurface operations pave the way for surface urban development. Urban development, in turn, is then left to deal with the environmental effects—primarily water and soil pollution—typical of post-oil landscapes.

The overlay of self-built towns onto derelict oil extraction infrastructure is not isolated to Venezuela. Most oil-heavy regions in South America have suffered this process. The case of Nueva Loja, a capital built by Ecuadorian oil companies, mirrors that of Ciudad Ojeda, yet it harbors much more extreme implications from an environmental perspective. Located on the northwestern edge of the Amazon rainforest, Nueva Loja settled above one of the greatest hot spots of biodiversity around the globe. Founded in the 1960s as an oil camp, it was named Lago Agrio, a direct reference to Sour Lake, Texas, home of Texaco. Originally, the camp was sustained as a provisional town with approximately three hundred seasonal workers seduced by the high wages of the oil industry. Today, Nueva Loja has a population of about thirty thousand. As the original prospecting strips settled into the muddy soils of the rainforest, they cleared the path for more permanent modes of habitation. The liquor store and brothel owners who chased after the mostly male oil camp labor force were quickly followed by cattle ranchers, loggers, drug dealers, and Colombian guerilla refugees, among others (Colombia's major cocaine production grounds are across the border a few miles to the north).[30] Beyond the shadow of Texaco, Nueva Loja today has become a consolidated urban node within the Ecuadorian Amazon, yet it cannot fully escape its origins. In the last decade, the community of Nueva Loja has come together in a lawsuit against the oil giant Chevron—which acquired Texaco's operations in 2001—for major environmental negligence in the area.[31] While a local court has ordered Chevron Corp. to pay over US$8 billion in damages, the outcome of the lawsuit is still unclear, as Chevron is currently appealing the case. Present-day Lago Agrio, living up to the meaning of its name, "sour lake," sits on what environmentalists have deemed one of the most contaminated industrial sites in the world.

Current and future plans for oil and hydrocarbon explorations in South America present a grim environmental scenario for the region. Peru, the

facing page
Figure 3.15. Oil and hydrocarbon extraction grids and strips as a template for informal urbanization. Drawing by Felipe Correa.

1940s Ciudad Ojeda, Venezuela	1970s Lago Agrio, Ecuador	1990s Nuevo Andoas, Peru	2000s Urucu, Brazil
			
prospecting grid / strip			
			
oil wells and drilling			
			
settlement / decommissioning			
			
urban / prospective interface			
			
typical conditions			

next South American oil haven, has approximately seventy million hectares of rain forest, of which approximately 70 percent have now been granted or offered in concession to foreign oil companies.[32] Brazil is following the exact same path along the northwestern portion of the Amazon. A quick glance at the Peruvian and Brazilian Amazon through Google Earth reveals a profusion of prospecting strips cutting into the depths of the Amazon forest, the exact same depredatory process witnessed by the Venezuelan desert and the Ecuadorian Amazon, where forest clearing for agricultural and urban uses becomes the region's worst enemy. The twentieth-century oil hot spots of South America have given us extensive material evidence of the afterlife of oil infrastructure and the urban model it enables. Given these past experiences, we are currently in an auspicious moment to rethink what the legacy of this industry in the twenty-first century should be. It is necessary to conceive of alternative oil exploration and exploitation processes that can yield alternative scenarios for the future of these oil camps and the cities they will inexorably generate. The purely utilitarian and monofunctional nature of current prospecting infrastructure values only the value of oil itself. These experiences in the recent past should force us to rethink extraction geographies through a set of values that present a more comprehensive view of the biophysical qualities of the territory and that go beyond the net profit of the extracted resource.

Given this framework, two primary concepts must evolve in order to open up an alternative to the current depredatory processes set forth by the oil industry that continue to consume large portions of the Amazon rainforest. First, the rainforest must be valued as something more than an obstacle to be removed prior to resource extraction. Only once the economic and cultural values of the surface and subsurface are acknowledged can we conceive of a synthetic project capable of mediating between resource, forest, and habitation. Second, both the oil corporations and the national governments that empower them must realize that the canvas of such a heavy extraction infrastructure extends far beyond the physical boundaries of the oil camp itself. The implications of such undertakings have to be measured in full and the extraction planning process must necessarily include a much more comprehensive set of actors that represent both the present and the future of oil-filled Amazonia.

While it is evident that the company town affiliated with the oil industry is part of a bygone era, the moment is right to open up a dialogue about oil extraction and the models of urbanism it creates. Only through a more ample conversation can we move toward a multifaceted model for the oil extraction city. Rather than continue to allow entropic development to follow the metrics of extraction, there is a need for new forms of organization and design that can draw together contrasting bureaucracies and synthesize the diverse economic, ecological, and urban pressures shaping these terrains. More than ever there remains the need for a new resource extraction framework, one whereby layering the delicate surface ecologies and vast subsurface black gold reserves produces a new territorial grammar. If

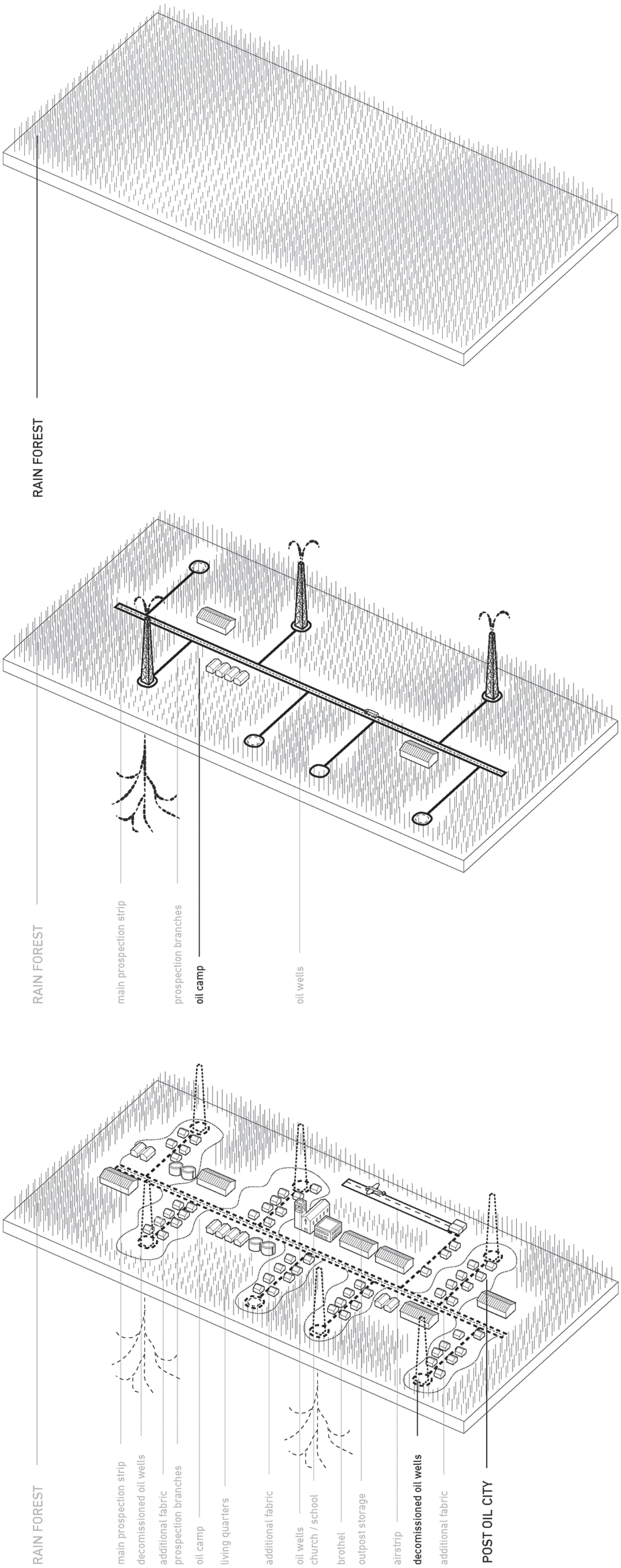
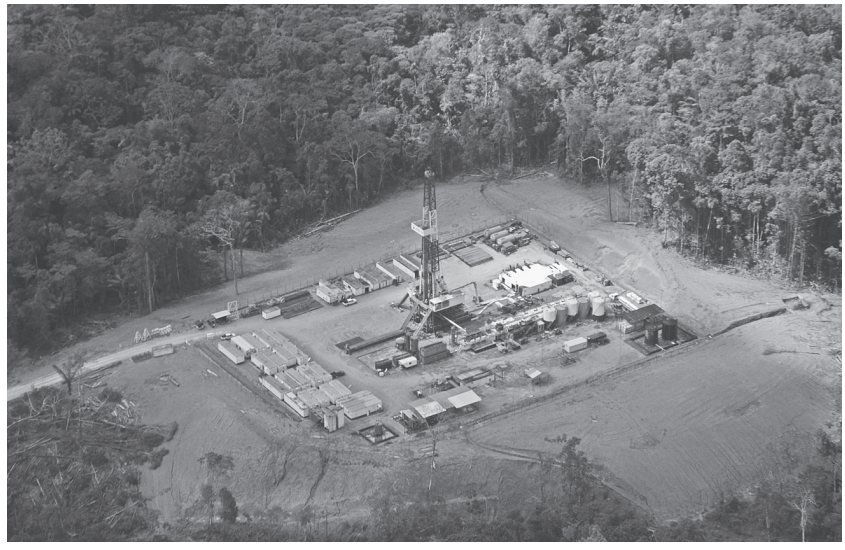


Figure 3.16. The evolution from prospecting strip to post-oil city. Drawing by Felipe Correa.

top
Figure 3.17. Polluted pond near Campo Libertadore in Nueva Loja, Ecuador. Photo © Remi Benali/Corbis.

bottom
Figure 3.18. An oil exploration rig in the Cuyabeno Reserve. Lago Agrio, Ecuador. Photo © Guillermo Granja/Reuters/Corbis.



only a portion of the billions of dollars currently under litigation in the Lago Agrio case would go toward a preemptive urban settlement strategy—one that understands that the lifespan of the camp is much more extensive and intricate that that of the oil well itself—it would yield long-term physical and social returns for those future oil towns that will most likely continue to germinate within the tar-filled shadows of the oil-tank farms.

4

A New Industrial Frontier

Ciudad Guayana

From the explorer Sir Walter Raleigh and the cartographer Charles-Marie de La Condamine to the naturalist and geographer Alexander von Humboldt, many have used the Orinoco River as a time-honored route to terra incognita. The gateway to the legend of El Dorado and a magnet for myth-makers and treasure explorers alike, the land south of the Orinoco has, throughout its Western history, persisted as the very definition of a new frontier. Its position in the twentieth century was no exception. The search for the city of gold was replaced by the city of steel, and in the late 1950s, the developmentalist government of Rómulo Betancourt set forth the largest experiment in the history of regional planning in Venezuela. An ambitious territorial scheme that involved the rebranding of the Guayana region as a new resource extraction and industrial zone, the project sought to aggressively transform this forgotten region, and in so doing, diversify the economic matrix of a nation too dependent on oil. Described as a city "whose purpose is not only ceremonial and governmental but also as muscular as Düsseldorf or Pittsburg,"[1] Ciudad Guayana was to be a new metropolis erected in the deep inland reaches of the Orinoco River and the physical and symbolic center of southern Venezuela. Conceived in Caracas and designed in Cambridge, Massachusetts, the plan for Guayana exemplified the aspirations of a city born at the confluence of design and the social sciences.

Oil and the Territorial Divide

Of the many territorial alterations caused by resource extraction in twentieth-century South America, the effects of oil within the nation-state of Venezuela are among the most extreme in the continent. The discovery of large quantities of crude in the early 1920s, followed by the country's fast-paced

global commercialization, caused the largest cultural, economic, social and territorial reorganization in its history. The revenue from oil generated a new type of wealth, bringing unprecedented structural changes to this once predominantly agrarian nation. Traditional affluence, generally represented by large landholdings and artisanal agricultural production, was rapidly superseded by new, oil-driven investment centers, where land ownership was no longer the gateway to prosperity. Tied into international commercial networks, these new centers required basic urban services. The introduction of such infrastructures enabled the rapid development of cities, empowering a radical national shift from a predominantly rural society to a country of oil boomtowns.

This drastic shift from agriculture to a newly emerging urban culture had three significant impacts on the territorial development of Venezuela, which would later exert a direct influence on the conceptualization and implementation of the larger Guayana project. The first of these effects was an unparalleled wave of migration from the hinterlands to existing and newly formed cities, primarily in the northern half of the country. From 1930 to 1960, the urban population in Venezuela increased from seven hundred thousand to over four million. By the early 1960s, the country had a population of eight million, of which over 50 percent lived in cities—most of these cities each serving as home to approximately one hundred thousand people.[2] Secondly, hydrocarbon-fueled urbanization induced a vast disparity between rich and poor. Despite the substantial investments, both public and private, that resulted from oil, the industry served only to generate huge amounts of wealth for the foreign companies extracting the oil and for the various governments that granted the concessions. Because most governments in Latin America inherited a civil as opposed to common-law system from Spanish colonialism, minerals and all subsoil resources were the property of the sovereign and later, the government. In the United States, a common-law system dictates that private landowners' property rights extend to the subsoil, but private landowners in Latin America did not enjoy the same rights.[3] Only a small percentage of Venezuelan society benefited from the oil enterprise. Further, crude as an industry generated minimal increases in the overall labor force, accentuating an implacable layer of urban poverty in the very cities it helped create. Finally, the oil boom, followed by an emerging manufacturing industry, created a deep socioeconomic divide between northern and southern Venezuela. Already by the 1950s, a territorial band that covered the western border of Colombia all the way to Barcelona and Puerto La Cruz was characterized as a wealthy national corridor, where newly finished highways tied Caracas—the nation's capital and its main economic hub—to the oil-driven affluence around Lake Maracaibo and the new manufacturing wealth budding in the city of Valencia.[4]

In complete economic and developmental opposition to the north, the southern region of Venezuela—more than three times the area of the northern band—was seen as terra incognita. Underpopulated and economically depressed, these territories were seen through a developmentalist lens by

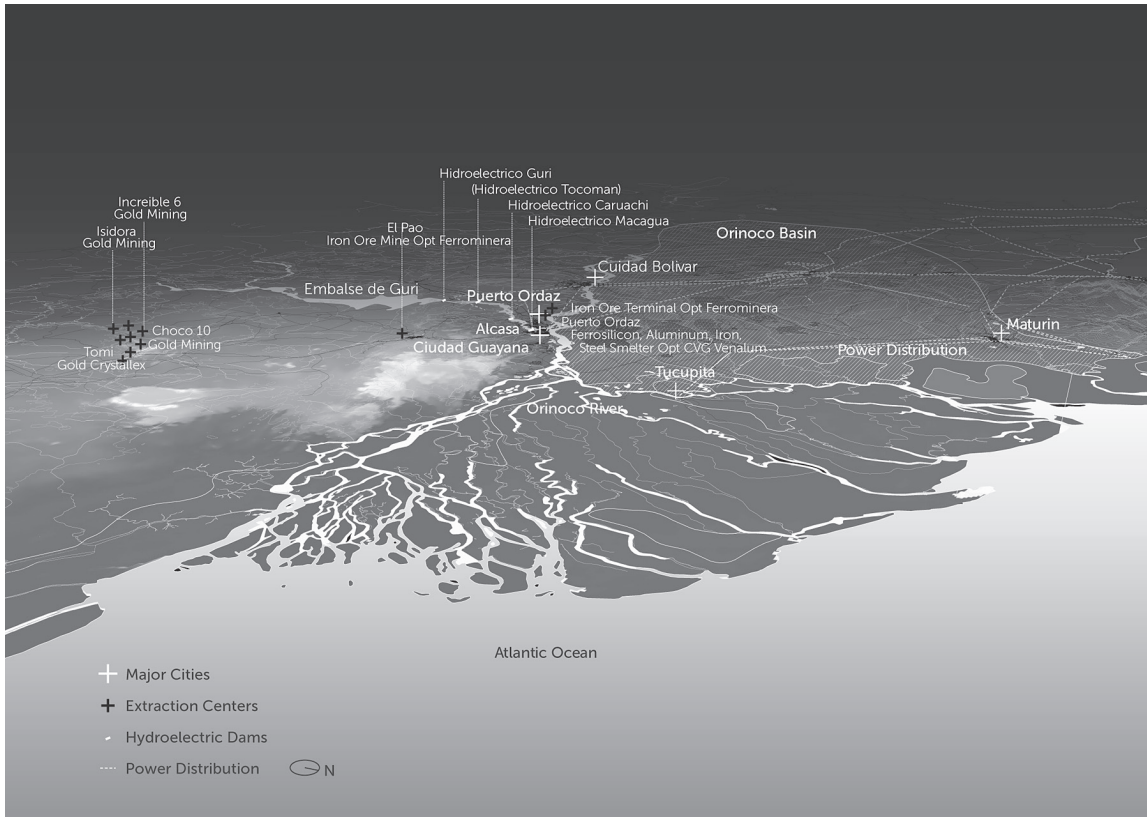


Figure 4.1. Aerial view of Ciudad Guayana in the context of the Guayana region. Drawing by Felipe Correa.

President Rómulo Betancourt (1908–1981) as a promising new frontier. In his view, economic progress could help mend the divide between north and south while also diversifying the country's main industries, then still heavily reliant on oil and concentrated in the northern belt. Crucial to the mission of President Betancourt—who along with the Democratic Action party and nonconformist members of the armed forces brought down the tyrannical dictatorship of General Marcos Pérez Jiménez[5]—was the need to decentralize the economic matrix of the country, which at the time was primarily centered in Caracas. In Betancourt's nationalist eyes, this change could only be achieved through economic programs that would broaden the country's economy paired with social initiatives that would yield trained labor with diversified skills. In turn, these initiatives would then allow Venezuela to expand its manufacturing capabilities and increase national employment rates.

As a management strategy that could choreograph the instrumental moves for a new social order, the broader notion of planning at a national level was of paramount importance for President Betancourt. As he stated in a presidential address, "In our days, responsible administrative work is inconceivable without a proper articulation of objectives, coordination of efforts and projections into the future."[6] The ambition to bring together nationalism, economic advancement, and territorial planning culminated in CORDIPLAN, a national planning agency created by presidential decree

in 1958, foreshadowing the operation set in place by the Alliance for Progress[7] three years later. CORDIPLAN, whose director had cabinet-member status,[8] was tasked with advancing the country's social and economic development with the specific mission of tackling areas outside the consolidated cities along the Caribbean coast. The Guayana region, located south of the Orinoco River, became the poster child for a national growth pole project that combined resource extraction, manufacturing, and social programs. Guayana, rebranded as a new development zone with the same name as the region, became the main target of a new territorial development strategy aimed at constructing a southern counterpart to the already flourishing economic hubs in Caracas and Valencia.

The Rebranding of the Guayana Region

While Guayana constituted the largest region in the country in terms of surface area, it accounted for less than 3 percent of the country's population in the early 1950s.[9] Located five hundred miles south of Caracas, the region was known for its poor agricultural soils and had remained off the radar of public and private investment. For centuries, the limited local population had survived through subsistence agriculture and cattle ranching, facing major food shortages on a regular basis. Yet, the fate of this remote region would soon change when the national government began to see the south as a plentiful spring of natural resources that could specifically help advance the national manufacturing agenda. While agriculturally unfertile, the landscape was ideal for an industrial hub. For one, it was extremely rich in mineral deposits. Iron ore, a key resource to advance Venezuela's emerging steel production, was abundant in the region. Key to this iron Eden was Cerro Bolivar, better known as "iron mountain." Located ninety miles southwest of Ciudad Guayana, the hill was described by the *Boston Globe* in 1964 as a "high plateau practically of iron instead of rock."[10] Gold, natural gas, and oil had also been spotted there in smaller quantities. In addition, the abundance in water flow provided by the Orinoco and Caroní Rivers made them hot spots of hydroelectric energy. In particular, the Caroní, with an elevation change of approximately eight hundred feet in the last sixty miles before it meets the Orinoco, provided naturally high-falling water that was ideal for hydroelectric production. And further, the deep thalweg of the Orinoco required minimum dredging, making it ideal for fluvial access to the Atlantic Ocean. The confluence of the Orinoco and the Caroní marked the center of a two-hundred-mile radius that defined a new zone for economic growth in Venezuela. Ciudad Guayana was to be implemented at its center, a new industrial city that would serve as the staging ground for the exploitation of this mineral rich territory.

The Corporación Venezolana de Guayana (CVG) was founded on December 29, 1960, as a decentralized, state-owned Venezuelan conglomerate under the direct supervision of President Betancourt. The corporation was tasked with overseeing the comprehensive development of the Guayana region. Conceived as a growth pole, it primarily supervised and

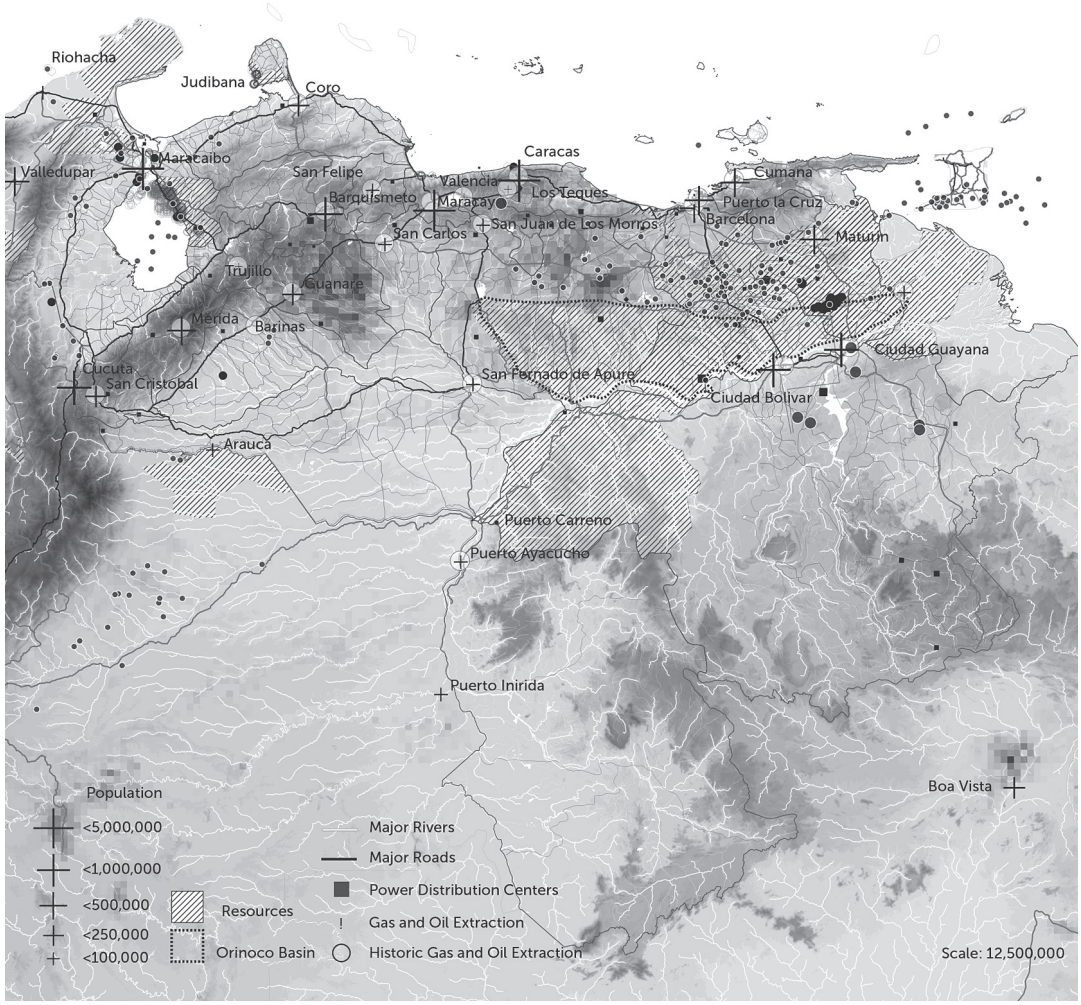
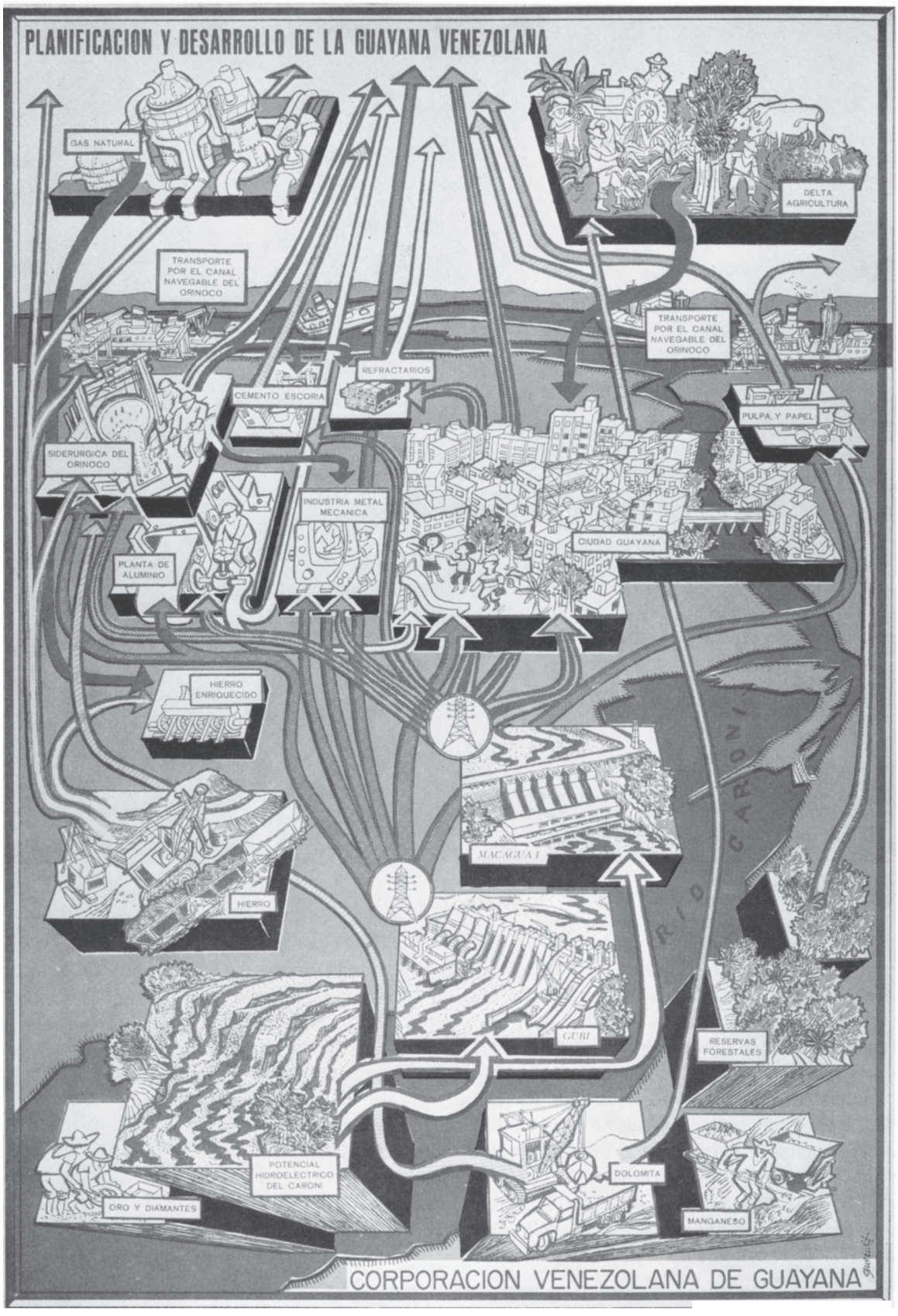


Figure 4.2. Map of Venezuela showing Ciudad Guayana in relation to current aluminum, iron, and oil deposits. Drawing by Felipe Correa.

managed four key agents with interests in the area: the iron and steel syndicate, the government's iron and steel institute, the research commission for the electrification of Guayana, and the president's commission for the advancement of Guayana. Under this mandate, the corporation established a new tripartite strategy. One critical component involved the advancement of the already present metallurgy industry in the region. Another key element was the development of hydroelectric energy along the Caroní River, as exemplified by the Guri Dam that was constructed in 1963 and later expanded in the 1970s. Finally, the third leg of the strategy involved studying potential drainage and flood-prevention strategies along the Amacuro River delta for new agricultural land. These three lines of action in conjunction with a strong governmental interest in advancing the human capital in the region would spur an unprecedented scale of development at the confluence of the two rivers and throughout the region.

The ideas of a young John Friedmann (b. 1926) on the notion of the core region and core-periphery development were extremely influential in the advancement of the larger Guayana project. Conversely, Guayana as an


PLANIFICACION Y DESARROLLO DE LA GUAYANA VENEZOLANA
GAS NATURAL
DELTA AGRICULTURA
TRANSPORTE POR EL CANAL NAVEGABLE DEL ORINOCO
TRANSPORTE POR EL CANAL NAVEGABLE DEL ORINOCO
REFRACTARIOS
CEMENTO ESCORIA
PULPA Y PAPEL
SIDERURGICA DEL ORINOCO
INDUSTRIA METAL MECANICA
CIUDAD GUAYANA
PLANTA DE ALUMINIO
HIERRO ENRIQUECIDO
MACAGUA I
HIERRO
RIO CARONI
GURI
RESERVAS FORESTALES
POTENCIAL HIDROELECTRICO DEL CARONI
DOLOMITA
ORO Y DIAMANTES
MANGANESO
CORPORACION VENEZOLANA DE GUAYANA

experimental project in a frontier region was the ideal testing ground for his work on regional development. The project set forth by the Venezuelan government offered a prime opportunity for Friedmann to advance François Perroux's (1903–1987) notion of the growth pole and give a spatial dimension to an abstract economic model.[11] First proposed by Perroux in 1950, the growth pole theory suggested that economic growth was uneven and inherently tied to particular centers of activity.[12] As it was interpreted by planners through the geographic lens of Jacques Boudeville (b. 1919) in his study of Minas Gerais,[13] Perroux's concept was used to underwrite the construction of new productive centers with the aim of stimulating regional development. Friedmann, who in the late 1950s had worked as an advisor on regional planning in northeast Brazil, returned in 1961 to academic life, joining the faculty at the Massachusetts Institute of Technology (MIT).[14] Through the work of the Joint Center for Urban Studies, a multidisciplinary venture founded in 1959 by Harvard University and the Massachusetts Institute of Technology, with funding from the Ford Foundation, to study postwar urbanization, Friedmann was able to spend a significant portion of the early 1960s studying the Guayana project and the broader territorial dynamics of a country eager to diversify its oil-centric economy. Begun during the height of the Cold War at a time when MIT was a major site of research in the physical and social sciences, Friedmann's work in Venezuela opened up a productive long-term exchange between the scholar's academic pursuits and the transformation of the country's interior.[15] This relationship would help him formulate the ideas behind his core-periphery model and fill a significant number of books on the subject, among the most well-known being his *Regional Development Policy: A Case Study of Venezuela* from 1966.

Friedmann argued that, "if regional policy reflects the existence of geographic and spatial inequities, it also reflects an awareness of the importance of a regional approach to the implementation of national growth objectives."[16] The mission set forth by the Corporación Venezolana de Guayana was not only central to Friedmann's arguments but also framed the regional problem as an issue of national and international importance. The Guayana project, sited in the deep Venezuelan interior yet conceived in Caracas, was seen as an enterprise of national importance. Instrumental to these territorial ambitions was the establishment of a city that, on the one hand, would accommodate the fast-paced migration that new productivity in the region would attract, and on the other, would serve as part of a larger economic matrix able to compete with other national economic centers like Barcelona, Caracas, and Maracaibo. Above all, Ciudad Guayana was to be a symbol that marked the arrival of modernity and progress deep into the Orinoco River.

facing page
Figure 4.3. Promotional illustration by the Corporación Venezolana de Guayana explaining the development plan for the Guayana region. From the Corporación Venezolana de Guayana annual report, 1969. Courtesy of Widener Library, Harvard University.

The City as Center

The conception and implementation of the city played a central role within the larger Guayana project. Early in the project's timetable, the corpora-

tion, under the direction of General Rafael Alfonzo Ravard (1919–2006), had designated sixty thousand acres of land along the southern bank of the Orinoco River for the construction of a new urban hub. Coincidentally, in 1959, Ravard, while still a colonel and before officially becoming president of the CVG, met Lloyd Rodwin (1919–1999), an urban planner and professor at MIT, while Rodwin was in Caracas on a consulting assignment with the Dirección de Urbanismo de Venezuela.[17] The initial meeting led Rodwin to undertake a reconnaissance trip to the Guayana region, which later resulted in a multiyear consulting agreement between the Joint Center for Urban Studies of MIT and Harvard and the corporation. Rodwin and a select number of architects, economists, and urban planners—including Willo von Moltke (1911–1987), his Harvard counterpart who would lead the urban design component of the project—became the team that would give shape to Ciudad Guayana.

Under the leadership of Martin Meyerson, a professor at the Harvard Graduate School of Design, with Rodwin as its first chair, the Joint Center for Urban Studies was conceived as a semiautonomous applied research entity hosted by both Harvard and MIT. As part of its mission, it conceived of urban planning as the common ground that brought together the many disciplines involved in the shaping of urban life. Planning, as a discipline, was placed at the confluence of the social sciences—mainly anthropology, economics, geography, and sociology—a position that would allow the Joint Center to be of interest to its academic hosts and also to development agencies championing urban development models at the height of the Cold War in diverse urban and agrarian geographies across the globe. The urbanization of agricultural and nonmetropolitan areas was central to the mission of the Joint Center, and the planning tasks for Ciudad Guayana were on target with the center's research and outreach agenda.

Labeled by the *Christian Science Monitor* as "the third completely new, architect-designed metropolis of the post war world,"[18] the Ciudad Guayana project took shape very rapidly. Departing from the mandate of its contemporaries, Brasilia and Chandigarh—two projects of national magnitude where the main motivation was to lay out a setting that would house future administrative bureaucracies—the plan for Ciudad Guayana required a much more flexible and multifaceted approach. On one hand, the city had to fulfill the desires of the corporation and become the new face of economic and social progress in southern Venezuela. On the other, the design had to adapt to the immediate demands of an industrial town that was already attracting a large amount of regional migration, primarily of unskilled laborers. The site was primarily defined by a plateau three hundred feet above sea level that straddled both sides of the Caroní River, flanked by an already established industrial site on the western edge and by the historic town of San Félix on the eastern bank. Prior to the CVG's involvement in the 1960s, the area already had multiple settlements sprinkled across the landscape that was destined to be urbanized. These included the town of Puerto Ordaz, a government-sponsored steel mill, and the facilities of the Orinoco Mining Company, which were already an integral part of the site.

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Figure 4.4. General study for the linear city in axonometric and section developed by the Joint Center for Urban Studies in the early 1960s. Courtesy of Special Collections, Frances Loeb Library at the Harvard Graduate School of Design.

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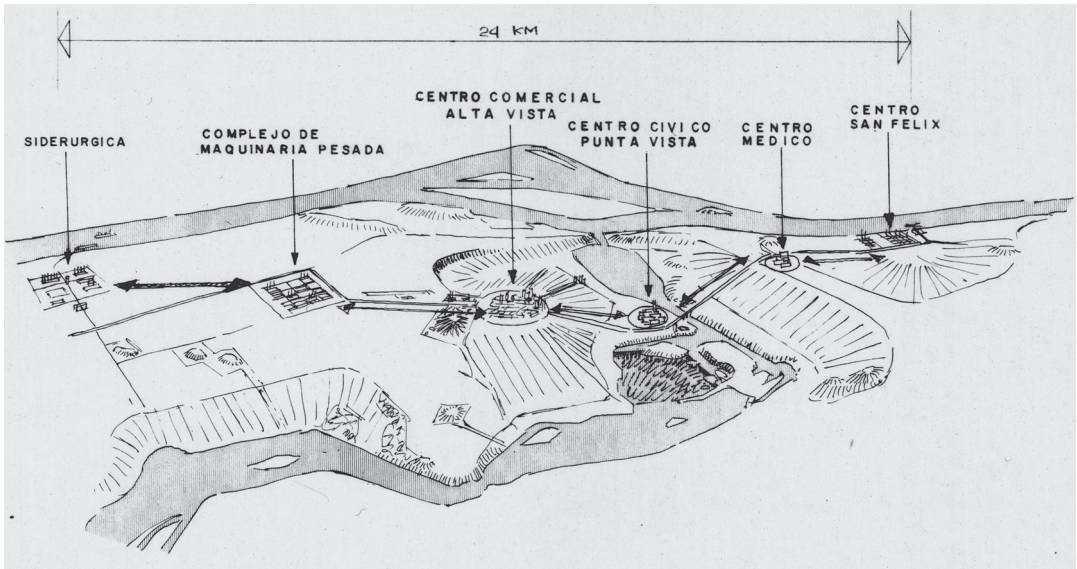
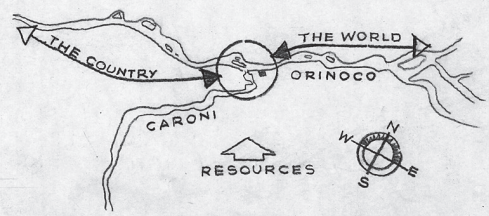
Figure 4.5. Regional concept sketch by the Joint Center for Urban Studies, prepared in the early 1960s. Courtesy of Special Collections, Frances Loeb Library at the Harvard Graduate School of Design.



SANTO TOMÉ DE GUAYANA
A NEW CITY
WHERE THE CARONI JOINS THE ORINOCO

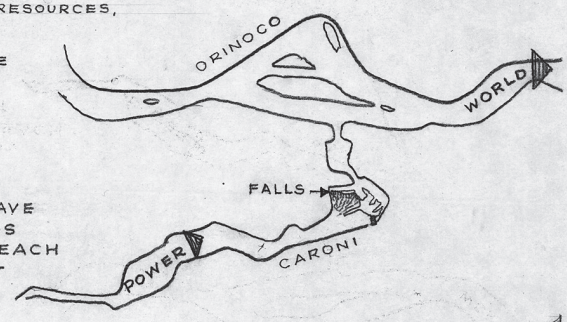
THEIR COMBINED WATERS INSURE SHIPPING
OPENING UP AN AREA RICH IN RESOURCES
WHERE THE SEAWAY FROM THE EAST
MEETS THE ROAD FROM VENEZUELA – TO THE WEST



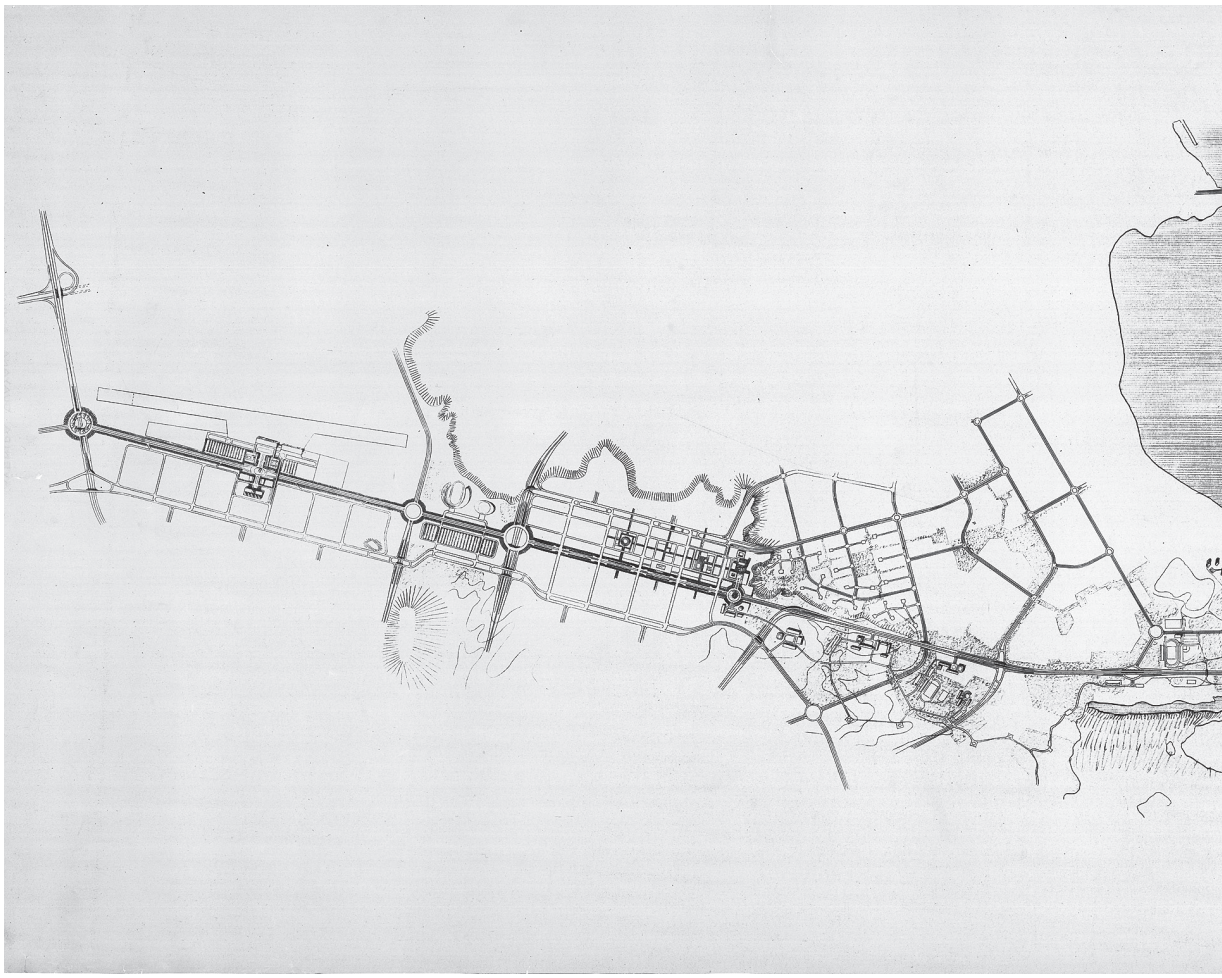
WHAT MAKES THE SITE MEMORABLE?

THE ORINOCO : GATE TO THE WORLD
THE CARONI : ARTERY OF REGIONAL RESOURCES, SOURCE OF POWER
THE FALLS : SOURCE OF PLEASURE

ALL THREE ARE A WELCOME SIGHT
A PLACE FOR THE RECREATION
OF BODY AND MIND



☐ THEREFORE EVERY CITIZEN SHOULD HAVE THE OPPORTUNITY TO PARTAKE IN THIS PLEASURE. – HE MUST BE ABLE TO REACH THIS SOURCE OF ENJOYMENT ON FOOT FROM HIS HOME



Two chief design references drove the overall strategy for Ciudad Guayana. One was a linear city that tied clearly zoned nodes with a continuous mobility infrastructure. The second was the development of discrete neighborhood units that would circumscribe the nodes in order to give them critical mass. The designers relied heavily, perhaps excessively, on the power of a linear form to give order by linking a series of existing and proposed centralities that in summation would make up the totality of the city. The spine was given physical dimension in the form of Avenida Guayana, which connected the steel mill on the western edge of the city with the old town of San Félix on the eastern edge, linking industry, the airport, the commercial center, the cultural center, the river, and the medical center as nodes along the way. As von Moltke described, "a basic objective of the plan is to connect the city's three major visual units—San Félix, the central valley and the western plateau—along a central spine. The spine, Avenida Guayana, would join all major existing elements into a series of intervisible nodes providing continuity for all the activities and experiences along it."[19]

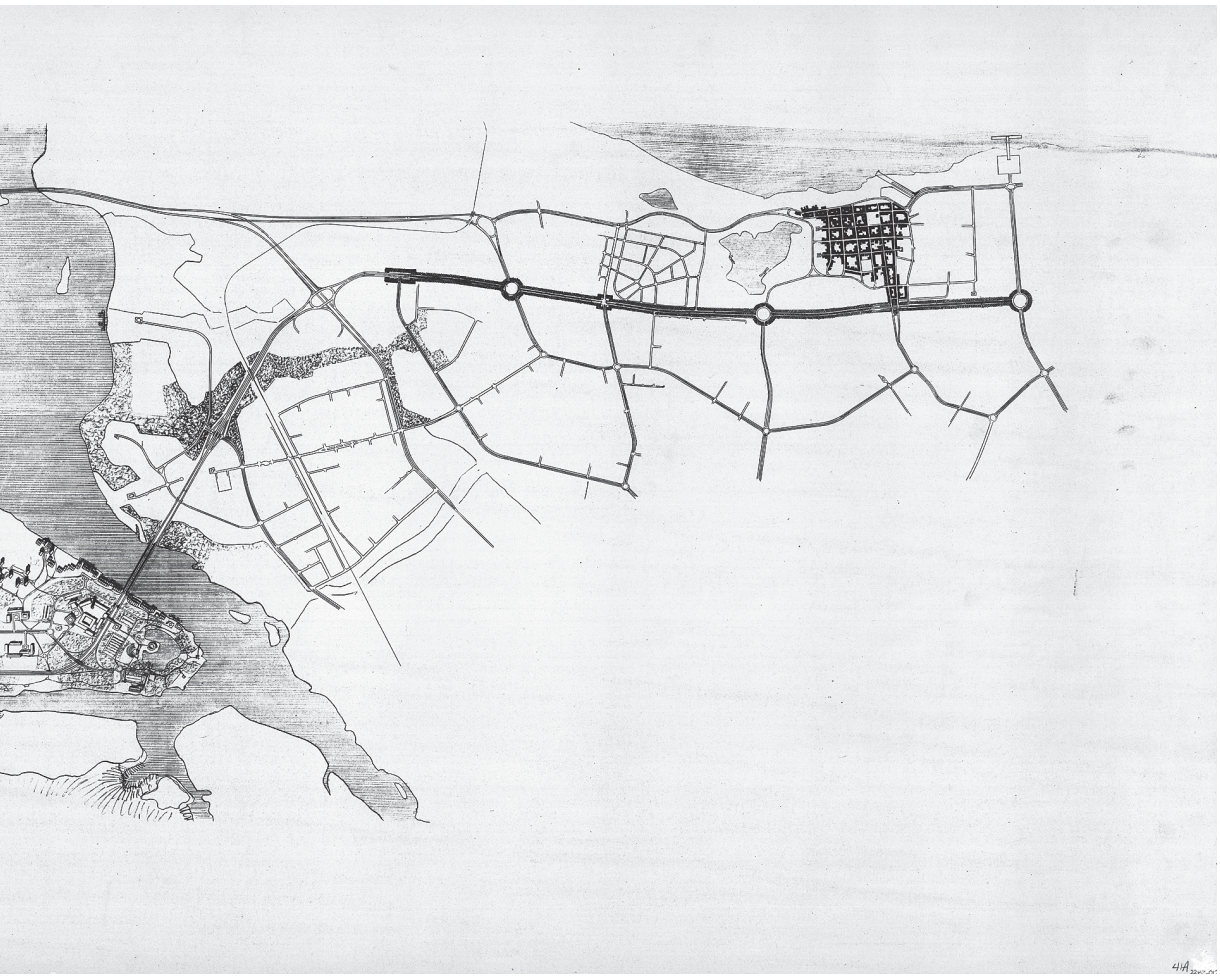


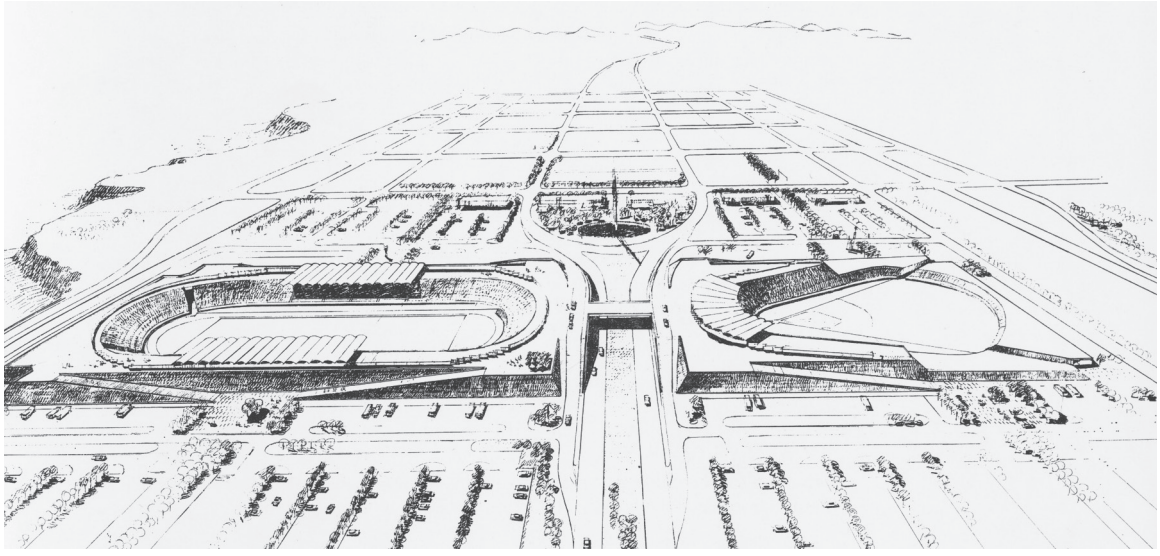
Figure 4.6. Schematic city plan for Ciudad Guayana developed by the Joint Center for Urban Studies in the early 1960s. Courtesy of Special Collections, Frances Loeb Library at the Harvard Graduate School of Design.

The relentlessness of the central line paired with the envisioned built mass of each node aimed at guaranteeing the strong spatial and visual continuity projected in the original plan. This was particularly the case in the proposed commercial center, where the avenue transformed into a boulevard that traversed through a grid that accommodated urban blocks of a rather monumental scale, all equal in height and similar in massing. The concept of neighborhood units, called *unidades vecinales* and abbreviated as UV in the plan, was also pivotal to the design of Ciudad Guayana. The UVs contained a variety of housing types, ranging from residences for the managerial class to self-built housing for workers. These units would then become the urban fabric that would activate the linear form. The confluence of avenue, centrality, and neighborhood resulted in a collection of spreads and densities that guaranteed a vibrant urban environment and a city with a strong image.

The rapid transformation of the Orinoco's south bank into the industrial metropolis of southern Venezuela was well documented by the CVG.

Figure 4.7. Model and drawing of the Alta Vista Civic Center. From the Corporación Venezolana de Guayana annual report, 1965. Courtesy of Widener Library, Harvard University.

Figure 4.8. Bird's-eye view sketch of the Alta Vista Civic Center as envisioned by the Joint Center for Urban Studies. From the Corporación Venezolana de Guayana annual report, 1967. Courtesy of Widener Library, Harvard University.



Issuing image-heavy annual reports, the corporation showcased powerful aerial views of streets and parcels being inscribed across this resource-rich landscape. The international press also picked up on the construction of this postwar industrial marvel with articles that described the development of a city made of iron. The *Baltimore Sun* praised the project, stating, "Venezuela is building a modern version of El Dorado, out in the remote plains where the Spanish conquistadores once sought the legendary city of gold. But this El Dorado—known as Ciudad Guayana—contains a steel mill, an aluminum plant, and a huge hydroelectric complex and it's being laid out by United States trained planners."[20] However, it did not take long for the discrepancies between the design aspirations and the reality of the project's implementation to surface.

The critiques of Ciudad Guayana have been extensive and very well documented. The American urban planner Kevin Lynch (1918–1984), who had just become a full professor at MIT in 1963 after codifying how people develop mental maps and use systems of urban "wayfinding" to navigate space in *The Image of the City* (1960), visited Guayana in 1964 and was one of the first to assess the project. In "Some Notes on the Design of Ciudad Guayana" Lynch claimed, "The designers of the city suffer from an acute case of standard planning anxiety: the maintenance of control, the preservation of form and quality, in the face of rapid growth and continuously shifting situation."[21] Lisa Redfield Peattie, an anthropologist who was part of the planning team that shaped Ciudad Guayana, emerged as its harshest critic. Peattie argued that the actors involved in the design of Ciudad Guayana were envisioning a Platonic city, a symbol of modernization and progress, while the reality on the ground was an Aristotelian city, characterized by local initiatives and idiosyncratic urban forms. Lloyd Rodwin, however, saw himself as the bridge between these two cities and believed that both cities could come together through good science.[22] Evaluating Ciudad Guayana in 1983, he told Peattie, "Our main concern was to introduce social and economic considerations into planning. I thought that if you could introduce solid technical thinking, it would be solid thinking socially."[23] In Peattie's eyes, that objective was never achieved, and after leaving Venezuela the anthropologist continued to write extensively about her experience in Ciudad Guayana. She published two key books on the project, *The View from the Barrio* (1968) and *Planning: Rethinking Ciudad Guayana* (1987), defining the Aristotelian city and heavily criticizing the Joint Center team's Platonic vision. John Friedmann and Lloyd Rodwin would also pen their own evaluations of the Guayana experience.

Fifty years after its initial conception, the moment is right to revisit the design project for Ciudad Guayana, reexamine its bearings at a more mature age, and trace how time has helped the city build upon its original concepts and adapt them to the necessities of its geography. Over its fifty-year lifespan, the city has grown from fifty thousand original inhabitants to more than one million people today. Testing the original plan against its rapid evolution can shed new light on the ambitions and limitations of Ciudad Guayana as an urban model. Given this framework, a trio of elements

from the plan must be reexamined. One is the overall zoning strategy of the project and its implications in the general morphology of the city. The second is the linear city concept and its main avenue's evolving relationship with the mesh of the city. Third are the *unidades vecinales* and the ways in which these neighborhood units were implemented and have evolved over time.

One of the most successful elements of the original plan was the overall zoning scheme and the distribution of programs based on a careful reading of the topography and existing settlements. The general guidelines for the disposition of industrial land proved to be quite successful and have effectively accommodated more than two thousand hectares of industrial sites.[24] The industrial quarters, smartly located along the northwestern edge of the city, work effectively in relation to the river and airport. In fact, the direct connection of industry to the deep waters of the Orinoco has proven to be a point of economic advantage for the region. Furthermore, the location is advantageous from a contamination standpoint, since the constant northeastern winds help move air pollution westward, away from the city, and it also encouraged the concentration of urban growth toward the east, which in many cases involved consolidating and upgrading existing neighborhoods.

below

Figure 4.9. Aerial view of the Alta Vista Civic Center under construction. From the Corporación Venezolana de Guayana annual report, 1968. Courtesy of Widener Library, Harvard University.

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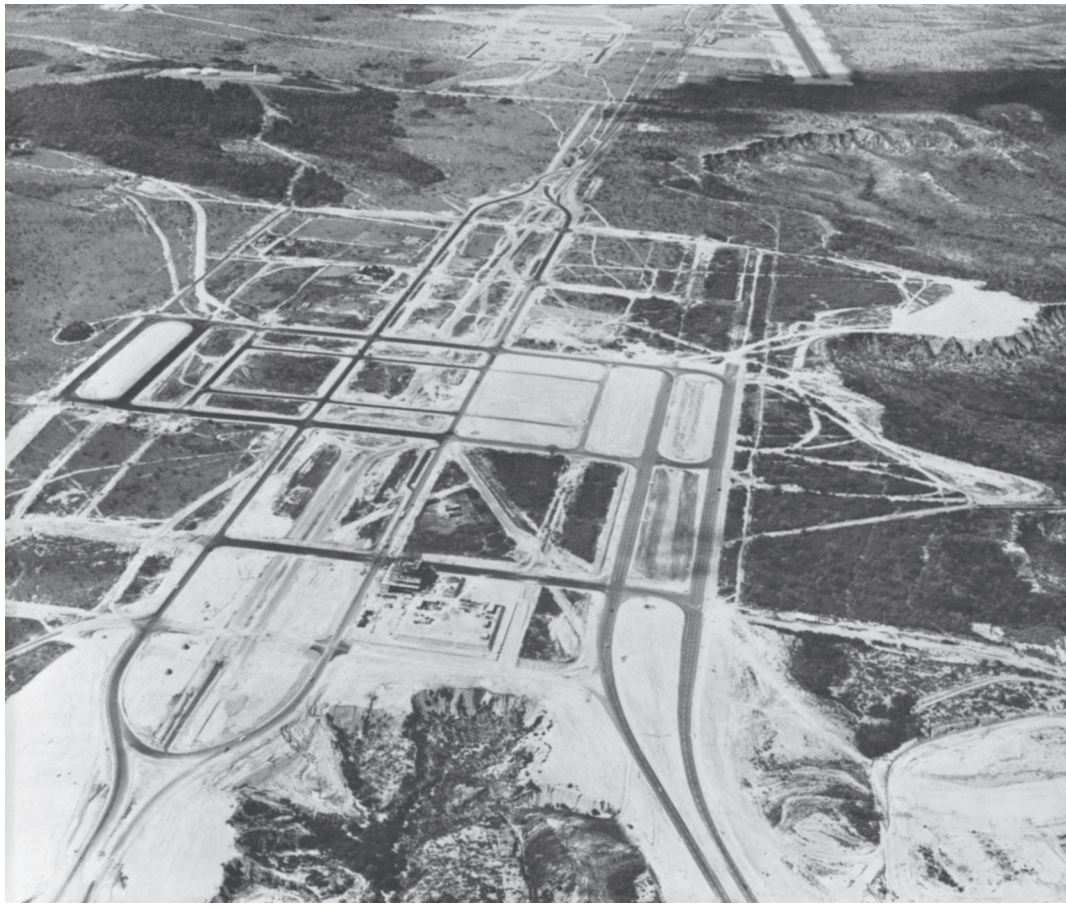
Figure 4.10. Entry axis and administrative building of the Siderúrgica del Orinoco plant. From the Corporación Venezolana de Guayana annual report, 1969. Courtesy of Widener Library, Harvard University.



While the execution of the linear city concept did not live up to its original plan, the main avenue, despite its overscaled dimensions, has served as an effective corridor that anchors multiple urban fragments, all diverse in scale, quality, and speed of growth. Looking beyond the incongruence of the monumentality of the road and the banality of the architecture that flanks its edges, the avenue has been effective in accommodating large-scale urban facilities—hospitals, schools, recreational facilities, and universities—along a citywide corridor. Furthermore, as the city's main spine, the avenue allowed for a fairly organized and consistent block structure as the city gradually expanded west of Alta Vista, the city center. In concept, the avenue lives up to von Moltke's vision of an armature that links and gives continuity to the loosely sprinkled settlements already on the site. Aesthetically, however, the ideals of the project strongly clash with the reality. As implemented, the avenue resembles a service corridor rather than a regal boulevard. This appearance is most extreme in Alta Vista, the city center. While the grid that flanks both sides of the avenue was built all at once, the gradual infilling of the other blocks occurred in a much more haphazard manner. Key parcels within the plan were left empty or were built at extremely low densities, adding to the general feeling of emptiness in the area. This vacuum is partially because the initial stages of the project emphasized the restructuring and development of historic San Félix, making it difficult then to attract activity to the new center across the river. In recent years, new construction and fully grown vegetation have significantly changed the perception of the city's center and of the avenue as a

preceding pages
Figure 4.11. Aerial photographs (1965 [left] and 1969 [right]) of the western edge of the Caroní River, showing urban development throughout the course of four years. From the Corporación Venezolana de Guayana annual report, 1969. Courtesy of Widener Library, Harvard University.

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Figure 4.12. San Félix residential neighborhood. From the Corporación Venezolana de Guayana annual report, 1968. Courtesy of Widener Library, Harvard University.

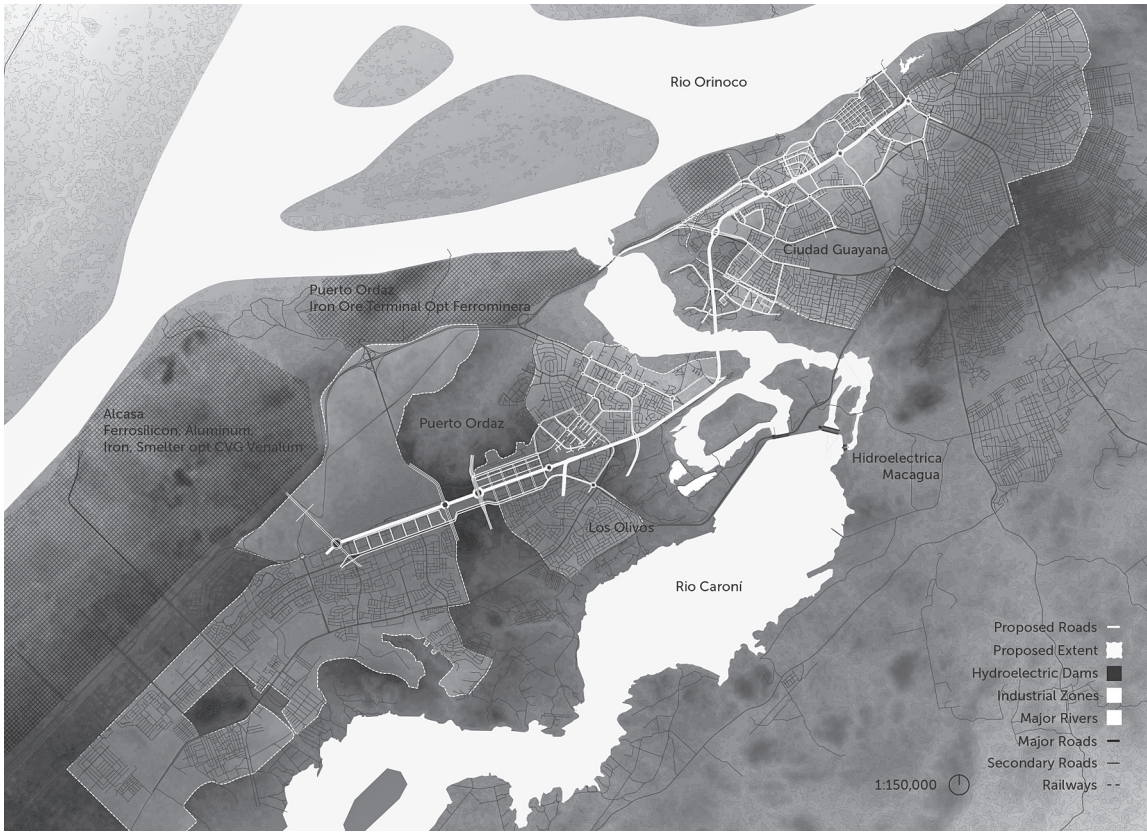


Figure 4.13. Current plan of Ciudad Guayana showing the original project in white and the growth of the city over time in tones of gray. Drawing by Felipe Correa.

whole. Yet the city's core remains noticeably hollow and has the potential to accommodate a greater density of built mass.

Despite the fact that the CVG was not a proper housing authority, the provision of housing became a central component of its mission. Any form of urban development in Ciudad Guayana had to contend with the rapid urban migration to the area and the immediate rise of squatter settlements. Workers' housing was an absolute priority for the project. Furthermore, a region like Guayana could only attract a high-level managerial class with innovative housing that would offer many of the amenities to which the Venezuelan elite were accustomed in Caracas. In light of these demands, the neighborhood unit in Guayana became a building block for innovative housing across income levels. While the project relied heavily on monofunctional zoning with little exploration into mixing socioeconomic levels within a single *unidad vecinal*, it did offer a variety of new housing strategies for each socioeconomic bracket. Of particular interest are UV-2, UV-3, and UV-4.

Unidad Vecinal 2, also known as El Roble, was an experimental housing block that developed guidelines for self-built units organized under the directives of a community plan. In opposition to standard 1960s slum-management practices—which generally involved police dismantling squatter

settlements and relocating inhabitants to peripheral areas—the strategy in this pilot neighborhood project involved embracing the building potential of the squatter settlement itself and providing its residents with mechanisms for the gradual improvement of their living quarters. As Rafael Corrada, a professor of urban planning at the University of Puerto Rico and housing advisor to the Guayana project, observed in the early sixties, "in Latin America, although [squatter] districts start from substandard conditions, there is a noticeable process of spontaneous improvements, despite the chaotic settlement parcels that often discourage such efforts."[25] Ciudad Guayana served as an exemplary laboratory to test the capacities of design in the face of fast-paced urbanization.

The concepts of John F. C. Turner (b. 1927), a British architect also linked to MIT who devoted most of his professional life to the study of self-built housing, filtered into the ideal conception of Ciudad Guayana. For Turner, architects as facilitators of self-built and self-managed housing was a much more important and effective strategy than the simple construction and delivery of public housing units. The attitude of the Joint Center team toward squatter settlements followed Turner's ethos. The strategies proposed for Unidad Vecinal 2 controlled road geometry and parcel structure. Residents were given manual-like drawings that visualized easy steps for progressive upgrades to each individual home. The residential blocks were designed with small lots arranged around cul-de-sacs with islands in the center that served as communal open space. A series of blocks were successfully developed using this model, but CVG engineers felt the cul-de-sac created added costs for introducing basic utilities, so the project was pared down to a parceling exercise. While the successful implementation of this model was limited in Ciudad Guayana, many of these ideas were explored in other self-built projects throughout South America, including the PREVI Housing Project in Lima in the 1970s. Furthermore, the attitude toward squatter settlements in Guayana and the inclusionary strategies that followed were predecessors to contemporary strategies for extralegal settlements. Recent successful experiments in the transformation of squatter settlements such as Quinta Monroy in Iquique by Elemental have used approaches similar to those in El Roble. There is now robust evidence that the incorporation of extralegal areas into the legal realm of the city, followed by a plan for physical upgrades, is one of the most effective ways to restore slums.

On the opposite end of the economic spectrum, UV-3 and UV-4 were pilot projects to house the new elite of Guayana. Tasked with providing innovative domestic configurations along with a wide host of neighborhood services, these residential quarters were to be the embodiment of urban life in the new frontier. As William Porter, an assistant chief of urban design for Ciudad Guayana, described it in 1969, "UV 4 was to be a demonstration of the CVG's intention to provide high quality environments for the elite and a demonstration to the residents of Ciudad Guayana of a better way of life."[26] Drawing on strategies developed in Sir Patrick Abercrombie's

County of London Plan from 1943, which brought together Clarence Perry's idea of the "neighborhood unit" and Patrick Geddes's work on community structures,[27] this first prototype for managerial housing was primarily a mid-density district configuration combining row houses and mid-rise apartments. Residences were placed along a network of streets, plazas, and pedestrian pathways and anchored by commercial services and a school. A similar organization drove the design of UV-3, but with a much lower density and with semi-detached homes that proved extremely successful with the newly arrived executives. In future versions of the neighborhood unit, such as Los Olivos, the concept shifted away from total design and focused on the design of streets, parks, and key public buildings, establishing a framework for growth rather than a fixed plan. Despite the fact that the housing component of the project never mixed incomes within a single *unidad vecinal*—an experiment that would have helped alleviate the perceived segregation of classes in the city—it did effectively provide a formal organization for each neighborhood. And while the spatial and material quality of the housing stock varied drastically throughout the city and even within each neighborhood unit, the general disposition of basic services, infrastructure, and public spaces within a clear formal structure has guided growth and change over time.

Beyond the specific successes and failures of the linear city and the larger regional project, the Guayana initiative was a relevant model that influenced multiple scales and spheres of regional planning in South America. For one, the creation of a national planning agency to implement the Guayana project served as a critical point of reference for national planning strategies across Latin America. Luis Muñoz Marín (1898–1980), the former governor of Puerto Rico and an advisor and close friend of President Betancourt, was heavily influential in the implementation of CORDIPLAN.[28] Muñoz Marín, who had experienced the Guayana project firsthand, would later become one of US President John F. Kennedy's primary advisors in crafting the Alliance for Progress, an economic development program responsible for implementing national planning agencies in most Latin American countries. In this context, Ciudad Guayana was part of a much larger Cold War agenda that involved a growing interest, among nongovernmental organizations like the Ford and Rockefeller Foundations as well as the US government, in advancing development through urbanization in many parts of Latin America.

The Guayana project was also successful by the measure of its regional ambitions. The plan was able to transform a rather sleepy region into an important industrial hub with an active inner river port and a regional urban center with a population of almost a million people. Today, Ciudad Guayana is the economic capital of the Guayana region and an essential contributor to Venezuela's national economy. While Rodwin's dream of an interdisciplinary city in which an alchemy of design and social sciences created a post–Second World War utopia never materialized, the design project and its inherent experimental capacity did provide a successful founda-

tional framework for future urbanization. The grand industrial metropolis that inhabited the minds of Lloyd Rodwin, Willo von Moltke, and the Joint Center team had a completely different physical and experiential identity than the reality experienced by the inhabitants of Puerto Ordaz and San Félix. Yet it is evident that the plan's rudimentary implementation provides a model for urbanization that is far more successful than many of the contemporary resource extraction landscapes that we see today—landscapes where the city is rendered a byproduct of myopic production metrics, excising the social contract once embedded in the extraction process.

5

Pioneering Modernity

Vila Piloto

An autonomous urban vessel encased by the purity of its geometry, Vila Piloto employs many of the ideas that shaped the urbanization of the Paraná-Uruguay river basin as Brazil transformed these remote hinterlands into a new hydroelectric Eden. Delineated as a perfect circle inscribed in the flat landscape of the basin, the "Pilot City" would be described by the *Hartford Courant* in 1966 as "sitting like a giant's play thing in the middle of prairie lands covered with shoulder-high grass."[1] Built in the early 1960s and conceived as a temporary encampment to house workers for the construction of the Jupiá Dam, the city evolved within an organizational ecology shaped by a multiplicity of ideas regarding energy infrastructure, urbanization, and territory. One of what would become a series of projects to leverage the Paraná River basin as an incubator of urban experimentation at a regional scale, Vila Piloto was the first and boldest urban experiment to emerge at the confluence of state-sponsored hydroelectric energy investment and regional planning in south-central Brazil. Its conception initiated a territorial process that from the 1960s to the 1990s would dramatically alter the urban and riparian landscapes of São Paulo and its neighboring states.

Hydroelectric Energy and the Path to Industrialization

Throughout the first half of the twentieth century, the federal and state governments of Brazil undertook heroic efforts to claim and domesticate its expansive interior territory. By the 1940s, as Belo Horizonte had consolidated into a prosperous city and Goiânia, the new capital of the state of Goiás, was rapidly being erected, nationalist governments commenced larger industrialization efforts—such as the first Brazilian steel plant in the Paraíba Valley in 1946[2]—that would encourage industrialization and mod-

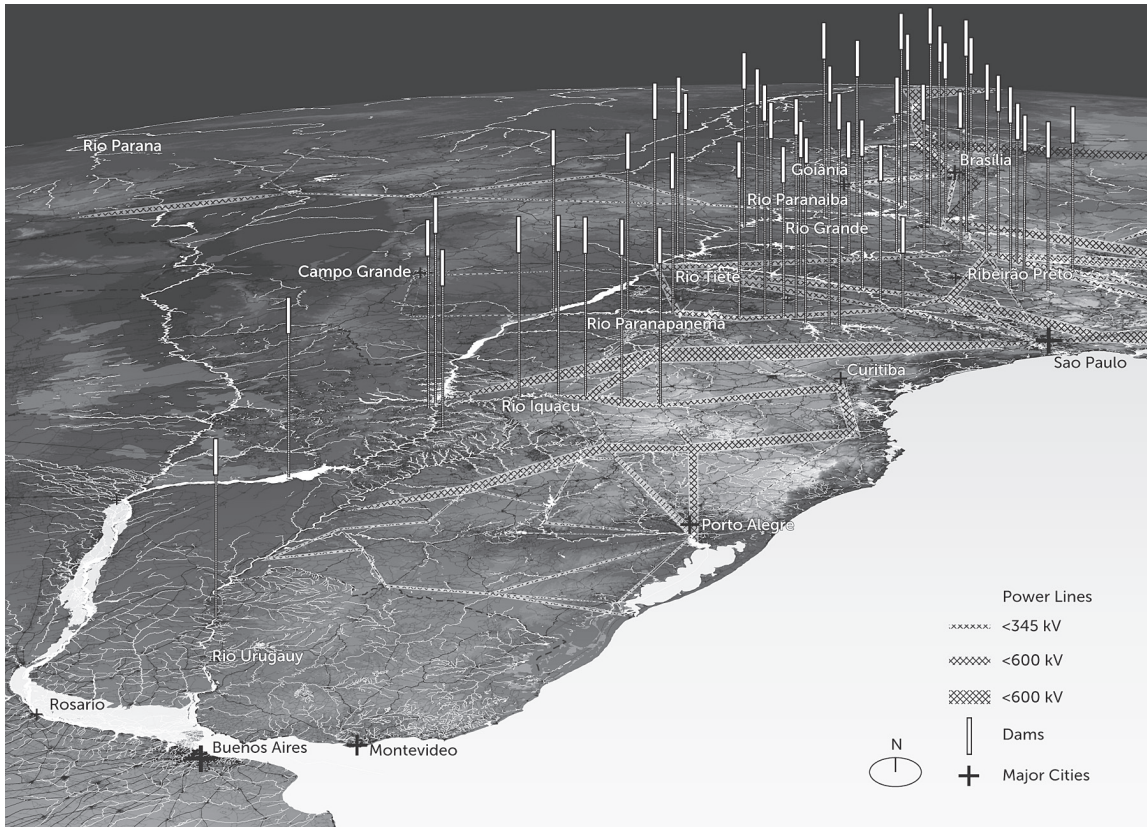


Figure 5.1. Contemporary bird's-eye view of the southern Paraná River basin and the network of hydroelectric dams. Drawing by Felipe Correa.

ernization within the country's sleepy interior. Essential to this agenda was the development of a clear energy policy that could provide reliable and steady energy sources for the nationally sponsored industries. It is not surprising, then, that the country saw its expansive network of rivers as the solution to its immediate electricity shortages and a long-term source of electric power that could help advance a nation that was pointed toward rapid industrialization. The unprecedented investment in hydroelectric energy that followed would set forth an aggressive spatial restructuring of Brazil's agrarian interior, a landscape that had previously supported a smattering of settlements, or *povoamentos*, sustained through cattle ranching.[3]

While the intent to transform Brazil's major rivers into a productive machine can be traced back to the late nineteenth century,[4] it was only in the Kubitschek era (1956–1961) that a push for water-based energy in the form of large-scale, state-sponsored projects gained momentum. Juscelino Kubitschek, who as governor of Minas Gerais expanded the state's hydroelectric capacity,[5] would, as president of the country, champion energy security as a main pillar for the advancement of an industrialized Brazil. Kubitschek ran on a presidential platform that targeted four strategic areas: energy, transportation, agriculture, and industry.[6] Within this context, hydroelectric projects were an essential component of his agenda to integrate the interior of the country with the coast. Despite the steep initial

Figure 5.2. Aerial view of Vila Piloto, 1962. Courtesy of the Acervo Fundação Energia e Saneamento.

investment, turning water into energy made sense in a country that at the time had a limited inventory of fossil fuels. Additionally, the larger enterprise of a hydroelectric network—dams, roads, towns, reservoirs, etc.—served as an ideal substructure for a much larger territorial plan that could link the resources of the country's interior with the economies along the coast. In Minas Gerais in the early 1960s, the Três Marias Dam and the Furnas Dam,[7] two pilot projects emblematic of the Kubitschek governorship, paved the way for the development of hydroelectric infrastructure that would rapidly transform the riparian geometries of south-central Brazil.

A perfect storm of rising nationalist sentiment paired with the central government's escalating response to frequent conflicts between foreign power companies and state governments culminated in the production of one of the largest networks of hydroelectric dams in the history of the country, and in all of South America.[8] By the late 1940s, hydroelectric energy was seen as a brand new public sector that could not only provide a steady flow of electricity but also become a significant pillar of the national economy. The formulation of the Plano Nacional de Electrificação (National Electric Plan) in 1954, along with the ongoing explorations of Brazilian river basins as potential sources of energy, marked the birth of regional planning in the country. Developmentally friendly governments such as the Kubitschek administration and that of his corporatist predecessor, Getúlio

Vargas (1882–1954), operated under the belief that regional planning could overcome Brazil's infrastructural shortcomings and further advance its quest for modernization. The relationship between energy, hydrology, and regional planning played a crucial role in redefining the image and value of the Brazilian interior, establishing a new physical and experiential identity that would emerge from the transformation of an economically sluggish hinterland into a new productive landscape.

The principle of regional planning that emerged in Europe at the turn of the twentieth century—disseminated primarily through Ebenezer Howard's *Garden Cities of Tomorrow* (1902) and Patrick Geddes's *Cities in Evolution* (1915)—and in North America a few decades later through the work of Lewis Mumford and the Regional Planning Association of America (RPAA), was by the 1940s widely circulated across the globe, and these ideas were present in the Brazilian planning mindset at the time.

More specifically, however, the Tennessee Valley Authority (TVA) had the most direct influence on the regional plans that would reshape the rivers of south-central Brazil. Born in the midst of an economic depression in the United States, the TVA channeled the regionalist concepts of Geddes and Mumford through the political framework of President Franklin D. Roosevelt's New Deal, becoming the poster child for the practice of regional renewal. Despite internal administrative disagreements among its leaders,[9] the TVA presented to the world the realization of an ideal regional plan. The Tennessee Valley served as a tangible case study of a territorial vision where settlement and natural resources coexisted effectively within an administrative unit defined by the orography of a basin, bypassing political boundaries. The authority's technical know-how and administrative models became significant references worldwide, particularly in the shaping of hydroelectric landscapes across the developing world. From Latin America to South Asia the TVA media machine exported the ability of democratic regional planning to put an environmentally damaged and economically depressed region to work. While many large-scale hydroelectric projects were directly influenced by the TVA, in south-central Brazil the larger ethos of the regional planning principles embedded in the Tennessee Valley had direct repercussions in the conceptualization and implementation of a series of regional plans for dams, levees, and reservoirs to serve as the backbones of a much larger, ambitious urbanization strategy.

Of the many concepts touted by the TVA, two were key in the development of regional planning in Brazil. One was Geddes's identification of the region as the basis for the construction of social and political life.[10] The other was Mumford's "fourth migration,"[11] the notion that technological advancement—primarily the proliferation of private mobility (the car, the cargo truck, and the trunk road) and electronic communications—would radically alter the relationship between city and territory and that the architect-planner had the capacity to give spatial synthesis to these new processes of urbanization. Both claims, which radically incorporated geography into urban planning, resonated decades later in Brazil as validating the larger developmentalist agendas of Vargas and Kubitschek. In Brazil's political

climate, so different from Tennessee's, these agendas would specifically focus on recasting the image and value of Brazil's hinterland through government-sponsored programs targeting the construction of highway infrastructure, telecommunication networks, and hydroelectric energy facilities. Reassessing the value of the region and the regional city was central to Brazil's midcentury developmentalist mindset.

Direct exchanges between the Tennessee Valley Authority and the Brazilian government date back to 1944, when Apolônio Salles, Brazil's minister of agriculture, made an official visit to the TVA. Salles's visit first brought the Tennessee project to the collective attention of Brazil's public administrators. Two years later, Oren Reed, a TVA engineer who had been in charge of the Watts Bar project, visited Brazil to see the early hydroelectric projects in the Rio São Francisco basin.[12] His endorsement of the São Francisco project and his belief in Brazilian rivers as a source of energy further cemented the links between TVA and the Brazilian federal government.[13] These initial exchanges with TVA engineers, along with the establishment of the Point Four Program by President Harry Truman—a US-sponsored technical assistance program catered to the developing world—led to the establishment of Brazil's Comissão Nacional de Assistência Técnica (National Commission for Technical Assistance) in 1950. The *comissão* became the main vehicle for transferring knowledge from experiences like the TVA encounter into the Brazilian context.

Many of the TVA's ideas were also filtered through other prevalent lines of thought regarding urban planning and urbanization in mid-twentieth-century Brazil. Particularly important were the ideas of Father Louis-Joseph Lebret (1897–1966), a French Dominican priest who in 1941 founded Économie et Humanisme, a Paris-based research center that involved the Catholic Church in issues related to global development. The center believed in the need for social action at all levels of community life. Lecturing throughout Brazil, Lebret argued for the ability of urban planning, in its plurality of models, to confront the urban challenges of the developing world, primarily through the introduction of social questions into the analyses of evolving urban processes.[14] While controversial with the most conservative factions of the Brazilian Catholic Church, Lebret's humanistic approach to urban development was generally well received. In 1947 he established the Sociedade para Análise Gráfica e Mecanográfica Aplicada aos Complexos Sociais (SAGMACS), a technical office modeled after the French Société pour l'Application du Graphisme et de la Mécanographie à l'Analyse (SAGMA), tasked with developing techno-scientific studies and proposals geared toward social and economic development and approached through an interdisciplinary lens that could further advance the principles of the Économie et Humanisme movement. Working in collaboration with engineers of São Paulo's polytechnic school, throughout the 1960s SAGMACS conducted an extensive report on urbanization along the lower Paraná River. A crucial component of the report was a plan called Comunidades Territoriais do Paraná,[15] which emphasized the importance of social agency in the physical development of the basin. Lebret and SAGMACS believed

in a humanized *mise en valeur*, arguing that any successful management strategy of a territory relied on a careful reading and interpretation of the human and physical values of the land.[16] These ideas resonated with the diverse agencies that would be responsible for the territorial agenda of the lower Paraná River basin, particularly because Lebret's approach acknowledged and valued existing local settlements, a departure from the more traditional approach in the region, which favored complete erasure. For Lebret, who later had a significant influence on François Perroux's concept of the growth pole, urban life was essential to social and economic development, placing the city as the center stage of larger regional plans.

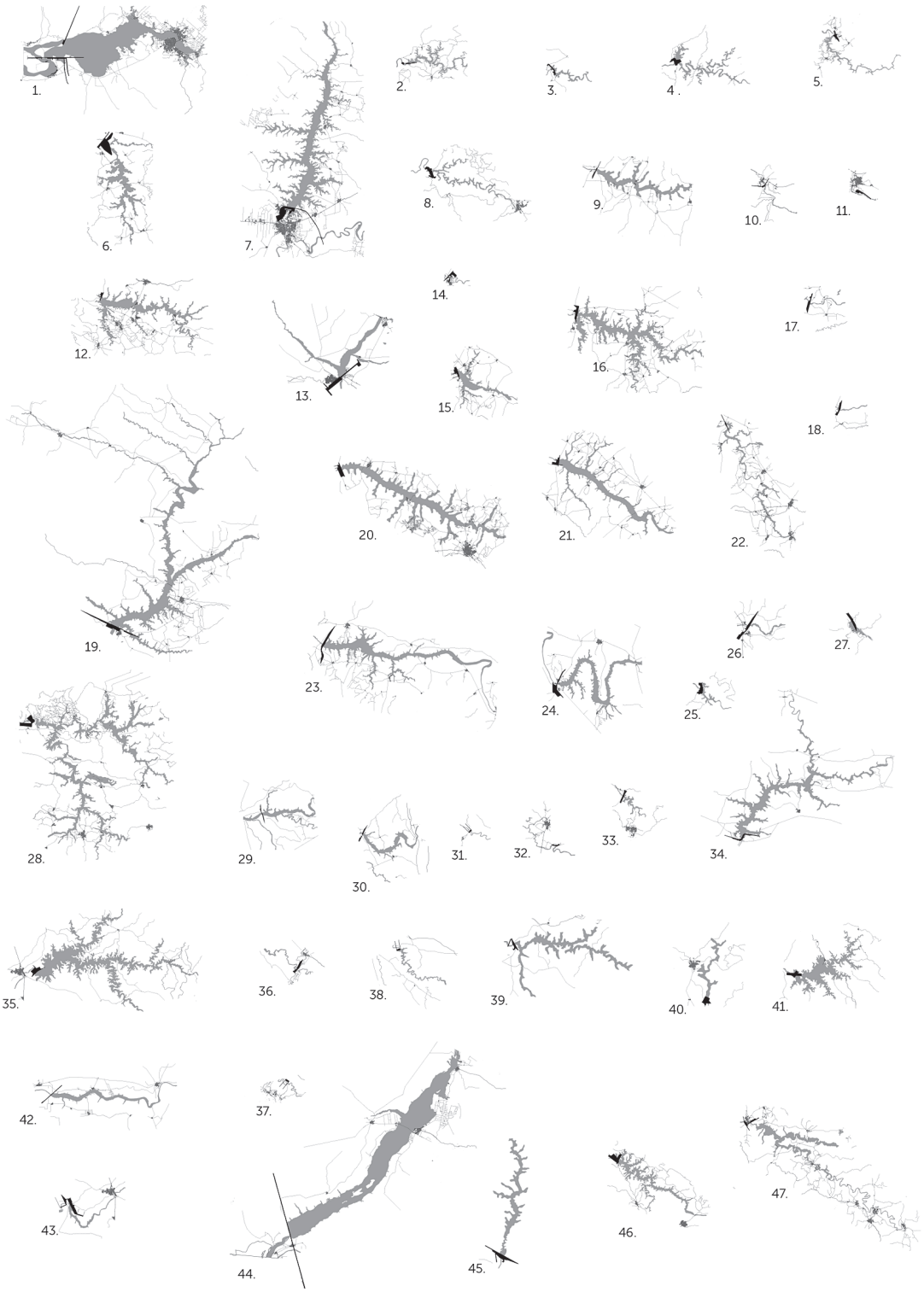
The Basin as a Regional Unit

While many river basins in Brazil were shaped by the influence of the TVA, the Paraná-Uruguay basin was the location of the most extensive experiment in midcentury regional planning. The Comissão Interestadual da Bacia Paraná-Uruguai (CIBPU), along with a group of adventurous architects and engineers who would later join the architecture and urbanism division of the Companhia Energética de São Paulo,[17] produced a collection of studies, plans, and projects that capitalized on investment in hydroelectric energy as the backbone for the development of a much more ambitious and comprehensive regional vision.

Established in 1951, CIBPU was a regional planning agency tasked with guiding the spatial and social advancement of the larger Paraná-Uruguay river basin. It was structured as an interstate institution that united seven states under a singular administrative body. With boundaries defined by the geography of the basin, CIBPU enlisted the states of São Paulo, Santa Catarina, Paraná, Mato Grosso, Rio Grande do Sul, Goiás, and Minas Gerais for a collaborative project that would help advance the common interests of this broadly diverse region unified by an overabundance of water.[18] Working as an independent authority outside the traditional framework of public administration, CIBPU's engineers and administrators were able to combine technical expertise and political muscle to dam the river to produce electricity. A prescient institution, the agency brought together the public and private sectors, knowledge from national universities, support from international technical assistance teams including the United Nations, the Ford Foundation, and the Rockefeller Foundation, and international financing agencies including the International Bank for Reconstruction and Development (IBRD) and the World Bank.[19]

Central to CIBPU's mission was the development of an integral management strategy, one that could effectively take advantage of the broad spectrum of resources across the basin. Distinguishing itself from more myopic planning enterprises, CIBPU sought to promote the *mise en valeur* of the landscape, suggesting a more humanized approach to development that focused on the analysis and enhancement of the region.[20] While hydroelectric energy production was at the core of their mission, the agency also developed strategies for river navigability, irrigation, flood control, water

facing page
Figure 5.3. Scalar comparison of hydroelectric dams and reservoirs built in the southern Paraná River basin. Drawing by Felipe Correa.



1. Yacyretá
2. Salto Caxias
3. Salto Osorio
4. Salto Santiago
5. Segredo
6. Xavantes
7. Itaipu
8. Foz do Areia
9. Taquaruçu
10. Salto Grande
11. Ourinhos
12. Jurumirim
13. Jupiá
14. Piraju/Piraju II
15. Nova Avanhandava
16. Capivara
17. Canoas
18. Canoas II
19. Ilha Solteira
20. Três Irmãos
21. Mario Lopes Leão
22. Ibitinga/Alvaro Sousa Lima
23. Agua Vermelha
24. Marimbondo
25. Jaguara
26. Igarapava
27. Estreito
28. Furnas
29. Porto Colombia
30. Volta Grande
31. Euclides da Cunha
32. Limeira
33. Caconde
34. São Simão
35. Itumbiara
36. Capim Branco I
37. Capim Branco II
38. Miranda
39. Nova Ponte
40. Corumbá
41. Emborcação
42. Rosana
43. Cachoeira Dourada
44. Porto Primavera
45. Serra do Facão
46. Peixoto
47. Barra Bonita

management, and fishery science. In addition, CIBPU was concerned with the overall improvement of quality of life in the region, and it channeled resources toward studies and programs that would benefit education, housing, sanitation, and vocational training programs. In later years, issues of environmental and ecological stewardship would become central to CIBPU's mission as well.

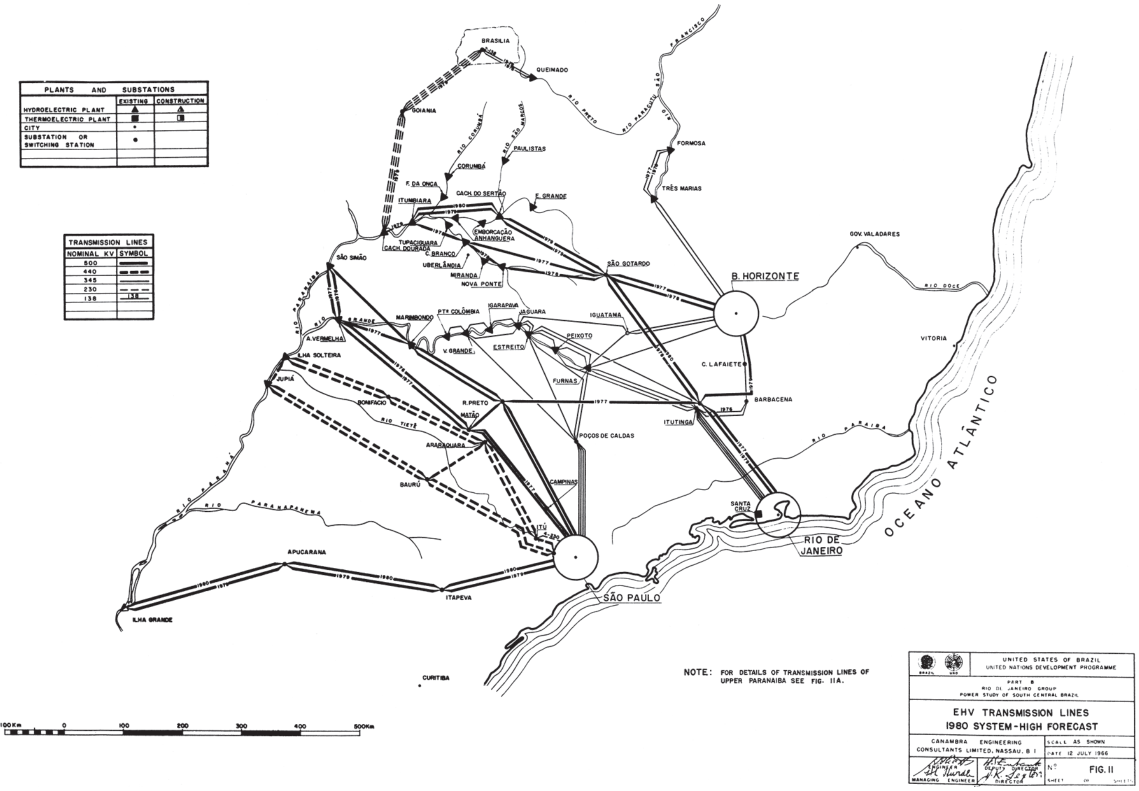
The strength of the emerging national electric energy sector was also crucial for regional development in the area, and the need for an integrated national electric grid spurred the systematic construction of hydroelectric plants along the basin. Key to the development of the electric energy sector in the region was the 1962 CANAMBRA study, an international report that provided a comprehensive overview of the hydrological resources in south-central Brazil and how these could become the pillar of a national electric grid.[21] CANAMBRA—partially funded by the Inter-American Development Bank and the United Nations—was named after the three nationalities of its team members (Canada, the United States, and Brazil). Its two leaders, Mario Bhering and John Cotrim, had been key figures in the consolidation of the Companhia Energética de Minas Gerais (CEMIG) in 1952 and extremely active in the development of earlier hydroelectric projects in that state. The study, a technical report, focused on the inherent benefits of hydroelectric exploitation in relation to growing market demands at a national scale. By ignoring the environmental costs of blocking the flow of the Brazilian Paraná for energy production, the economists and engineers projected tremendous economic gains.

facing page, top
Figure 5.4. Drawing produced by the CANAMBRA study in 1966. The drawing in its original large format forecasts required transmission lines for 1980. From *Power Study of South Brazil Report*, by Canambra Engineering Consultants, Brazil, United Nations Development Programme.

facing page, bottom
Figure 5.5. Drawing produced by the CANAMBRA study in 1966 depicting a larger territorial analysis in relation to energy extraction. This map in its original large format shows the locations of potential hydroelectric dams and their relations to existing towns and villages. From *Power Study of South Brazil Report*, by Canambra Engineering Consultants, Brazil, United Nations Development Programme.

The cost per kilowatt for producing hydroelectric energy in south-central Brazil was minimal compared to the costs of other potential energy sources. While CANAMBRA's main objective was to maximize energy resources, the overall study, by default, also provided a comprehensive geographic survey of the territory. The report contained valuable information regarding water supply, flood management, and navigation potential of the rivers—all elements that would play a key role in the urbanization process of the basin. The investment from the electric energy sector in south-central Brazil, heavily guided by CANAMBRA, allowed CIBPU to advance and implement many of its studies and plans. Critical to this process was the creation in 1966 of the Companhia Energética de São Paulo (CESP), a state electric company that consolidated thirteen regional public and private electric companies under a single administrative entity. The regional plans championed by CIBPU, along with the massive construction of hydroelectric dams by CESP and its predecessors, completely recast the Paraná-Uruguay river basin. Over the span of forty years, CESP built nearly thirty dams, most of them large in scale, altering the basin into a continuous chain of reservoirs linked by concrete dams.

The work conducted by CIBPU and CESP brought together a collection of architects and engineers who dedicated a significant portion of their professional lives to this region. Hélio Pasta (b. 1927), a São Paulo-based architect, along with the engineer/architect team of Ernest Robert de Carvalho Mange (1922–2005) and Ariaki Kato (b. 1931), confronted a regional


PLANTS AND SUBSTATIONS
EXISTING
CONSTRUCTION
HYDROELECTRIC PLANT
THERMOELECTRIC PLANT
CITY
SUBSTATION OR SWITCHING STATION
TRANSMISSION LINES
NOMINAL KV
SYMBOL
500
440
345
230
138
BRASILIA
QUEIMADO
GOIANIA
FORMOSA
TRÊS MARIAS
ITUMBIARA
SÃO SIMÃO
SÃO GOTARDO
B. HORIZONTE
GOV. VALADARES
VITORIA
ILHA SOLTEIRA
JUPIÁ
FURNAS
ESTREITO
PEIXOTO
IGUATAMA
MARIMBONDO
R. PRETO
MATÃO
ARARAQUARA
BAURÚ
POÇOS DE CALDAS
CAMPINAS
C. LAFAIETE
BARBACENA
ITUTINGA
SANTA CRUZ
RIO DE JANEIRO
SÃO PAULO
APUCARANA
ITAPEVA
ILHA GRANDE
CURITIBA
OCEANO ATLÂNTICO
NOTE: FOR DETAILS OF TRANSMISSION LINES OF UPPER PARANAIBA SEE FIG. 11A.
100Km 0 100 200 300 400 500Km
UNITED STATES OF BRAZIL
UNITED NATIONS DEVELOPMENT PROGRAMME
PART B
RIO DE JANEIRO GROUP
POWER STUDY OF SOUTH CENTRAL BRAZIL
EHV TRANSMISSION LINES
1980 SYSTEM-HIGH FORECAST
CANAMBRA ENGINEERING CONSULTANTS LIMITED, NASSAU, B. I.
SCALE AS SHOWN
DATE 12 JULY 1966
FIG. 11

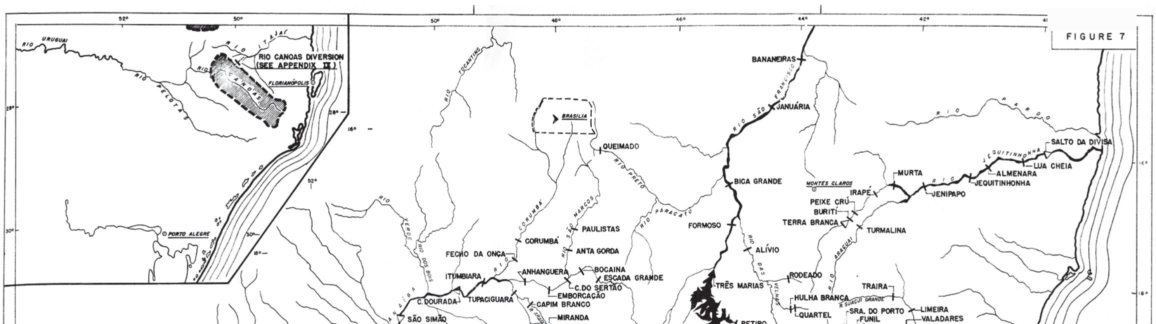


FIGURE 7
RIO CANOAS DIVERSION (SEE APPENDIX IX)
FLORIANÓPOLIS
PORTO ALEGRE
BRASILIA
QUEIMADO
BANANEIRAS
JANUÁRIA
BICA GRANDE
FORMOSO
TRÊS MARIAS
SALTO DA DIVISA
FURNAS
ITUTINGA-CAMARGOS
BELO HORIZONTE
ILHA SOLTEIRA
TRÊS IRMÃOS
JUPIÁ
BARRA BONITA
CAPIVARA
SALTO GRANDE
CHAVANTES
JURUMIRIM
SANTO ANTÔNIO
CAPIVARI-CACHOEIRA
RIO NEGRO DIVERSION (SEE APPENDIX VII)
PARAGUAI
ARGENTINA
ACARAI
PÔRTO MENDES
ILHA GRANDE
CARAGUATATUBA
MAMBUCABA
ATLANTIC OCEAN
CONVENTIONS
EXISTING HYDRO PLANTS (OVER 25 MW)
HYDRO PLANTS (UNDER CONSTRUCTION)
HYDRO SITE FEASIBILITY STUDIES
HYDRO SITES STUDIED (AS REFERRED TO IN THE RESUME OF THE HYDRO SURVEY, SECTION 4.1)
DIVERSION PROJECT STUDIED
UNITED STATES OF BRAZIL
UNITED NATIONS DEVELOPMENT PROGRAMME
LOCATION OF HYDRO PROJECTS
CANAMBRA ENGINEERING CONSULTANTS LIMITED, NASSAU, B. I.
SCALE AS SHOWN
DATE 12 JULY 1966
FIGURE 7
W. Gr.

project that demanded a redefinition of what an architect-planner in mid-twentieth-century Brazil should be. In tackling this territory, these figures, along with a larger interdisciplinary group, spearheaded a collection of experimental architectural and urban projects that contributed to reshaping the basin's spatial identity. Later, in the 1990s, Nina Tsukumo would take the leadership of CESP's division of architecture and urbanism and exercise significant design influence on projects developed in the last two decades.

From the initial hydroelectric plants in Salto Grande and Barra Bonita in the late 1950s and early 1960s to the Três Irmãos, Canoas, and Porto Primavera projects in the 1990s, designers Pasta, Mange, Kato, and later Tsukumo worked with a mindset that placed the architect at the confluence of multiple scales and disciplines. In principle, their working method involved three scales of action.[22] The territorial scale encompassed basin-wide issues and dealt with the regional implications of each project individually, along with evaluating the impact of the totality of projects in the basin. Key to this scale was the drafting of impact analysis surveys that could chart ways in which hydroelectric investment would improve local life in the region. The second, intermediate scale, focused on the reservoir and the disposition of infrastructure and services around it. This scale directly planned for the immediate impact of dam and reservoir construction. Crucial to this scale were negotiations with local municipalities for the relocation of settlements below the flood line, the introduction of new mobility networks, and the programming of future economic activities—fisheries, forestry, recreation, and tourism—that would be developed once the reservoir was put into place. From the 1980s onward, once the environmental damage caused by dams built in earlier decades could be measured and proven, environmental mitigation became another central focus of this working scale. Finally, the third working scale focused on the design of the dams themselves and their required support infrastructures, including the design of residential and administrative encampments. CESP and its predecessors combined these scales onto a single drafting board, conceiving of hydroelectric projects within larger spatial compositions and bringing a robust level of design attention to the regional scale.

The introduction of a regional *problematique* into the architectural practices of mid-twentieth-century Brazil questioned the efficacy of top-down impositions of architectural and urban form as the template for urban growth. Recent examples of designed cities like Goiânia and the new capital, Brasilia, were seen as exceptions rather than models, forcing architects to concoct new approaches to urban growth and architectural form within interdisciplinary strategic planning frameworks. The working environment set in place by the larger agendas of CIBPU and CESP provided a laboratory for a new model of architectural practice where the top-down deployment of architectural form would be guided by territorial surveys addressing larger physical, social, and economic objectives for the region. This environment allowed architects like Pasta, Mange, Kato, and Tsukumo to test architectural forms in relation to the territorial, social, and economic

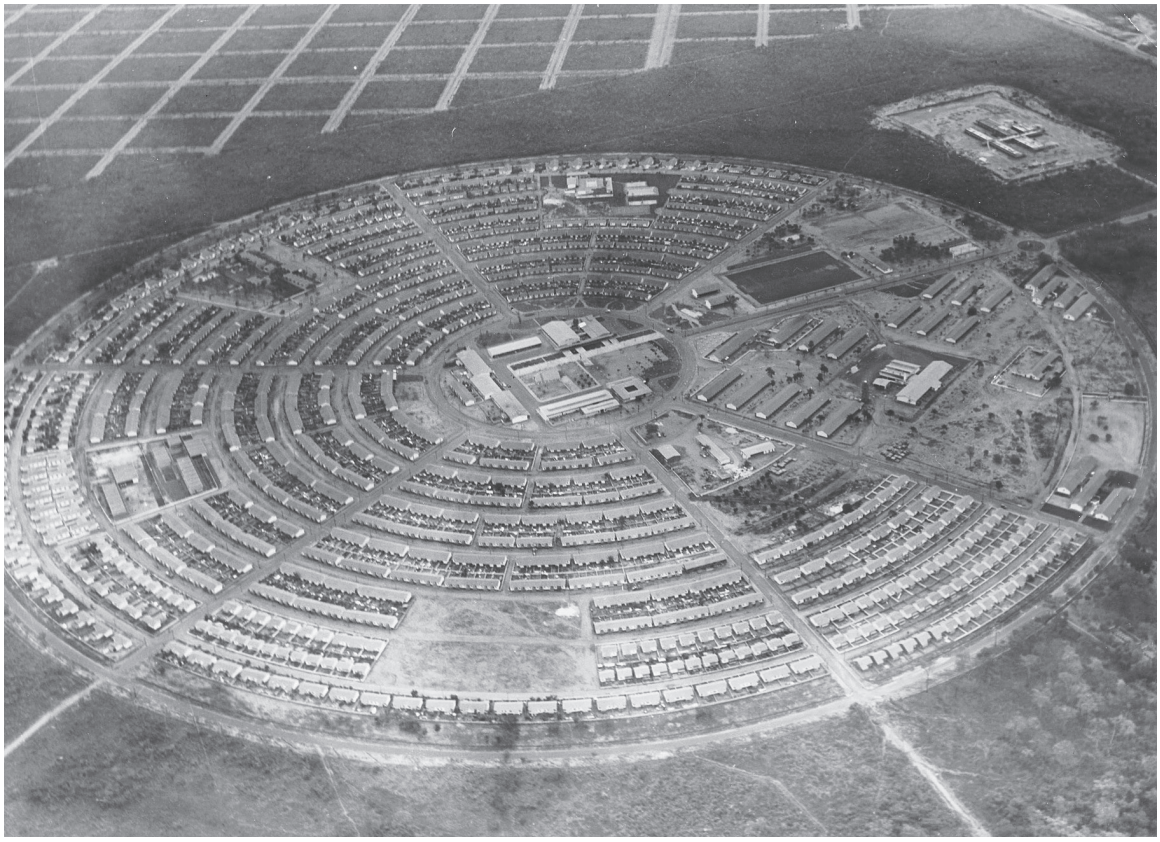
objectives of the regional survey. Their design proposals oscillated between autonomous architectural forms and design guidelines, accounting for different degrees of urban growth over time.

For this group, the conceptualization of the city, and what a city should be in the context of the region, became the primary focus of the design process. As Mange argued in the introduction to his thesis on the project, "It is necessary to create a 'city' with citizens and not a jumble of shacks with servants and carpenters. Between us, it is necessary by all means possible, to develop a 'cultural' action, a 'civilizing' action, with particular emphasis on issues of education and health."[23] The notion of "the city"—a changing and variable design target—became the most fruitful vehicle for the exploration of spatial strategies throughout the basin. From the construction of temporary encampments and the deployment of brand new cities to the upgrade of existing towns, the design of the city was always the epicenter of a regional plan. In the search for an interface between city and region, CESP and its predecessors developed a series of projects to test and advance their developmentalist hypotheses. Of these developments, Vila Piloto and Ilha Solteira in the Urubupungá complex and later Porto Primavera further south, best encapsulate new conceptions about the urban in relation to the production of hydroelectric energy and the larger water-based systems of the southern Brazilian Paraná.

Urban Cocoon: Vila Piloto and the Jupiá Hydroelectric Plant

The development of the Usina Hidrelétrica Jupiá (today Engenheiro Souza Dias), at the confluence of the Paraná and Sucuriú Rivers, was one of the first planning projects in the region to bring together energy infrastructure and urbanization strategies. Conceived as a three-piece plan, the project included the design of a temporary encampment for the construction workers who were to build the dam, a smaller, permanent village for dam operators known as the Núcleo do Operadores, and upgraded mobility infrastructure (primarily roads and rail) to better connect the plant to the region and to São Paulo. This last piece involved investment in roads, a new airport, and the upgrade of existing rail lines. With this project, Ernest Mange and Ariaki Kato sought to create an urban cocoon in the middle of the Brazilian wilderness. It would also serve as a pilot project to showcase upgraded living standards in the severely underdeveloped region of Urubupungá. From the start, however, this hydro-urban complex, sited eight kilometers away from the remote village of Três Lagoas, posed a compelling set of challenges for its designers.

A temporary encampment with a projected population of fourteen thousand construction workers and their families, Vila Piloto was the pivotal piece of the Jupiá plan. Constructed in 1961 with a built-in expiration date of five to seven years, Vila Piloto became an experimental project to provide housing for the massive migration of workers to construct the dam. While the supply of housing for temporary workers in remote locations had previously been resolved through the militaristic deployment of prefabricated



barracks, at Vila Piloto Mange saw an opportunity to conceive a new form of urban development—a project that could strive to be something more spatially ambitious than the "technical favelas" built next to the construction sites of previous hydroelectric power plants.[24] As a result, Mange and Kato proposed an encampment that, despite its provisional nature, would aspire to provide higher living standards for its dwellers through better quality housing stock and basic services and facilities systematically included in the plan. Strongly influenced by the "neighborhood unit,"[25] by then a widespread concept, Mange and Kato opted to construct a self-sufficient town organized around a gradient of residential types. After much debate over the many formal configurations this new outpost could take—including the common *superquadra*[26] prototype used in the design of Brasilia—the design team decided on a strategy of concentric rings subdivided by sectors. A clearly defined urban vessel in the Brazilian hinterland, the perfectly circular city would stand in direct contrast to the open landscape of the Paraná River.

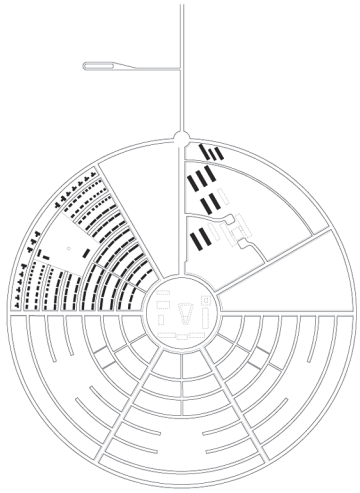
Mange and Kato argued in favor of the circle on technical and qualitative grounds. From a more pragmatic standpoint, they saw the concentric-ring strategy as the most efficient way of deploying infrastructure. Electricity, potable water, and sewerage could be organized radially, significantly reducing linear distances. Also, this configuration allowed for a calibrated overlap between vehicular and pedestrian traffic. Radial streets would accommodate heavier vehicular traffic, while the concentric rings would be primarily for pedestrian use and light vehicular access. This intention is clear in the slight offset of the road from one sector to another. Working in a context before urban density had ever existed, Mange argued against the modernist tradition of completely separating vehicular and pedestrian circulation. Instead, he searched for a strategy of coexistence. Mange's strongest argument for the circular scheme revolved around the definition of a clear center where activities such as commerce, administration, recreation, and communications would be grouped. A common open ground that was protected by layers of housing from the vast emptiness of the barren landscape would provide, in Mange's own words, "a sense of belonging."[27]

The seven sectors that made up the circle contained the basic infrastructure for an instant city. Sector one grouped most of the bachelor housing, sectors two and seven were open and recreational spaces, and sectors three through six aggregated the majority of the housing, in addition to a neighborhood unit in each sector. While the subdivided sectors enabled a general differentiation of uses, housing types—from attached row houses to single-family homes—were mixed within each sector, fomenting social exchange among the diverse socioeconomic strata that would soon inhabit Vila Piloto. Following the construction method of conventional Brazilian *casinhas*, the residential units were built with standardized timber framing. High-pitched roofs and long overhangs were essential to mitigate the hot, humid climate in the region. The units were produced in three different sizes. Type A, the largest unit, was a detached single-family home generally located along the outermost ring, allowing for direct unit access by a private

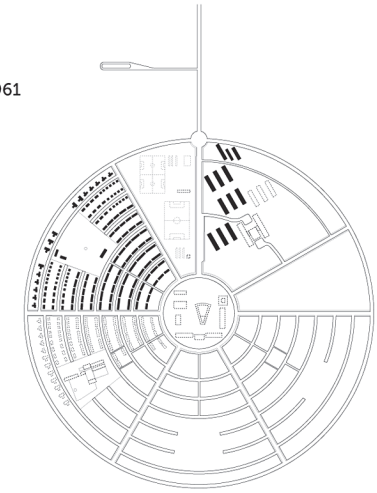
facing page, top
Figure 5.6. Aerial view of Vila Piloto, 1962. Used by courtesy of the Acervo Fundação Energia e Saneamento.

facing page, bottom
Figure 5.7. Aerial view of Vila Piloto. Photo by Sayuri Baez; used by courtesy of the photographer.

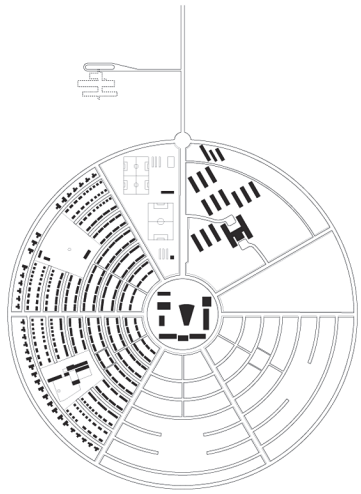
1961



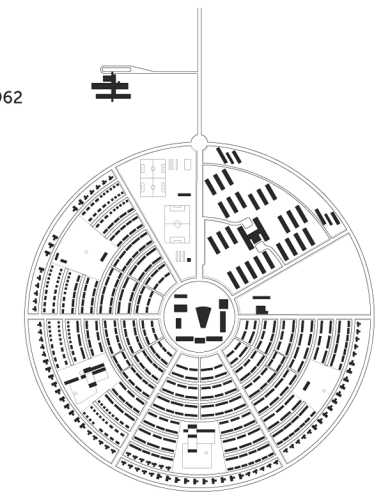
1961



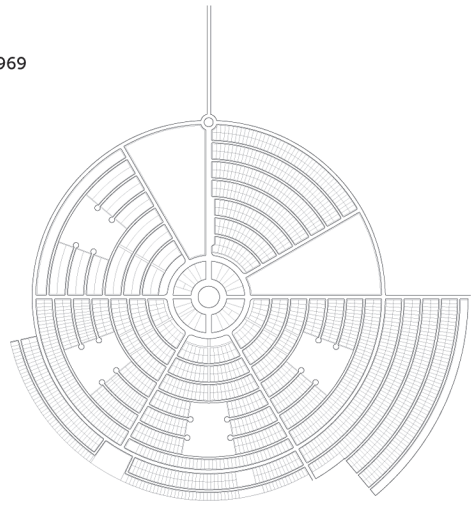
1962



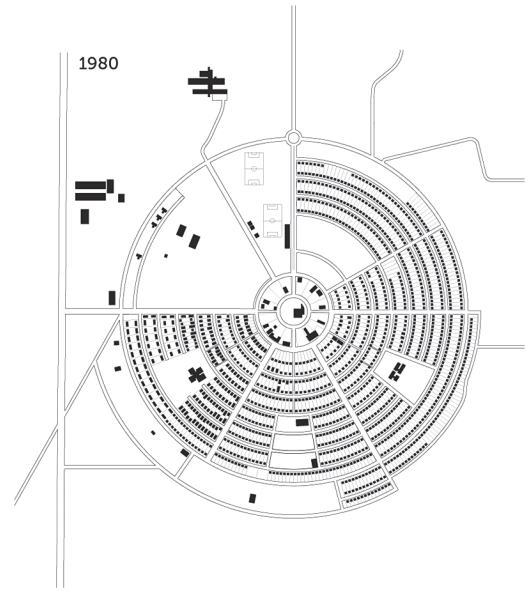
1962

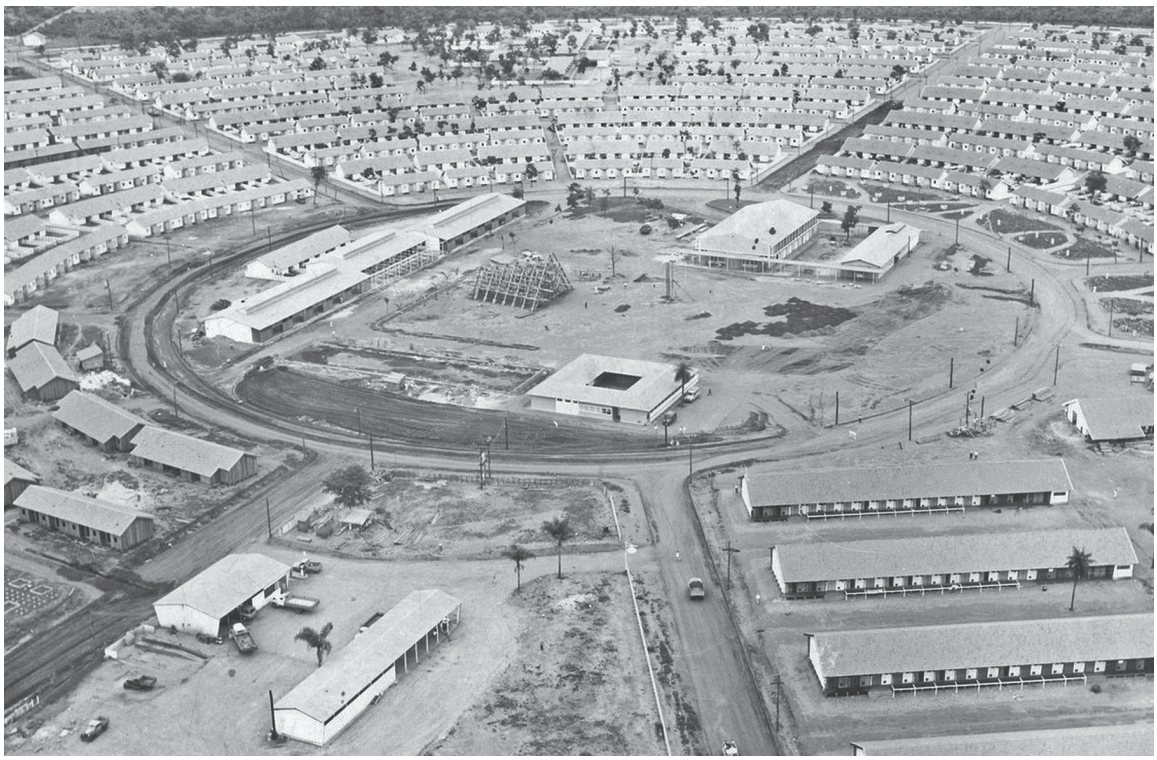


1969



1980





facing page
Figure 5.8. Assembly, disassembly, and reuse of the Vila Piloto project. Drawing by Felipe Correa.

above
Figure 5.9. View of Vila Piloto's central space under construction, 1962. Used by courtesy of the Acervo Fundação Energia e Saneamento.

vehicle. Types B and C, smaller in size and built in groupings of four to six units, formed the inner rings. The proportion of collective to private open space was critical in the spatial definition of each type of housing. Mange and Kato favored smaller private backyards in order to emphasize the space of the street. Flanked by wooden porches, the street would serve as the main space for outdoor life. Bachelor housing, which occupied most of sector one, transformed the traditional *casinha* archetype into an elongated bar building that accommodated approximately 180 people in rooms with three to six beds. These buildings were assembled around community halls and the refectory, creating a congenial, campus-like atmosphere.

Due to the scarcity of basic services available in the area, Mange and Kato saw the need for a self-sufficient city in terms of health care, basic education, and recreation. They also proposed a means by which many of these infrastructures would remain in the area beyond the city's built-in expiration date and become accessible to the expanding town of Três Lagoas. Following this notion, service buildings such as the hospital were designed and built as freestanding structures outside the confines of the circle. Inside the circle, a series of administrative, educational, religious, and recreational facilities made up the civic center. Among these were a church, a swimming pool, a cinema, and commercial stores. While many of these programs seem like the basic staples of any company town by the early 1960s, in the context of the Brazilian interior they were an unprec-

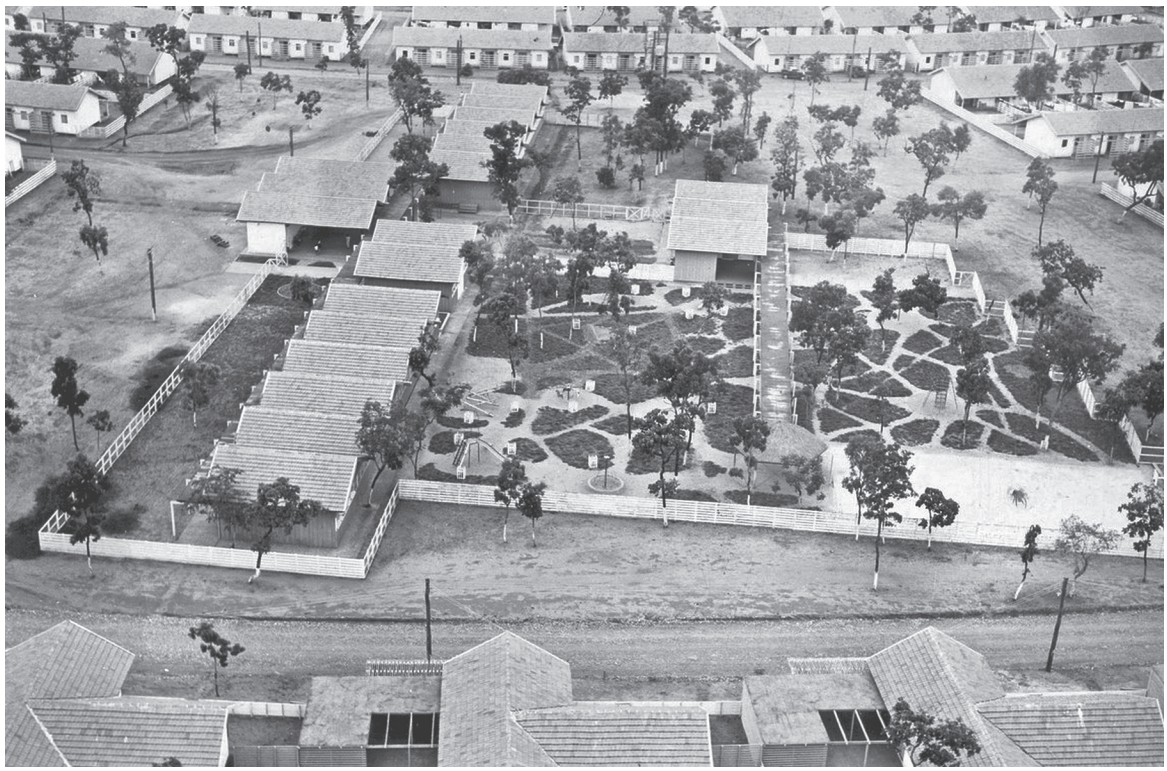


Figure 5.10. View of communal facilities, including a school, in one of the sectors, 1962. Used by courtesy of the Acervo Fundação Energia e Saneamento.

edented array of urban amenities and represented an unforeseen level of social investment in the area.

The ease of disassembly was a crucial component of the Vila Piloto plan. From the start, the residential units were conceived with the objective of being dismantled and reassembled in future CESP projects. Once the Jupiá Dam was operational in 1968, the process of taking apart the city began. The figure of the circle slowly eroded as the housing units were gradually removed, yet the basic infrastructure defined by the original plan—the roads, parcel structure, and open spaces—remained. These surviving elements gave structure to an infill process that took place once the ghost of Vila Piloto was annexed to Três Lagoas. Through the 1970s and 1980s, a large number of individual plot owners built their dwellings within the circle, guided by the traces of the Vila Piloto plan. Today, the circle is once again fully built. In the last two decades, the transformation of the private encampment into an open city has resulted in a neighborhood that, despite its economic limitations, offers many more amenities than most comparable areas in Três Lagoas.

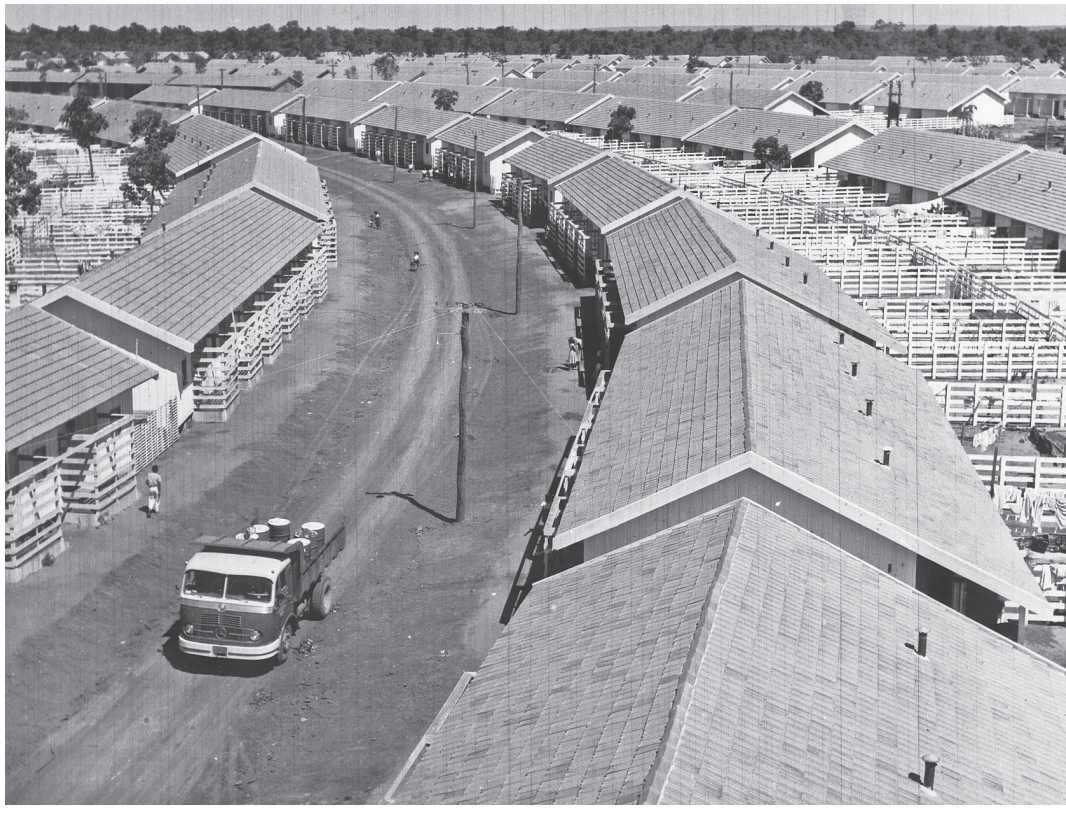
Another part of the Jupiá Dam project, the permanent Núcleo do Operadores, was built on the eastern edge of the Paraná River in São Paulo state. Much smaller in scope, this village housed the full-time operators of the plant and their families. Built with cleaner modernist lines than Vila Piloto, its overall spatial strategy was very similar to its provisional counterpart.

top
Figure 5.11. Vila Piloto's covered walkways mediated between interior and exterior spaces in the harsh climate of south-central Brazil, 1963. Used by courtesy of the Acervo Fundação Energia e Saneamento.

bottom
Figure 5.12. Interior communal spaces in Vila Piloto, 1963. Used by courtesy of the Acervo Fundação Energia e Saneamento.

right
Figure 5.13. Classrooms opening to covered walkway in Vila Piloto, 1963. Used by courtesy of the Acervo Fundação Energia e Saneamento.

below
Figure 5.14. Photogarph of Vila Piloto showing the relationship of street, residence, and backyard, 1963. Used by courtesy of the Acervo Fundação Energia e Saneamento.



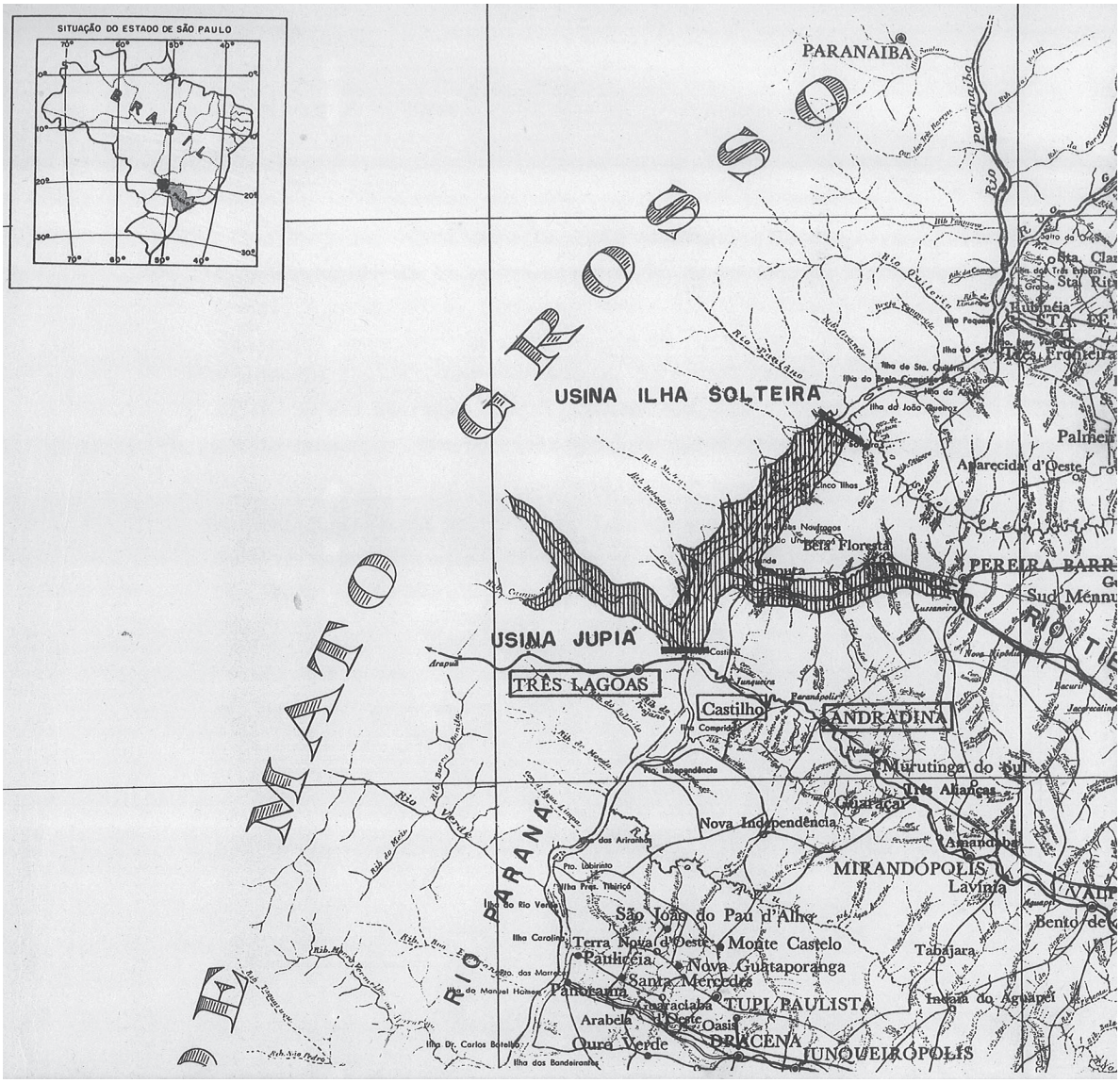


Figure 5.15. Usina Jupia in its regional context, as drawn by Ernest Robert de Carvalho Mange. From "Planejamento em Urubupungá. Tese apresentada a congregação da escolar politecnica da universidade de São Paulo—concurso de docência livre de cadeira no 12 'Noções de Arquitectura e Construções, Historia de Arquitectura'" (thesis, São Paulo, 1963). Courtesy of Acervo FAU–PGR.

All of the community and recreational facilities were placed right along the river's edge, creating a more institutional waterfront. Behind the community center, the housing units were terraced along a gently sloping hill. In this case, housing also came in three different types, which included single-family detached homes as well as smaller attached units grouped into clusters of four and six. North–south circulation favored vehicular traffic while east–west paths were primarily defined for pedestrian use. The disposition of private and collective open space also resembled its older sibling's across the river. Backyards within each residential unit were small and shaded by trees, providing an intimate domestic space. These were in direct contrast to the large collective lawns that divided each housing cluster. At present, the Núcleo do Operadores is still standing and fully operational. The simplicity of its original figure has been accentuated by fully grown vegetation

that gives it well-defined grounds. In overall effect, the *núcleo* now evokes a modernist university campus.

From Encampment to City: The Case of Ilha Solteira

The regional migration triggered by hydroelectric investment in the region made CESP question the validity of the provisional city model it had employed at Vila Piloto and favor a new gradual city concept that could evolve in shape from company town to autonomous municipality.[28] Thus, a new urban model was tested in the design and implementation of Ilha Solteira. Built approximately fifty miles north of Jupiá, the hydroelectric plant of Ilha Solteira and the adjacent city were the second urban experiment in the Urubupungá region. Planned in the early 1960s and inaugurated in 1969, Ilha Solteira was conceived as a housing encampment for construction workers that over time would transform into a fully fledged city of thirty-five thousand residents within this rich agricultural area along the Paraná River Valley.[29] After closing Vila Piloto, CESP had to relocate a large number of workers and their families who had already set up a life in the region. A large percentage of the workforce shifted to the construction site of the new dam. Those who did not relocate to the construction site itself found employment in regional support businesses that were starting to pop up in the area. Funded by the state of São Paulo and the federal government, Ilha Solteira was conceived as a regional economic growth pole, an urban and economic development model that was quite common across the global south at the time.[30] Adopting strategies similar to those of Ranchi in India and Ciudad Guayana in Venezuela,[31] Solteira was conceived as a strategic urban center at the crossroads of new national mobility networks and the Paraná River. Through the introduction of industry, commercial services, and agricultural support programs, the city was to be the epicenter and engine of a new and diversified regional economy.

Influenced by many of the linear city prototypes developed in Europe at the turn of the twentieth century, Mange and Kato conceived a project that involved the aggregation of neighborhood units along an avenue.[32] Approximately 1.5 kilometers in length, Avenida Brasil served as the main organizational spine for the project and linked the new city to regional highways that connected the country's interior to the Atlantic Ocean. An elevated water tank of monumental scale was placed at the center of the avenue, marking the beginning of this new commercial hub. The city plan was subdivided into four sectors, each containing residential units and basic services along with a set of specialized programs. Sector one held leisure and recreational spaces; sector two had schools and educational facilities; sector three had the main community center and its affiliated programs, including commercial space, a cinema, banking halls, a post office, and a telephone office; and sector four contained facilities for future service industries. Each of the specialized programs were placed in the inner corner of each sector, making them simultaneously part of each district and of the city center. Industry also played a key role in the spatial organization

of Solteira. Light manufacturing was placed along the main avenue, while land on the outer edge of the perimeter road was subdivided to accommodate heavier industrial plants and agricultural service facilities. The new city was to be encased by an agro-industrial ring that would, in the long run, guarantee its survival.

Housing units throughout the project followed similar principles to those in Vila Piloto. Bachelor housing, especially important in the initial stages of the city, was in independent full-service buildings following the dormitory model. Family housing came in six housing types, varying in size and amenity, clustered around basic services in each of the sectors. Following the Vila Piloto model, houses were laid out in a gradient, where smaller units sat closer to the center and larger houses were placed along the perimeter road, offering direct vehicular access to each unit. This placement served to alleviate the city center from vehicular traffic. The scalar transition from center to periphery was occasionally broken in order to provide a better mix of social groups within the project. Despite the differences in layout and size of the buildings, the disposition of housing units in Ilha Solteira highlighted one of the greatest challenges in the project,

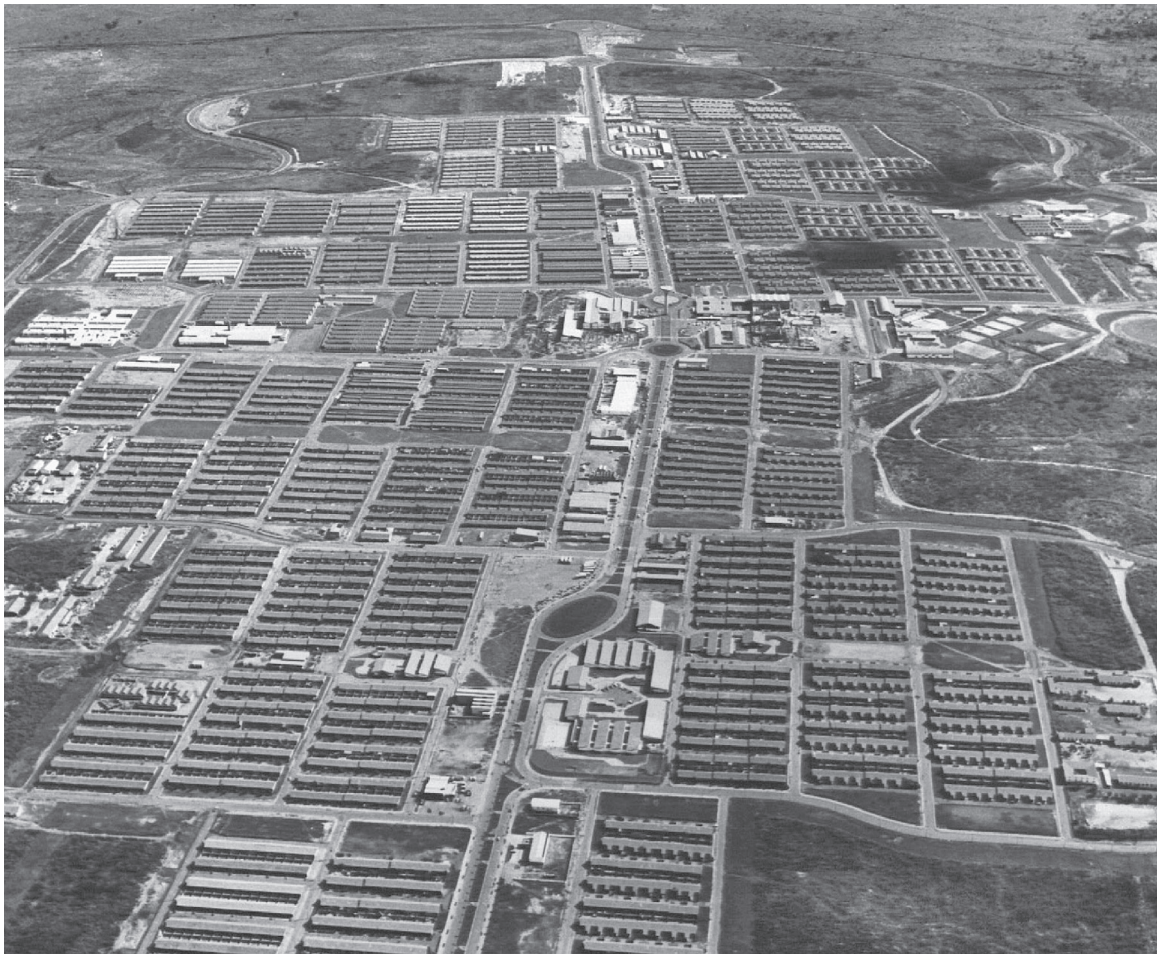


Figure 5.16. Aerial view of Ilha Solteira, 1973. Photographer unknown; collection of the author.

the relentless repetition of single-story shacks, which offered minimal differences in identity and which were assigned to dwellers based on their company standing. Described by dwellers as "being done in a militaristic style with little individuality,"[33] this residential model, common in company towns conceived in earlier decades, generated an inherent homogeneity that was not conducive to the active and diverse urban environment to which Solteira aspired. Mange and Kato would be compelled to address this issue well into the late 1980s in the subsequent master plans they developed for Solteira.

The most innovative component of Ilha Solteira was the administrative structure put in place by CESP in order to guarantee its development and future transition into an independent municipality. Given the remoteness of Solteira's location and the extensive investment in public works it required, the successful evolution of the city relied on a strong, yet nimble, administrative body that could oversee the progressive implementation of the master plans and also adapt to changes over time. In 1969, the Administração Especial de Ilha Solteira (AEIS)[34] was established as an independent public administration agency following an agreement between CESP and the municipality of Pereira Barreto. AEIS was given full authority to manage Ilha Solteira, including the collection of taxes and the use of those funds for capital improvements. Under AEIS, Mange and Kato continued to develop revised plans with the ultimate goal of transforming the encampment into a city, a process that was achieved in the early 1990s. While the monotony of the original plan was never fully resolved, the overall growth pole strategy proved to be successful. The opening of a branch of the Universidade Estadual Paulista in the mid-1970s further cemented this success and marked a pivotal point in the evolution of the city and the region. Today, a population of over twenty thousand people resides in Solteira, most of whom rely on the industries incubated by CESP.

Planning for Permanence: Porto Primavera

Moving away from the "provisional city" model of Vila Piloto and the "encampment-to-city" model of Ilha Solteira, Porto Primavera was to be, from the start, a permanent settlement destined to grow over time with capital from the private and public sectors.[35] Shortly after CESP received the initial go-ahead for the construction of the hydroelectric plants at Rosana and Porto Primavera—sited twelve kilometers from each other and defined as the Paraná-Paranapanema Hydroelectric Complex—the company commissioned a series of territorial and urban studies for the development of the area, many based on research CIBPU had already conducted in the 1950s. However, the nature of this project was different than the previous ones. In this case, the proposed reservoirs' water lines would require the relocation of small villages along the river's edge. However, by the time of the project's conception in the 1980s, the environmental impact of previous hydroelectric projects in Brazil had come under scrutiny, demanding CESP to pay more attention to the ecological and social effects the new plants

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Figure 5.17. Current aerial photograph of Porto Primavera. Courtesy of Google Earth.

would have in the region. These elements guided the conceptualization of Porto Primavera.

Led by CESP's division of architecture and urbanism under the direction of Hélio Pasta, Porto Primavera showcased a radically different approach to city making along the Paraná River. The city as a finite architectural form derived from a kit of parts made out of road geometries, open spaces, and repetitive architectural types was replaced by a more nuanced planning strategy. Here, CESP took an approach that favored the definition of an urban grid and a parcel structure, allowing for a gradual and flexible infill process over time. The ability for independent entities to purchase land within the city was a critical component in guaranteeing its success. Conceived as a complementary counterpart to Rosana, the plan capitalized on Highway SP-613 by defining it as the city's main avenue, Avenida Pontal, where most commercial and mixed-use activities were placed following a main-street model. A soft grid of undulating streets projected from the main avenue and was filled in by a collection of residential structures of varying types. Many of these residences were provided by CESP for workers, while others were built for relocated settlements and other settlers in the area. Avenida dos Barrageiros, which crosses Avenida Pontal right at the center of the city, served as the main administrative and recreational axis, flanked with administrative buildings, educational facilities, and recreational areas.

The role of architecture as a driver of spatial diversity was crucial in Porto Primavera. No longer was CESP uniquely responsible for the deployment of standardized housing types; instead the city evolved through a hybrid model where individual landowners could also contribute to its development. Furthermore, for this project CESP proposed a more lax set of housing guidelines that provided differentiation both in terms of layout and construction techniques. The original plan for Primavera required approximately 1,250 permanent homes and 3,500 temporary units in addition to temporary bachelor housing. This mix itself demanded a much more ample palette of construction materials. While a wood structure with fiber cement roofing became the most commonly used building materials, cast-in-place concrete and other types of masonry were also adopted.[36] The plan also strongly emphasized the role of key architectural projects throughout the city. Buildings like the church, the exhibition hall, and CESP's hotel were conceived as singularly authored architectural pieces that would contribute to the identity of the new town.

While in previous projects landscape as a spatial condition was approached from within the domain of architecture, in Porto Primavera, landscape architecture as a discipline makes an appearance in CESP's portfolio. In 1979, CESP's division of architecture and urbanism hired the noted landscape architect Fernando Chacel (1931–2011) and the agricultural engineer João Régis Guillaumon to develop a landscape strategy for the area. Channeling the influences of Roberto Burle Marx and the botanist Luiz Emygdio de Mello Filho,[37] Chacel introduced an approach to landscape in which the methods of botany replaced hard geometry as the primary orga-

nizational device. Indeed, many of the recommendations made in his landscape study were prominently acknowledged in the city plan.[38] Of those elements, the preservation of forested land, the incorporation of endemic vegetation, the creation of small-scale playgrounds and recreational spaces, and a consistent tree canopy are today more evident than ever in the overall figure of the city. In Porto Primavera, the landscape strategy, much more than the introduction of building types, guided the town's formative process.

The River Basin as a Chain of Dams

From the construction of the Salto Grande Hydroelectric Plant in 1958 until today, a constellation of dams and reservoirs has dotted the landscape of the Paraná-Uruguay river basin. A heavier concentration of dams, over thirty of them, lies within the state of São Paulo and its border rivers. The rapid transformation of the hydrological landscapes that link the city of São Paulo to the interior of the country drastically reformatted the relationship between coast, city, and hinterland. Throughout the second half of the twentieth century, hydroelectric energy infrastructure in conjunction with broad-stroke regional planning concepts gave birth to a national project that helped Brazil claim this new frontier and put it to work in favor of the larger economic engines of the eastern coast. Here was a planning initiative that was unique in the Brazilian context, one that went beyond the individual caveats of each intervention to have a significant impact in urbanizing one of Brazil's most remote regions.

While the creation of new cities as growth poles around state-sponsored energy enterprises might no longer be the mission of CESP and the governments of our time, the advancement of a new, twenty-first-century territorial vision for the area is more crucial than ever. Throughout the last forty years, the state of São Paulo and the Paraná River basin have undergone an unprecedented urbanization process fueled primarily by the push-pull factors of the city of São Paulo. What was traditionally a riparian environment with cities sprinkled along its edges is now transformed into a "metapolized"[39] landscape that is neither urban nor rural in traditional terms, and is in desperate need of a new set of design parameters that can define its condition and guide its growth.

The work done by CESP and its group of architects offered a solid demonstration of how the urbanization of the region might be shaped. Today, much thought is needed about how to upgrade and improve the constellation of towns and villages that proliferated as a result of CESP and government-sponsored investment in the region. If the twentieth-century project was once one of colonizing and building a new frontier, the twenty-first-century project has to provide strategic growth and management strategies that can help organize the territory with models that provide a complementary alternative to the hyper-urbanism of the city of São Paulo. A fresh look at the hydroelectric infrastructure built in south-central Brazil throughout the last sixty years introduces an opportunity to study the afterlife of

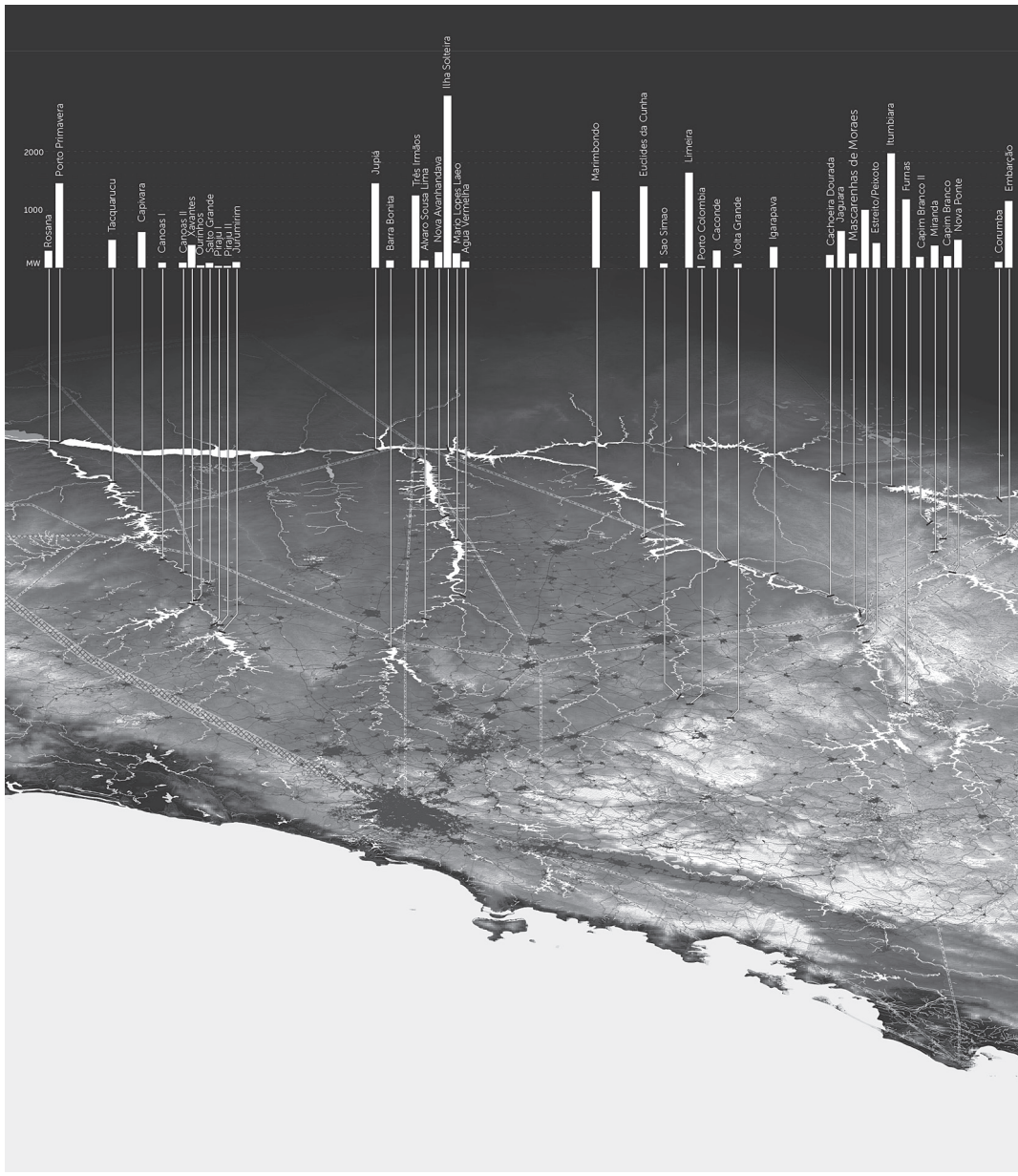


Figure 5.18. Bird's-eye view from the coast looking into the Paraná River basin. The view singles out the pressures of urbanization pushing inland, intermingled with the network of hydroelectric dams and reservoirs. Drawing by Felipe Correa.

the basin beyond its original mission of providing hydroelectric energy at a national scale. Achieving a more expansive vision of this territory can work to reposition the concrete remnants of once-productive landscapes into key organizational devices with the capacity to serve as the backbone for a renewed territorial project. Such a project could readily take advantage of the scale and territorial configuration of this network of elements to introduce new spatial templates that can better accommodate the fast-paced growth originally instigated by CESP.

EPILOGUE

The Legacy of Resource Extraction Urbanism and the Future of the South American Hinterland

The ubiquitous presence of resource extraction urbanism throughout the course of the twentieth century made the South American hinterland a unique experimental site for regional planning and city design. From the progressivist models based on the social utopias of the nineteenth century to the regionalist principles adopted from Howard's garden city or Geddes's valley section, modern South America became a testing ground for a variety of widespread urban planning hypotheses of the nineteenth and early twentieth centuries. The most exemplary projects within the ex post facto category of resource extraction urbanism are not representations of singular ideologies casted in adobe, brick, or concrete. To the contrary, the projects showcased here represent a collection of exemplary urban visions, modified by unique geographic conditions and tested against the strictures of governments and the tight grip of regional and global markets. With their successes and failures, the projects assembled under the rubric of resource extraction urbanism mark a series of concerted efforts to synthesize ideal urban visions with the gradual incorporation of local practical knowledge. This synthetic quality endowed these cities with spatial structures capable of outliving their primary urban mission and accommodating additional forms of urban growth through the incorporation of new constituencies and lifestyles over time. Above all, the cases documented in this book exhibit a belief in the powerful role of a social project—as envisioned by architects and planners in the concept of the city—as a critical component in the integration of resource extraction frontiers into agendas of national development.

In Belo Horizonte and María Elena, the multifunctional nature of the geometries proposed in their original plans is their most transcendental quality. In the case of Belo Horizonte's plan, its most resilient quality

is the dimension of the grid and its accompanying subdivision scheme. The adaptability of Reis's block morphology provided an efficient template for the coexistence of varied building types. This organizational flexibility allowed a city originally tasked with housing administrative bureaucracies to successfully accommodate many mixed-use blocks over time. Today, Belo Horizonte is a vibrant center of an important industrial region. In a similar manner, yet on a completely different scale, the regional infrastructures that crisscrossed the pampas linking coast, desert, and mountain in the service of nitrate can once again be reutilized through the introduction of new economies and services into this remote region. María Elena's shift from a struggling private company town into an independent municipality is a key step toward the transformation of this landscape. Once achieved, the spatial quality embedded in the geometries inscribed by Brainerd and Skougor will prove ideal for the introduction of new cultural and recreational programs. Such uses can capitalize on a growing desert tourism industry in the region and showcase the legacy of the nitrate era as a national historic treasure. The rebranding of the struggling town of María Elena is an ideal entry point to creating a contemporary spatial fantasy that can give the derelict landscape of nitrate country a new lease on life. In both Belo Horizonte and María Elena, the original plans were strong enough to establish a new social order, yet lissome enough to allow for continued improvisation in the face of unpredictability.

Judibana and Ciudad Guayana demonstrated compelling alternatives to the gated company town model that had served as such a prominent typology throughout the world in the early part of the twentieth century. Despite its rudimentary implementation, Judibana proved the effectiveness of public-private partnerships in constructing an urban project—a "city of the future," as it was called by the Creole Petroleum Corporation—that could outlive the built-in expiration date of the resource that instigated its construction. Today, while the importance of the nationalized refinery has waned, Judibana has grown into a successful town on its own terms and is now supported by a diverse range of economies beyond oil. In the case of Ciudad Guayana, while the powerful linear city never lived up to its formal expectations, many of the strategies conceived by the Joint Center and implemented by the Corporación Venezolana de Guayana helped give structure to a territory that otherwise would have become an industrial shantytown. As such, it managed to avoid falling victim to a recurring phenomenon that befell many other resource extraction sites in the region in which the hand of urban planning has been nonexistent. As Ciudad Guayana reaches a population of over one million, it is essential for the city to revisit its original organizational principles, specifically the ones that focused on process rather than form, many of which are still relevant today.

Vila Piloto and the urbanization of the southern Paraná River basin demonstrated a tireless effort to hybridize the large-scale energy extraction lessons adopted from the Tennessee Valley Authority with a more socially oriented approach inspired by Father Lebret and his Économie et Humanisme movement. It is precisely in the conceptualization of the city where

these two approaches best came together. From its designs for temporary encampments, as exemplified by Vila Piloto, to those for permanent forms of settlement such as Ilha Solteira and Porto Primavera, CESP and its team of architects made these cities much more cosmic entities, advancing their implementation far beyond their basic purpose as staging grounds for resource extraction. In this sense, the work of CESP showcases the ability of the architect to negotiate between form and process, striking a more intricate balance between the interests of the state, revolving around large-scale hydroelectric infrastructure, and the aspirations of the different communities that make up the river's landscape at a much more local level. In sum, Vila Piloto, along with the full complement of projects presented in this book, demonstrates how smart design can successfully outlive singular ideologies and adapt to the shifting rhythms of urban life. They are not only projects of historical importance but also critical reference points that can persuasively inform architects as they conceptualize new ideas.

As South America today champions a new agenda of regional integration through the vehicle of IIRSA, it is essential to ask about the spatial implications of the ten east–west corridors that link the two coasts of the continent? Furthermore, what are the potential benefits of this new scale of infrastructure on the future urbanization of the South American hinterland? The aspiration to connect the Atlantic Ocean with the Pacific Ocean through mobility corridors revolutionizes continental integration. The new axes and corresponding development hubs proposed by IIRSA completely dismantle the five-hundred-year territorial divide between Spanish and Portuguese America established in 1494 by the Treaty of Tordesillas. More importantly, these roads reverse the highly prominent centrifugal flow of resources extracted from the hinterland, transported to the port city, then loaded in boats and shipped to global markets. While the new lines inscribed by IIRSA allow for an even more aggressive extraction of resources from deep within the confines of the Amazon Basin, they also open up the possibility for unprecedented forms of exchange solely within the continent. In this way, the region's prosperity on the global stage can be leveraged to feed positive developments closer to home; investment in transnational infrastructure can be used as a bargaining chip to guarantee the upgrade of urban and regional settlements in a manner beyond the basic utilitarian necessities for the withdrawal of raw goods.

While the achievement of continental trade will require more than the implementation of roads, IIRSA's plan promises to set up a more robust infrastructure for inner South American trade. Providing both a faster route to trading markets in Asia and a new methodology by which to integrate South American commerce, the building of mobility corridors at a continental scale will further compound the already rapid pace of urbanization of the hinterland, with significant spatial implications at an urban and regional scale. Among the many physical outcomes that the initiative has brought to the surface, three seem most salient: the emergence of new regional nodes that are transforming the urban structure of once small and mostly forgotten regional cities and towns; the "over-infrastructuralizing"

Figure 6.1. Aerial view of Iquitos (Peru). Photo by Musuk Nolte; used by courtesy of the photographer.

of the hinterlands with heavyweight projects directly related to resource extraction; and the consistent urbanization of areas in between cities with extremely disperse settlements—the "metapolization" of the hinterland, as defined by François Ascher.[1] It is in these three prominent spatial processes that the agency of architecture and urban planning is most needed and can have the greatest effect.

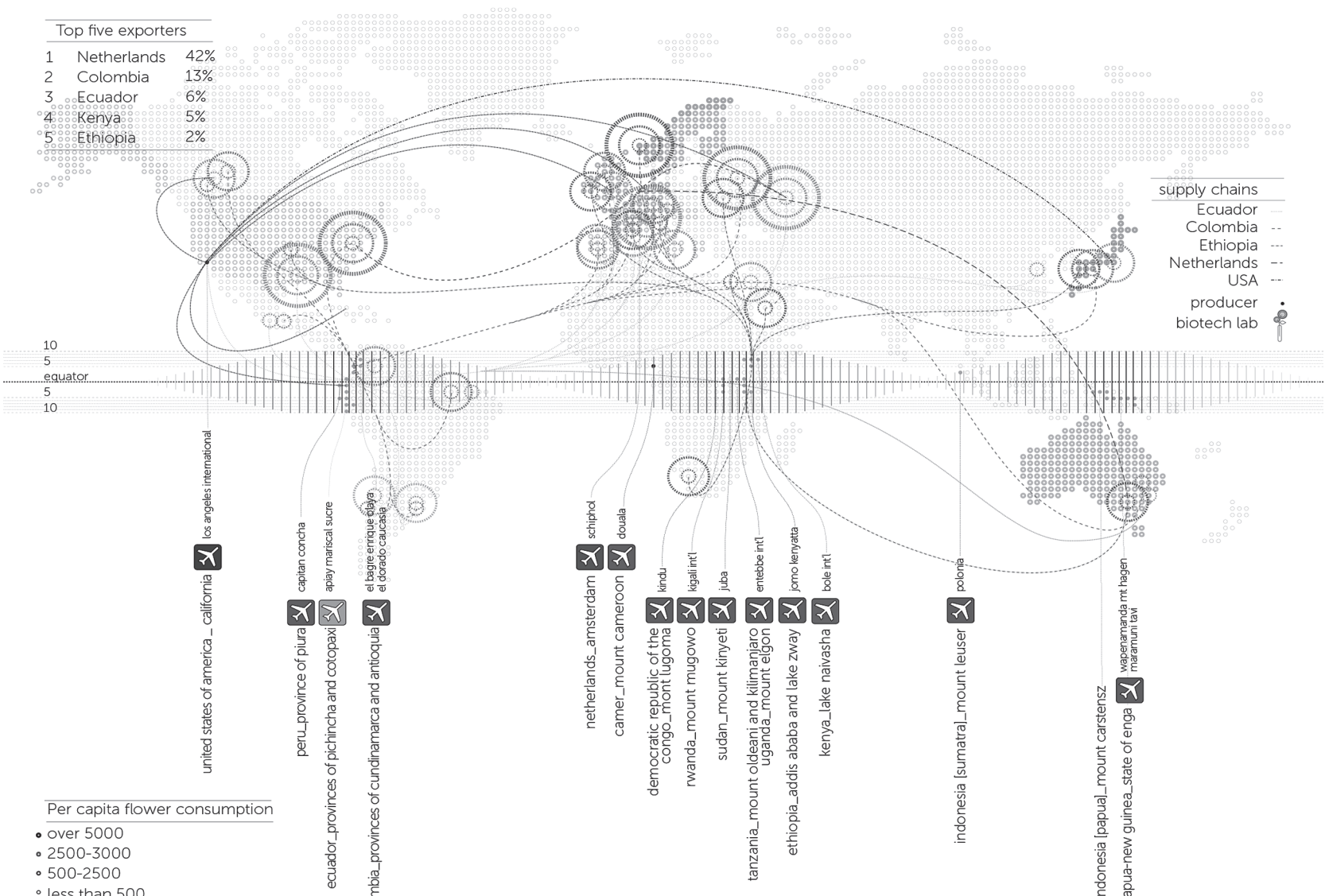
Among the settlements in the South American hinterland most affected by the new transportation infrastructure are regional capitals and towns. For many years remote and almost inaccessible, these outposts are currently being transformed into major logistical nodes. Beyond offering improvements in basic physical connectivity, they have become pivotal staging grounds for new trade routes both in the continental interior and along the coasts. A case in point is the city of Iquitos, Peru. Until now accessible only by air or boat, this frontier town at the edge of the Amazon peaked during the rubber boom of the first decade of the twentieth century as a smaller counterpart to the Brazilian city of Manaus. Major investments to improve the navigability of the Amazon and Napo Rivers, paired with road improvements in the Andes and on the Ecuadorean coast, have reframed Iquitos as a cardinal port city along the new Manta (Ecuador)-to-Manaus transoceanic corridor. As part of the IIRSA initiative, a new port and logistics center are being planned for Iquitos.[2] Through the project, this water-based city has an opportunity to rethink the relationship between its urban dynamics and the delicate ecologies of the Amazon. The construction of a new port and its logistical hub will bring several potential physical improvements to Iquitos. For one, the new port opens up the possibility of a much more ambitious waterfront project, going beyond the strictly utilitarian needs of trade and acting as a symbol of progress, while

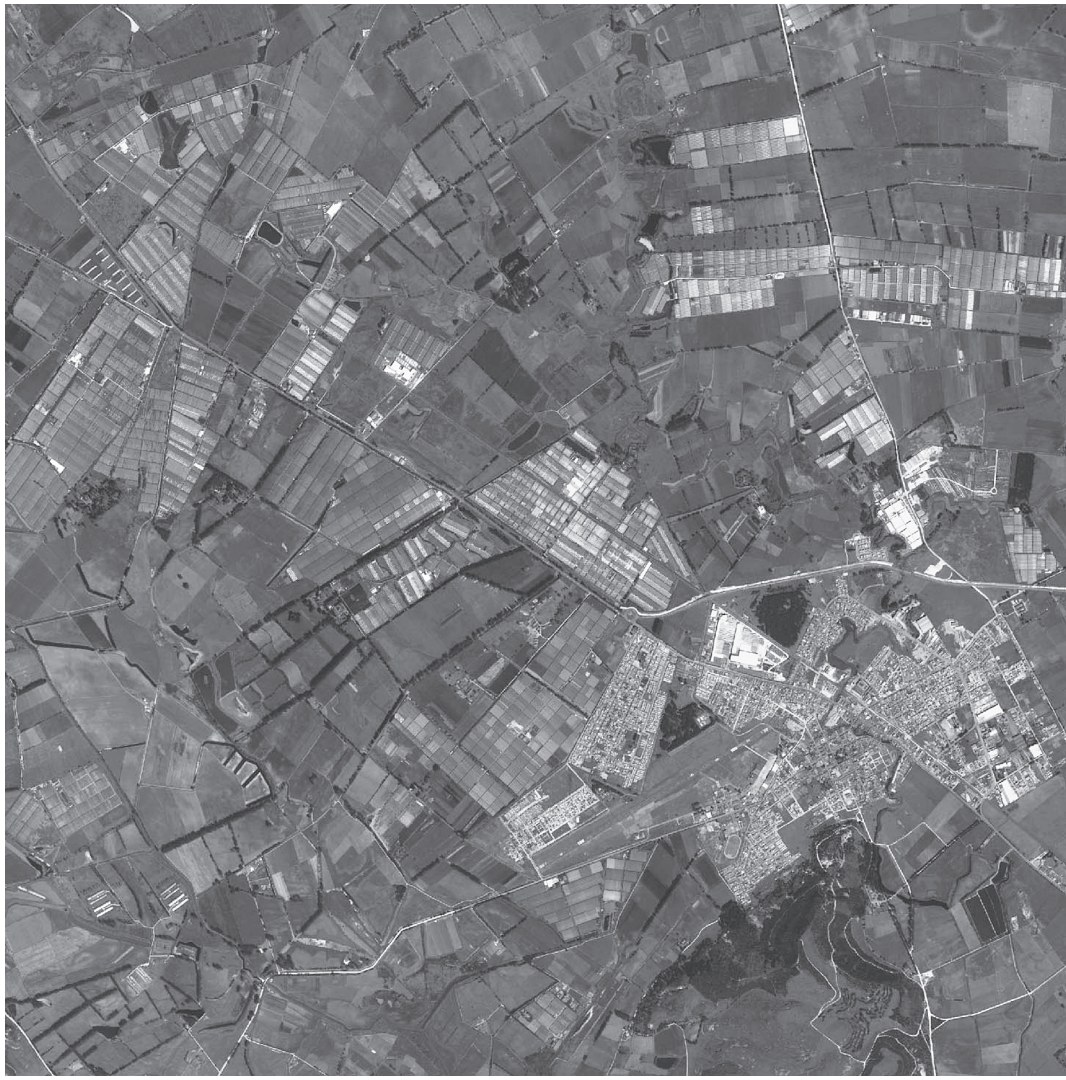
also establishing new relationships between city, water, and infrastructure.

Like Iquitos, many regional cities—Manaus and Fortaleza (Brazil) and Manta—are being transformed by the new transnational infrastructure into commercial and administrative centers of domestic and international importance. This continental trend presents significant challenges for these cities as they confront the changing economic and social dynamics of their region and try to determine how key built urban projects will positively affect their relationship to the hinterlands while improving the overall quality of life in the region. As they become regional hub cities and towns, many of the settlements that will be affected by IIRSA can be reconfigured. To capitalize on the potential for regional transformation embedded within this transnational project, it becomes essential for the IIRSA investment to be seen as the backbone for more comprehensive urban projects and plans that over time can raise living standards in remote areas as well as major centers.

The expansive deployment of heavy infrastructure has significantly altered the once rural landscapes of South America. The large staging grounds required for the extraction, processing, and global distribution of natural materials have produced an extensive series of projects—airports, roads, basic utilities, and telecommunications networks, among others—conceived in direct relation to extraction industries but with total inattentiveness to the needs of the settlements they traverse.

A paradigmatic example of this process is provided by the rose industry along high-altitude rural land in the northern Andes. Fresh-cut flowers have become a luxury global commodity, and flower cultivation now occupies an extensive surface that continues to take over fertile agricultural plots. In the last three decades, countries such as Colombia and Ecuador have become leading suppliers of flowers to the world and have witnessed a complete transformation of their agricultural models, from artisanal practices focused on local provision of food to a capital-intensive model driven by agro-industrial complexes. While significant investments have been made in the basic infrastructures associated with the flower-production industry, primarily in the construction of roads and airports that guarantee a continuous "chilled delivery chain," such improvement has mainly been for the benefit of private enterprise alone. Little or no attention has been given to ways in which such investments in the hinterland could improve urbanism and the general quality of life outside private enclaves. Similar results are also produced by the lumber and soy industries in Brazil, in which large investments in public works result in the over-infrastructuralizing of the landscape with airport strips, port facilities, and new and improved highways working in favor of private production camps yet never considered in direct relation to the more modest settlements that surface as a result of these industries. The relentless repetition of "agro-industrial clusters" opens up a compelling landscape for design. The necessary task at hand is to rethink new public-private development models that can provide better spatial formats for the settlements that are rapidly emerging as a byproduct of resource extraction.


Top five exporters
1 Netherlands 42%
2 Colombia 13%
3 Ecuador 6%
4 Kenya 5%
5 Ethiopia 2%
supply chains
Ecuador
Colombia
Ethiopia
Netherlands
USA
producer
biotech lab
10
5
equator
5
10
united states of america _ california
los angeles international
peru_province of piura
capitan concha
ecuador_provinces of pichincha and cotopaxi
apiay mariscal sucre
colombia_provinces of cundinamarca and antioquia
el bagre enrique olaya
el dorado caucasia
netherlands_amsterdam
schiphol
camer_mount cameroon
douala
democratic republic of the congo_mont lugoma
kindu
rwanda_mount mugowo
kigali int'l
sudan_mount kinyeti
juba
tanzania_mount oldeani and kilimanjaro uganda_mount elgon
entebbe int'l
ethiopia_addis ababa and lake zway
jomo kenyatta
kenya_lake naivasha
bole int'l
indonesia [sumatra]_mount leuser
polonia
indonesia [papua]_mount carstensz
papua-new guinea_state of enga
wapenamanda mt hagen
maramuni tavi
Per capita flower consumption
over 5000
2500-3000
500-2500
less than 500



facing page
Figure 6.2. Flower production along the equator and its global distribution systems. Drawing by Felipe Correa.

above
Figure 6.3. Flower greenhouses near Madrid, Colombia. Image courtesy of Google Earth.

Proportionate to overinvestment in monofunctional infrastructures is the under-urbanization of the South American hinterland. As new roads, fluvial corridors, and airports open up remote geographies for further extraction of raw materials, these regional conduits serve as spines for the proliferation of extremely dispersed forms of settlement, which are rapidly transforming the space between consolidated urban areas as they spread out from the newly opened routes. Networks of polynuclear and discontinuous villages and towns, primarily fueled by global capital, now extend over vast rural land. This patchwork in the continent's interior creates a new frontier urbanism, neither urban nor rural, that must be defined on its own terms.

Such a patchwork is being produced by IIRSA's keystone Southern Interoceanic Highway project. Over 2,600 kilometers of roads have been built or upgraded to connect the core of the Amazon and its wealth of natural resources to port cities along the Peruvian coast and thus shorten trad-

ing time with Asia.[3] The unfortunate side effect of this new superhighway can be consistently seen along the corridor's edges, where a proliferation of dispersed and discontinuous dirt crossroads, built piecemeal, are transforming this strip of deep jungle into a patchwork of forest, agricultural fields, sporadic residential enclaves, processing camps, service stations, and warehouses, among many other uses. Disturbingly, this new road cuts through the center of the Madre de Dios region, an area designated by ecologists as one of the richest in biodiversity on Earth, with zones that until 2000 remained as "first nature."[4] This new transnational vector has unprecedented ecological and social repercussions. Its relentless linear imprint has disintegrated a myriad of natural ecological systems. The most critical effect has been deforestation, since over 75 percent of logging in the Amazon happens on a fifty-kilometer band along paved highways.[5] Further, the new road has had a catalytic effect in creating a second Peruvian gold rush, with accompanying environmental perils. The highway is also destabilizing the nomadic lifestyles of several Amazonian tribes that until recently were disconnected from the outside world. As it is all but impossible to stop the effects of urbanization that follow the opening of a highway, it becomes essential for the designers of infrastructure to introduce with the road a set of complementary environmental management strategies that can more effectively mitigate the clash between road and forest.

As the South American interior confronts the urbanization pressures that accompany IIRSA's projects, the disciplines of architecture and urban planning must rethink their methodological toolkits in order to better approach and bring spatial synthesis to these new urban processes. As the long-established division between city and hinterland dissolves into a new urbanized landscape that is neither urban nor rural in traditional terms, the architect-planner must be able to read beyond IIRSA's single-sided, monofunctional approach to heavyweight infrastructure and bring to the table a unique ability to coalesce complex urban and regional dynamics.

Among the examples in this book, the most successful design strategies have never been those that attempt to simplify the complexity of the built environment based on a singular ideology, but rather are those that can construct a vision that brings spatial synthesis and clarity to complex territories through a diversity of methods and strategies. Yet, while the designers of those projects participated in a vision of economic and technological progress tied to the enterprise of modern nation building, the architects and planners working today must conceive of their efforts within an emerging transnational framework. Today, the monolithic idea of progress must be allowed to pursue multiple paths as the material well-being enabled by global exchange is transposed across a constellation of distinct municipal and cultural centers. In this context, the promise of the city becomes more crucial than ever. As the architect-planner confronts the changing hinterland as one of the most prominent arenas of disciplinary action, the results of past experiments must be folded into a creative practice capable of generating robust concepts that can effectively exercise judgment upon the spatial challenges of the present.

NOTES

Introduction

1. For additional information, see the IIRSA website, http://www.iirsa.org/.

2. IIRSA projects are funded by the sources that have always been used for physical infrastructure works in the region—i.e., the public and private sectors, multilateral financial institutions, etc. See http://www.iirsa.org/.

3. See Enrique Amayo, "Amazonia, MERCOSUR, and the South American Regional Integration," in *The Bush Doctrine and Latin America*, ed. Gary Prevost and Carlos Oliva Campos (New York: Palgrave Macmillan, 2007), 105–128.

4. Inter-American Development Bank. *IIRSA 10 años después: Sus logros y desafíos* (Buenos Aires: Primera Edición, 2011), 9, 109.

5. For a comprehensive overview of IIRSA, see Pitou Van Dijck, *The Impact of IIRSA Road Infrastructure Programme on Amazonia* (Milton Park, UK: Routledge, 2013).

6. The French urbanist and sociologist François Ascher (1946–2009) developed the idea of the "metapolis" to describe an urban phenomenon in which the fragmented centers of knowledge, leisure, and production are linked through high-speed mobility and communications infrastructures into an insulated hub-and-spokes system that excludes territorially contiguous landscapes and urban regions. See François Ascher, *Métapolis ou l'avenir des villes* (Paris: Editions Odile Jacob, 1995); and Ascher, *Los nuevos principios del urbanismo*, trans. María Hernández Díaz (2004; repr., Madrid: Alianza Ensayo, 2012).

7. Fernando Belaúnde Terry, "Roads to New Lands," *El Arquitecto Peruano* (1960): 26–27.

8. Frederick Jackson Turner, *The Significance of the Frontier in American History* (1894; repr., Mansfield Center, CT: Martino, 2013), 3.

9. John J. Crocitti and Monique Vallance, *Brazil Today: An Encyclopedia of Life in the Republic* (Santa Barbara, CA: ABC-CLIO, 2011), 36.

10. William Chandless, *Resumo do itinerario da descida do Topajoz en outubro de 1854* (Rio de Janeiro: Notas, 1868).

11. Mentioned in Alberto Buela, "Geopolítica Suramericana: Los canales Fluviales," *Dossier Politico* (Sept. 2009): 2.

12. Ibid.

Chapter 1: A Regional Capital

1. The first cycle would be the network of cities inscribed on the South American landscape by the Spanish Crown throughout the sixteenth and seventeenth centuries.

2. The positivist movement and the ideas of the French philosopher and sociologist Auguste Comte (1798–1857) were critical to the development of republican Brazil and Latin America as a whole. Throughout the 1800s, diverse takes on positivism set the stage for important cultural, educational, and political reforms. For an overview of the subject, see Arturo Ardao, "Assimilation and Transformation of Positivism in Latin America," *Journal of the History of Ideas* 24, no. 4 (1963): 515–522.

3. Marshall C. Eakin, "Creating a Growth Pole: The Industrialization of Belo Horizonte, Brazil, 1897–1987," *The Americas* 47, no. 4 (Apr. 1991): 386.

4. Marshall C. Eakin, *Tropical Capitalism: The Industrialization of Belo Horizonte, Brazil* (New York: Palgrave, 2002), 33–58.

5. Jeffry Adelman, "Urban Planning and Reality in Republican Brazil: Belo Horizonte, 1890–1930" (PhD diss., Indiana University, 1974), 16.

6. Known as the father of Belo Horizonte, Pena became president of the Brazilian Republic in 1906. Pena's patriarchal role with respect to Belo Horizonte was comparable to that of Juscelino Kubitschek with Brasília seventy years later.

7. Minas Gerais, *Annaes do Congresso Constituinte do Estado de Minas Geraes, 1891* (Ouro Preto, Brazil: Imprensa Official, 1896), 436 (author's translation).

8. Adelman, "Urban Planning," 49.

9. Ibid., 50–51.

10. Robert G. Nachman, "Positivism, Modernization, and the Middle Class in Brazil," *Hispanic American Historical Review* 57, no. 1 (Feb. 1977): 1.

11. Ibid., 50.

12. Centro de Estudios Históricos de Obras Públicas y Urbanismo, *La ciudad hispanoamericana: El sueño de un orden* (Madrid: Ministerio de Obras Públicas y Urbanismo, 1989), 32–33.

13. Adelman, "Urban Planning," 56.

14. The term "glacis" has its origins in military engineering and refers to the constructed slope that reinforces medieval fortress walls. Often of earthen construction, it can also be built with stone to achieve a more permanent fortification.

15. "Trees Are Square in Brazilian City," *Baltimore Sun*, December 7, 1952.

16. Adelman, "Urban Planning," 54.

17. Julio Angel Morosi, "La Plata: An Advanced Nineteenth Century New Town with Ancient Roots," *Planning Perspectives* 18 (2003): 23–46.

18. Roberto Segre, "Reflexões sobre o centenário de Belo Horizonte. As duas modernidades: de Aarão Reis a Oscar Niemeyer," *Capa* 5, no. 2 (1998): 5.

19. Daniel de Carvalho, *Capítulos de memórias* (Rio de Janeiro: Livraria J. Olympio, 1957), 30.

20. Eakin, "Creating a Growth Pole," 393.

21. Adelman, "Urban Planning," 127.

22. Eakin, *Tropical Capitalism*, 59–88.

23. Adelman, "Urban Planning," 122–133.

24. Ibid., 130–131.

25. "The City of the Captive Globe" (1972), by Koolhaas, was included in Rem Koolhaas, *Delirious New York: A Retroactive Manifesto for Manhattan* (London: Thames & Hudson, 1978), 294–296.

26. "First of Brazil's New Planned Cities," *New York Herald Tribune*, March 4, 1956.

27. For an introduction to Burle Marx, see Anita Berrizbeitia, *Roberto Burle Marx in Caracas: Parque del Este, 1956–1961* (Philadelphia: University of Pennsylvania Press, 2004).

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30. Celina Borges Lemos, "The Modernization of Brazilian Urban Space as a Political Symbol of the Republic," in Brazil theme issue, *Journal of Decorative and Propaganda Arts* 21 (1995): 218–237.

31. Ibid., 225.

32. Ibid.

33. Ibid.

Chapter 2: A Mining Town Constellation

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3. John L. Rich, "The Nitrate District of Tarapacá, Chile: An Aerial Traverse," *Geographical Review* 31, no. 1 (Jan. 1941): 19–20.

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5. Michael Monteón, "John T. North, the Nitrate King, and Chile's Lost Future," *Latin American Perspectives* 30, no. 6 (2003): 71.

6. Thomas O'Brien, *The Revolutionary Mission: American Enterprise in Latin America, 1900–1945* (Cambridge: Cambridge University Press, 1999), 170.

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8. Noah Hysler-Rubin, *Patrick Geddes and Town Planning: A Critical View* (New York: Routledge, 2013), 48.

9. For a comprehensive overview of Geddes's "valley section," see Volker Welter, *Biopolis: Patrick Geddes and the City of Life* (Cambridge, MA: MIT Press, 2003), 60–66.

10. Sergio González, "El cantón Bolivia o central durante el ciclo de expansión del nitrato," *Estudios Atacameños* 39 (2010): 85–86.

11. Ibid., 87.

12. Bermudez, *Breve historia del salitre*, 19, 20.

13. Juan Benavides Courtois, Marcela Pizzi K., and María Paz Valenzuela, *Ciudades y arquitectura portuaria: Los puertos mayores del litoral chileno* (Santiago: Editorial Universitaria, 1994), 52–53.

14. Ibid.

15. María Piedad Alliende Edwards, *Historia del ferrocarril en Chile* (Santiago: Pehuen Editores, 1993), 74.

16. Ibid., 95–96.

17. Rasheed Sajjadur, "Depopulation of the Oases in Northern Chile," *Revista Geográfica* 74 (June 1971): 105.

18. Ibid., 108–109.

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23. "Revived Use of Chilean Nitrate," *New York Times*, February 14, 1927.

24. Robert Neal Seidel, "Progressive Pan Americanism: Development and United States Policy towards Latin America, 1906–1931" (PhD diss., Cornell University, 1973), 331–332.

25. "New Nitrate Plant to Open in the Fall," *New York Times*, May 10, 1926.

26. Garcés Feliú, *Las ciudades del salitre*, 73.

27. "Coya Norte Nitrate Plant to Commence Operations in the Fall," *New York Herald*, May 10, 1926.

28. Lucie K. Morisset, "Non-fiction Utopia: Arvida, Cité Industrielle Made Real," *Journal of the Society for the Study of Architecture in Canada* 36, no. 1 (2011): 15.

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31. A resident of the Chilean pampa.

32. Smil Vaclav, *Enriching the Earth: Fritz Haber, Carl Bosch, and the Transformation of World Food Production* (Cambridge, MA: MIT Press, 2004), 105–106.

33. For a comprehensive view of copper company towns in Chile, see Eugenio Garcés Feliú, Marcello Cooper Apablaza, and Mauricio Baros Townsend *Las ciudades del cobre: Sewell, Chuquicamata, Potrerillos, El Salvador, San Lorenzo, Pabellón del Inca, Los Pelambres* (Santiago: Ediciones Universidad Católica de Chile/Comisión Bicentenario, 2010).

34. http://museosferroviarios.wordpress.com/2010/09/03/museo-casa-de-maquinas-de-baquedano/.

35. Correa3 Arquitectos, *María Elena: Plan de desarrollo estratégico 2030* (Santiago, 2010), 19.

36. *X Jornadas Chilenas de Preservación Arquitectonica y Urbana* (Iquique, Chile: Universidad Arturo Prat, 2006), 7.

37. Joan Busquets and Felipe Correa, *Cities X Lines: A New Lens for the Urbanistic Project* (Cambridge, MA: Harvard Graduate School of Design, 2006), 237–238.

Chapter 3: Petrol Encampments

1. See Alex Krieger, *Studies for the Enlargement of an Industrial Town: Judibana, Venezuela* (Cambridge, MA: Harvard University Graduate School of Design, 1991).

2. See Miguel Tinker Salas, *The Enduring Legacy: Oil, Culture, and Society in Venezuela* (Durham, NC: Duke University Press, 2009), 200.

3. Ibid.

4. M. S. Vassiliou, *The A to Z of the Petroleum Industry* (Lanham, MD: Scarecrow, 2009), 527.

5. Tinker Salas, *Enduring Legacy*, 19, 25.

6. Robert S. Platt, "Pattern of Occupance in the Maracaibo Basin," *Annals of the Association of American Geographers* 24, no. 3 (Sept. 1934): 157.

7. Edwin Lieuwen, *Petroleum in Venezuela: A History,* University Of California Publications in History, vol. 47 (Berkeley: University of California Press, 1954), 39.

8. Jonathan C. Brown, "Why Foreign Oil Companies Shifted Their Production from Mexico to Venezuela during the 1920s," *American Historical Review* 90, no. 2 (Apr. 1985): 375–380.

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12. Ingrid Reti, "No One Ever Walks Here: Judibana Oil Camp, Paraguana Peninsula, Venezuela, 1958–1960," excerpts from a journal by Ingrid Reti, ed. Irene Reti, http://www.randytrahan.com/ocov/general_interest/Ingrid-Reti's-Journal2.pdf.

13. Matthew J. Abrams, "The Company Camp in Latin America: A Change in the United States Mining and Petroleum Company Policy," *Land Economics* 42, no. 4 (Nov. 1966): 523.

14. For a discussion of the growth pole concept and its history in South America, see chapter 4, on Ciudad Guayana.

15. See chapter 4, on Ciudad Guayana.

16. Figured through a purchasing-power calculator, GBP 100 million in 1968 would be worth at least GBP 1.5 billion in 2013. See Lawrence H. Officer and Samuel H. Williamson, "Five Ways to Compute the Relative Value of a UK Pound Amount, 1270 to Present," *MeasuringWorth*, 2015, http://www.measuringworth.com/ukcompare/. Converting GBP to USD with Google Finance, one finds that the 1968 figure is equivalent to US$2.3 billion today.

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18. Ibid.

19. Jonathan Smulian, "El Tablazo," *AD* 39 (Aug. 1969): 442–444.

20. Jorge Goodridge, "Venezuela Plans Two Supercities," *Washington Post*, September 13, 1969.

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22. Henry-Russell Hitchcock, "The Architecture of Bureaucracy and the Architecture of Genius," *Architectural Review* 101 (Jan. 1947): 3–6.

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25. Louis Skidmore to Standard Oil Company of New Jersey, Attn. J. M. Sitler, in ibid., appendix, 1–2.

26. In January of 1960, at a 3-to-1 exchange rate, 37,500,000 Venezuelan bolívares was equivalent to US$12,500,000. See http://fxtop.com/en/historical-exchange-rates.php. Converted into 2013 dollars using a purchasing-power calculator, that figure reaches roughly US$98 million. See Samuel H. Williamson, "Seven Ways to

Compute the Relative Value of a U.S. Dollar Amount, 1774 to present," *MeasuringWorth*, 2015, http://www.measuringworth.com/uscompare/.

27. Corporación Venezolana de Fomento, *Contribucion al estudio de la vivienda en Venezuela* (Caracas: Ediciones C.V.F., 1959), 11.

28. Tinker Salas, *Enduring Legacy*, 94.

29. Ibid.

30. Ana Maria Duran Calisto, "Predator Urbanism: The Birth and Growth of Nueva Loja," in *Beyond Petropolis: Designing a Practical Utopia*, ed. Michael Sorkin (Hong Kong: Oscar Riera Ojeda, 2014), 48–49.

31. William Langewiesche, "Jungle Law," *Vanity Fair*, May 2007.

32. "Blood in the Jungle: Alan García's High-handed Government Faces a Violent Protest," *The Economist*, June 11, 2009.

Chapter 4: A New Industrial Frontier

1. "New City in the Orinoco," *Christian Science Monitor*, September 11, 1961.

2. Anthony H. Penfold, "Ciudad Guayana: Planning a New City in Venezuela," *Town Planning Review* 36, no. 4 (Jan. 1966): 226.

3. See Sebastián Edwards, *Left Behind: Latin America and the False Promise of Populism* (Chicago: University of Chicago Press, 2010).

4. John Friedmann, "The Changing Pattern of Urbanization in Venezuela," in *Planning Urban Growth and Regional Development: The Experience of the Guayana Program of Venezuela*, ed. Lloyd Rodwin and Associates (Cambridge, MA: MIT Press, 1969), 48.

5. Leslie Bethell, *Latin America: Politics and Society since 1930* (Cambridge: Cambridge University Press, 1998), 185–186.

6. Presidencia de la República, *Mensaje Presidencial* (Caracas: Miraflores, March 12, 1963) (author's translation).

7. The Alliance for Progress was an ambitious program for inter-American cooperation and economic development sponsored by President John F. Kennedy. Signed in Punta del Este (Uruguay) in 1961, one of its primary missions was implementing national planning programs for most Latin American countries. For additional information on the Alliance for Progress, see John C. Dreier, ed., *The Alliance for Progress: Problems and Perspectives* (Baltimore, MD: Johns Hopkins University Press, 1962).

8. Robert Jackson Alexander, *Romulo Betancourt and the Transformation of Venezuela* (New Brunswick, NJ: Transaction Books, 1982), 514.

9. Penfold, "Ciudad Guayana," 228.

10. Otto Zausmer, "A City Rises Overnight at Iron Ore Mountains," *Boston Globe*, February 6, 1964.

11. François Perroux, "Note sur la notion de 'pôle de croissance,'" *Économie appliquée* 7 (1955): 307–320; translated as "Note on the Concept of 'Growth Poles'" in *Regional Economics: Theory and Practice*, ed. David L. McKee, Robert D. Dean, and William H. Leahy (New York: Free Press, 1970), 94.

12. François Perroux, "Economic Space: Theory and Applications," *Quarterly Journal of Economics* 64, no. 1 (1950): 89–104.

13. Jacques Boudeville, *Contribution à l'étude des pôles de croissance brésiliens: Une industrie motrice, la sidérurgie du Minas Gerais* (Paris: Institut de Science Économique Appliquée, 1957).

14. John Friedmann, "Encounters with Development Planning," lecture given at the Bartlett School of Planning, May 26, 2009.

15. For more on MIT and its sources of funding during the Cold War, see Arindam Dutta, ed., *A Second Modernism: MIT, Architecture, and the "Techno-social" Moment* (Cambridge, MA: MIT Press, 2013).

16. John Friedmann, *Regional Development Policy: A Case Study of Venezuela* (Cambridge, MA: MIT Press, 1966), 5.

17. Lloyd Rodwin and Associates, *Planning Urban Growth and Regional Development: The Experience of the Guyana Program of Venezuela* (Cambridge, MA: MIT Press, 1969), 1.

18. "New City in the Orinoco."

19. Willo von Moltke, "The Evolution of the Linear Form," in *Planning Urban Growth*, ed. Rodwin and Associates, 139.

20. Nathan Miller, "A New El Dorado Rises on Venezuelan Plains," *Baltimore Sun*, July 20, 1968.

21. Kevin Lynch, "Some Notes on the Design of Ciudad Guayana," CVG Staff Working Paper, CVG-C.Guayana file no. E-90, July 22, 1964, (Ciudad Guayana: CVG-Ciudad Guayana, Joint Center for Urban Studies, Records of the Guayana [Guiana] Project, MIT, Institute Archives and Special Collections).

22. Robert H. Kargon and Arthur P. Molella, *Invented Edens: Techno-cities of the Twentieth Century* (Cambridge, MA: MIT Press, 2008), 121.

23. Lisa Peattie, *Planning: Rethinking Ciudad Guayana* (Ann Arbor: University of Michigan Press, 1987), 36.

24. Maritza Izaguirre, *Ciudad Guayana y la estrategia del desarrollo polarizado* (Buenos Aires: Ediciones SIAP, 1977), 61.

25. Rafael Corrada, "The Housing Program," in *Planning Urban Growth*, ed. Rodwin and Associates, 238.

26. William Porter, "Changing Perspectives on Residential Area Design," in *Planning Urban Growth*, ed. Rodwin and Associates, 254.

27. On Abercrombie and the genesis and implementation of his planning ideas, see Anthony Raynsford, "From Urban Village to Metropolitan Picturesque: Precincts, Townscape, and the 'Cellular' Planning of World War II London," paper delivered at the first meeting of the EAHN, Guimarães, Portugal, June 2010.

28. Thomas L. Hughes and the Association for Diplomatic Studies and Training, *Perilous Encounters: The Cold War Collisions of Domestic and World Politics; Oral History Interviews with Thomas L. Hughes* (Bloomington, IN: Xlibris Corporation, 2012), 57.

Chapter 5: Pioneering Modernity

1. Claude E. Erbsen, "Brazil's New Pilot City," *Hartford Courant*, June 19, 1966.

2. Oliver Dinius, *Brazil's Steel City: Developmentalism, Strategic Power, and Industrial Relations in Volta Redonda, 1941–1964* (Palo Alto, CA: Stanford University Press, 2010).

3. Jefferson Tavares, "The Geographers and the Region Concept in State of São Paulo" (paper presented at the 15th International Planning History Society Conference, São Paulo, July 2012): 3, http://www.fau.usp.br/15-iphs-conference-sao-paulo-2012/abstractsAndPapersFiles/Sessions/19/TAVARES.PDF.

4. The notion of reworking the interior rivers of South America goes back to the nineteenth century and includes a long roster of territorial proposals such as the "Plan Moraes" (1869) by José de Moraes, which aimed at connecting the Río de la Plata with the Orinoco.

5. In 1952, under the Kubitschek governorship, the Centrais Elétricas de Minas

Gerais (CEMIG)—the national electric company for Minas Gerais—was established and spearheaded the country's race toward hydroelectric energy by building four hydroelectric plants in its first ten years.

6. Rolf Sternberg, "Large Scale Hydroelectric Projects and Brazilian Politics," *Revista Geográfica* 101 (1985): 31.

7. J. P. Dickenson, "Electric Power Development in Minas Gerais, Brazil," *Revista Geográfica* 70 (1969): 216–217.

8. Sternberg, "Large Scale Hydroelectric Projects," 31–32.

9. Peter Hall, *Cities of Tomorrow*, updated edition (Oxford: Blackwell, 2001), 162.

10. Patrick Geddes, *Cities in Evolution: An Introduction to the Town Planning Movement and to the Study of Civics* (1915; New York: H. Fertig, 1968).

11. See Carl Sussman, *Planning the Fourth Migration: The Neglected Vision of the Regional Planning Association of America* (Cambridge, MA: MIT Press, 1976), 55–64.

12. Monica Peixoto Vianna, "De edificação ao traçado urbano: A experiência de planejamento regional integrado na CESP" (PhD diss., Instituto de Arquitectura e Urbanismo, Universidade de São Paulo, 2012), 151–152.

13. The TVA's influence in Brazil was also cemented by publishing efforts such as David Lilienthal's book *TVA: Democracy on the March* (1944), which was translated into Portuguese in 1956. Lilienthal (1899–1981) was one of the three codirectors of the Tennessee Valley Authority appointed by President Franklin D. Roosevelt in 1931, and in 1944 he became the chairman of the TVA.

14. Ivani Vassoler, "Explaining Institutional Change," chap. 3 in *Urban Brazil: Visions, Afflictions, and Governance Lessons* (Amherst, MA: Cambria, 2007), Kindle edition.

15. Silvia Barbosa de Souza Ferreira, "O planejamento territorial do Paraná," in *Tempos e escalas da cidade e do urbanismo: Anais do XIII Seminário de História da Cidade e do Urbanismo*, organized by Elane Ribeiro Peixoto, Maria Fernanda Derntl, Pedro Paulo Palazzo, and Ricardo Trevisan (Brasília, DF: Universidade Brasília–Faculdade de Arquitetura e Urbanismo, 2014).

16. Virginia Pontual, "Lebret in Latin America: Urban Planning Institutions in Uruguay and Brazil" (paper presented at the 15th International Planning History Society Conference, São Paulo, July 2012): 5–6, http://www.fau.usp.br/15-iphs-conference-sao-paulo-2012/abstractsAndPapersFiles/Sessions/05/PONTUAL.pdf.

17. Companhia Energética de São Paulo (CESP) was formed in 1966, consolidating a series of smaller public and private electric companies in the state of São Paulo, including CELUSA, which was originally responsible for the construction of the Jupiá Dam.

18. Elisângela de Almeida Chiquito, "A criação da Comissão Interestadual da Bacia Paraná-Uruguai: referencial norte-americano no planejamento regional brasileiro dos anos 1940–50," *Revista Faac* 2, no. 1 (2012): 69–78.

19. Ibid.

20. For an introduction to the idea of *mise en valeur* in the context of South America, see Pontual, "Lebret in Latin America."

21. Sternberg, "Large Scale Hydroelectric Projects," 29–44.

22. Vianna, "De edificação ao traçado urbano," 168–170.

23. Ernest Robert de Carvalho Mange, "Planejamento em Urubupungá" (thesis, Concurso de Livre Docência, Escola Politécnica, Universidade de São Paulo, 1963), 3 (author's translation).

24. Ibid., 41.

25. The concept of the neighborhood unit was greatly influential in Brazil and South America as a whole in the second half of the twentieth century. As conceived by Clarence Perry in 1929, this structure organized a neighborhood around a half-mile radius of a school and community center. See Clarence Perry, *The Neighborhood Unit* (1929), in *Regional Survey of New York and its Environs*, vol. 7, *Neighborhood and Community Planning*, monograph 1 (New York: Committee on Regional Plan of New York and its Environs, 1974), 21–140.

26. The *superquadra* is a large-scale city block of approximately 280 meters by 280 meters that was utilized in the residential quarters of Brasília a few years prior to the design of Vila Piloto. For additional material on the *superquadra*, see Fàres El-Dahdah, *CASE: Brasilia's Superquadra* (New York: Prestal Verlag, 2005).

27. Mange, "Planejamento em Urubupungá," 40.

28. Vianna, "De edificação ao traçado urbano," 232.

29. Ibid.

30. Ibid., 54. For a discussion of the growth pole concept and its adoption in South America, see chapter 4, on Ciudad Guayana.

31. For a more detailed overview of Ciudad Guayana, see chapter 4.

32. Vianna, "De edificação ao traçado urbano," 236.

33. James Nelson Goodsell, "Brazil's Giant Dams: Pioneering in the Modern Style," *Christian Science Monitor*, June 6, 1970.

34. Vianna, "De edificação ao traçado urbano," 246.

35. Monica Peixoto Vianna, "Porto Primavera: A transformação de um núcleo operário em distrito urbano," *Capa* 10, no. 1 (2008): 3–6.

36. Vianna, "De edificação ao traçado urbano," 265.

37. Mirian Mendonça De Campos Curado, "Paisagismo contemporâneo no Brasil: Fernando Chacel e o conceito de ecogênese" (paper presented at the 8th DOCOMOMO Brazil Seminar, Rio de Janeiro, Brazil, Sept. 2009).

38. Vianna, "De edificação ao traçado urbano," 262.

39. See the introduction to this book for a note on François Ascher's conception of the "metapolis."

Epilogue

1. François Ascher, *Los nuevos principios del urbanismo*, trans. María Hernández Díaz (2004; Madrid: Alianza Ensayo, 2012), 56–57. Also see the introduction to this book for a note on Ascher's "metapolis" concept.

2. Inter-American Development Bank *IIRSA: Building a New Continent; Project Information Sheets* (Washington, DC: author, 2006), http://idbdocs.iadb.org/wsdocs/getdocument.aspx?docnum=834687.

Also see the note on Ascher's conception of the "metapolis" in the introduction to this book.

3. See http://www.bankinformationcenter.org/feature/corredor-multimodal-pasto-mocoa-e-hidrovia-del-putumayo/.

4. Ted Conover, "Peru's Long Haul: Highway to Riches or Ruin?" *National Geographic*, June 2003, www.tedconover.com/2010/01/perus-long-haul-highway-to-riches-or-ruin/.

5. Claudia Azevedo-Ramos, "Sustainable Development and Challenging Deforestation in the Brazilian Amazon: The Good, the Bad, and the Ugly," adapted from a paper presented at the symposium "Our Common Ground: Innovations in Land Use Decision-Making," Vancouver, Canada, May 8–9, 2007, www.fao.org/docrep/011/i0440e/i0440e03.htm.

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