The Fossil Fueled Metropolis: Los Angeles and the Emergence of Oil-Based Energy in North America, 1865-1930

by

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Abstract

Beginning with coal in the nineteenth century, the mass production and intensive consumption of fossil fuel energy fundamentally changed patterns of urban and industrial development in North America. Focusing on the metropolitan development of Los Angeles, this dissertation examines how the emergence of oil-based capitalism in the first three decades of the twentieth century was sustained and made increasingly resilient through the production of urban and industrial space. In a region where coal was scarce, the development of oil-based energy was predicated on long-term investments into conversion technologies, storage systems and distribution networks that facilitated the efficient and economical flow of liquefied fossil fuel.

In this dissertation, I argue that the historical and geographical significance of the Southern California petroleum industry is derived from how its distinctive market expansion in the first three decades of the twentieth century helped establish the dominance of oil-based energy as the primary fuel for transportation in capitalist society. In North America, the origins of oil-based capitalism can be traced to the turn of the twentieth century when California was the largest oil-producing economy in the United States and Los Angeles was the fastest growing metropolitan region. This dissertation traces how Los Angeles became the first city in North
America where oil became a formative element of urban and industrial development: not only as fuel for transportation, but also in the infrastructures, landscapes and networks that sustain a critical dependence on oil-based energy. With a distinctive metropolitan geography, decentralized and automobile-dependent, Los Angeles became the first oil-based city in North America and thus provides an ideal case study for examining the regional dynamics of energy transition, establishment and dependence. Interwoven with the production of urban and industrial space, oil remains the primary fuel that sustains the capitalist mode of production.
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INTRODUCTION

Oil and the historical problem of fossil fuel energy dependence

The events known as the energy crisis of 1973 exposed the precarious foundations of the “American Century,” a period of history when oil became the quintessential fuel in urban North America. When the Organization of Petroleum Countries (OPEC) declared an oil embargo against the United States, the global dominance of advanced capitalism was faced with the threat of immediate energy scarcity – not only perceived, but also in absolute terms. “The Arab oil embargo in 1973…raised serious questions about American vulnerability,” argues Martin V. Melosi, “especially in the acquisition and control of energy resources.”¹ Between 1950 and 1970, oil demand in the United States (relatively high to begin with) had nearly tripled. Due to the inability of domestic reserves to satisfy this surge in demand, this energy need has increasingly been supplied with crude oil imported from the Middle East. By the 1970s, the landscapes, economies and culture of consumption in North America had become critically dependent on nonrenewable sources of imported fossil fuel energy.²

Beginning with coal in the middle of the nineteenth century, the mass production and intensive consumption of fossil fuel energy fundamentally changed the structural possibilities of urban and industrial development in North America. “Modern societies as we have known them could not operate without ample and diverse supplies of energy,” argues historian Jay Hakes,

“suggesting that the story of our major fuels can hardly be ignored in any attempt to understand American history.” Over the course of the twentieth century, oil-based energy became “internal and necessary” to the capitalist mode of production – especially in the transportation sector. “Without oil there is virtually no mobility,” explains renowned energy historian Daniel Yergin, “and without electricity – and energy to generate that electricity – there would be no Internet age.” Indeed, the survival of capitalism seemingly depends on the constant motion that fossil fuel energy provides, making the “annihilation of space by time” possible. Insofar as capitalism depends on the application of technology and the building of transportation infrastructure to overcome the friction of distance, oil-based energy has become an indispensable element to the accumulation process, which emerged historically and geographically based on the mobilization of massive quantities of fossilized energy. Nowhere is the relationship between oil and urban-industrial capitalism more apparent than in the United States.

In North America, over 150 years of urban and industrial development has culminated in a critical dependence on oil-based energy. In this dissertation, I develop a dialectical understanding of “inertia” that captures how the dominance of oil as a dominant fuel for urban-industrial society has been sustained and made increasingly resilient through the dynamic coproduction of energy, landscape, political economy and environment. In general terms, the concept of inertia refers to the factors, circumstances and conditions that align to obstruct and impede the transition from one state of affairs to another. When applied to the historical development of fossil fuels, the inertia of oil-based energy is rooted in landscapes of production,

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has been sustained by technologies that convert oil into useful energy for human society, and has been made increasingly resilient through long-term investments into landscapes of consumption. The inertia of oil-based energy has emerged incrementally and cumulatively, as large-scale investments made at one particular point in time have provided the foundation for successive capital investments. As decades and even centuries have passed, the vast system developed to facilitate the production and consumption of oil-based energy has become increasingly resilient and highly resistant to significant transition.\(^7\)

The web of relationships that comprise oil-based energy is dense and has not been easy to untangle. According to Mazen Labban, “it is necessary to produce oil in large quantities to reap a return on investment in the enormous quantities of capital fixed in its production, from drilling pipes to refineries, linked through a vast web of pipelines, tankers, trucks and storage facilities – including the reserves themselves.”\(^8\) In 2008, the total value of infrastructure devoted to the production of oil at the global scale was estimated to be $10 trillion.\(^9\) In combination with the role of industrial networks, the dominance of oil-based energy in North America has also been sustained through the production of urban landscapes that have become increasingly tailored to the automobile as a primary mode of transportation.

The historical inertia of the built landscape, developed incrementally and cumulatively over the course of several decades, needs to be understood in the context of oil as a non-renewable and environmentally destructive form of energy. “Although estimating reserves of fossil fuels is a politico-technical process involving rival methods of calculation,” explains Timothy Mitchell, “it appears that we are about to enter an era of declining supplies.”\(^10\)

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\(^8\) Mazen Labban, *Space, Oil and Capital* (New York: Routledge, 2008), 4.

\(^9\) Ibid.

In this regard, the lingering problem of oil dependence in the context of impending scarcity needs to be understood as a culmination of historical interactions between human society and the crude energy resources that continue to sustain it. “The availability of inexpensive oil encouraged the United States to adopt patterns of economic organization premised on high levels of oil use,” argues historian David S. Painter: “Understandable when oil was inexpensive and access secure, this way of life has become less sustainable as economic, strategic, and environmental conditions have changed.” Without question, the resource abundance that stimulated the transition to fossil fuel energy in North America beginning in the middle of the nineteenth century no longer exists.

**Southern California, Los Angeles and the advent of oil-based energy**

In the first three decades of the twentieth century, Southern California was one of the largest oil-producing economies in the United States and Los Angeles was the fastest-growing metropolitan region. “The presence of oil under Los Angeles and residents’ early adoption of the automobile made southern Californians more familiar than most Americans with the range of consequences of petroleum dependency,” argues historian Sarah S. Elkind, “from runaway wells and refinery fires to gridlock and smog.” Compared to older and established cities like New York and Chicago, Los Angeles developed an early and lasting relationship with oil-based energy as a formative element in the production of urban and industrial space. Focusing on Southern California between 1865 and 1930, the aim of this dissertation is to gain historical and geographical insight into how the emergence and establishment of oil-based energy has

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culminated in a strong inertia that sustains the fossil fueled mode of capitalist production in North America.

In the context of North American urban history, fossil fuels are often approached as one of many material inputs (along with water, wood and food) that stimulated and sustained the emergence of industrial-capitalist cities in the nineteenth and twentieth centuries. In the case of Los Angeles, urban historians have recognized the petroleum industry as an important engine of regional economic development in the first half of the twentieth century. Yet, there remains a need to gain a deeper understanding of how fossil fuel energy and oil in particular have become intertwined with the production (and ongoing reproduction) of urban and industrial space in North America. In this dissertation, my objective is to gain insight into the strong historical and geographical inertia of fossil fuel energy by addressing the following research question: how was the emergence of oil-based energy in the first three decades of the twentieth century constitutive of, and constituted by, wider processes of urban and industrial development in Los Angeles?

In this dissertation, I argue that the emergence of oil-based capitalism in Los Angeles in the first three decades of the twentieth century was sustained and made increasingly resilient through the ongoing production and reproduction of urban and industrial space. In a region where coal was scarce, the development of oil-based energy was predicated on a series of long-term investments into conversion technologies, storage systems and distribution networks that facilitated efficient and economic flows of liquefied fossil fuel. Whereas the innovation of oil-burning technology for steam-powered locomotives stimulated the development of a regional petroleum industry in the late-1890s, the widespread adoption of internal combustion technology in the first decades of the twentieth century solidified the status of oil as a dominant fuel for transportation in capitalist society.

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The first oil well in the United States may have been drilled in Pennsylvania, but I argue that the historical and geographical significance of the Southern California petroleum industry is derived from how its distinctive market expansion in the first three decades of the twentieth century helped secure the dominance of oil-based energy as the primary fuel for transportation in North America. “While the oil boom began as a regional phenomenon,” explains Melosi, “it ultimately had a major impact on the entire nation.”15 In Southern California, oil-based energy emerged as a complex web of relationships between society and the environment. Over time, these relationships have been sustained and made increasingly resilient through streams of fixed-capital investment into a modern industrial society based on cheap and abundant oil.

Although there is no formal definition of Southern California that corresponds with the uneven geographies of oil-based energy, most scholars would agree that Los Angeles County was the dominant urban market that supported the expansion of the regional petroleum industry in the first decades of the twentieth century. “In a physical sense,” writes L. Mark Raab, “the Los Angeles region could be identified as roughly the area encompassed by Los Angeles County.”16 Accordingly, this historical geography of fossil fuel energy systems focuses on Los Angeles County but also acknowledges the more expansive geographic scales of oil-based capitalism as it became established in Southern California and gradually expanded across North America.

The spatial-fixity of oil-based energy

With the objective of investigating the regional coproduction of oil-based energy and the emergence of Los Angeles as a modern industrial metropolis, this dissertation builds on the

15 Melosi, *Coping with Abundance*, 35.
concept of “spatial fixity” as developed by the Marxist geographer David Harvey.\textsuperscript{17} In \textit{Limits to Capital}, Harvey uses the concept of the spatial fix to emphasize the necessary (yet contradictory) role of long-term, fixed-capital investments into build landscapes to facilitate capital accumulation. “The growth of productive forces,” explains Harvey, “acts as a barrier to rapid geographical restructuring in exactly the same way as it hinders the dynamic of future accumulation by the imposition of the dead weight of past investments.”\textsuperscript{18} From this perspective, established patterns of urban and industrial development need to be understood as a major source of geographic inertia that reinforces established spatial fixes.

When it comes to oil and fossil fuels in general, the uneven geography of natural resource deposits has exercised a formative influence over the historical development of the North American urban system. In the Los Angeles Basin and across Southern California, the spatial fixity of oil was based on the uneven geography of crude oil deposits and reinforced by long-term, fixed capital investments into transportation networks, storage facilities and a range of other infrastructures that were developed to mobilize efficient and economical flows of liquefied fossil fuel energy. In this dissertation, I approach the spatial fixity of oil-based energy as a formative influence on urban and industrial development in Southern California.

In the Los Angeles region, oil emerged in the context of a distinctive metropolitan geography comprised of urban and industrial landscapes. By 1930, a vast industrial network comprised of derricks, refineries, pipelines and highways formed an energy system that integrated the vast oil-producing territory around the city of Los Angeles. The cumulative and overlapping spatial fixes of oil-based energy have culminated in a strong historical and

\textsuperscript{17} David Harvey, \textit{The Urbanization of Capital: Studies in the History and Theory of Capitalist Urbanization} (Baltimore: Johns Hopkins University Press, 1985); David Harvey, \textit{The Limits to Capital} (London and New York: Verso, 2006 [1982]). The term “spatial fix” was first introduced by Harvey in the article “The spatial fix – Hegel, Von Thunen and Marx,” \textit{Antipode} 13 (3) (1981): 1-12.

\textsuperscript{18} Harvey, \textit{The Limits to Capital}, 428.
geographical inertia that sustains the fossil-fueled mode of capital accumulation. Through qualitative historical geographical analysis, I trace relationships between oil as a fuel for transportation and the emergence of Los Angeles as the first oil-based city in North America.

Even when focusing on the regional context, there are two elements of geographical scale that need to be emphasized in any comprehensive approach to understanding the spatial fixity of oil-based energy. First, a consideration of scale is necessary for capturing the evolution of the Southern California petroleum industry from a regional to a national market. As will be illustrated, fixed capital investment in the form of Los Angeles Harbor functioned as a spatial fix that facilitated flows of California oil and petroleum products to distant markets across the continental United States. Based on the foundation of core productive regions, a national energy market was emerging.

The second element of scale emphasizes the contradictory influence of government between the municipal, state and national levels. With regional abundance and modern production infrastructure, the Southern California oil industry became a direct focus of federal strategies to conserve vital fossil fuel resources. In this dissertation, I examine how differing objectives and a generalized lack of consensus between different levels of government has contributed to the inertia of fossil fuels by hindering the potential for a large-scale, coordinated energy transition.19

Los Angeles through the lens of oil-based energy

Los Angeles is widely regarded by historians and historical geographers as the first city in North America to become “decentralized” and dependent on the private automobile as a dominant

mode of transportation.\textsuperscript{20} In \textit{The Fragmented Metropolis}, published in 1967, Robert Fogelson emphasizes the role of transportation (and the politics of investing in large-scale transportation infrastructures) as a driving force behind the early and rapid horizontal expansion of Los Angeles in the first three decades of the twentieth century.\textsuperscript{21} Whereas a comprehensive system of streetcar lines facilitated urban decentralization in the first two decades of the twentieth century, the 1920s were a formative decade when the citizens of Los Angeles made a long-term commitment to the automobile. In 1924, public preference for the automobile culminated in the passing of the \textit{Major Traffic Street Plan}, which was backed by a bond issue of $5,000,000 to begin the tedious process of expanding the existing street system and effectively integrating it into a vast regional network of highways and interchanges.\textsuperscript{22}

To be sure, \textit{The Fragmented Metropolis} is more comprehensive than a focused history of transportation. Fogelson also considers rapid population growth, industrial development, modern land-use planning and civic imagination to be important elements that shaped the explosive urban expansion of Los Angeles in the early decades of the twentieth century. According to Robert Fishman, another notable urban historian, “many of the most important studies of Los Angeles history published since 1967 can be read as book-length expansions of topics or themes first introduced to the scholarly literature in \textit{Fragmented Metropolis}.”\textsuperscript{23} Indeed, the depth of primary range and range of analysis is why this seminal “urban biography” remains one of the most influential books on the metropolitan development and horizontal expansion of Los Angeles.

\textsuperscript{21} Fogelson, \textit{The Fragmented Metropolis}, 85-107.
\textsuperscript{22} Bottles, \textit{Los Angeles and the Automobile}, 92-121.
\textsuperscript{23} Robert Fishman, forward to Fogelson, \textit{The Fragmented Metropolis}, xx.
One branch of research on the urban history of Los Angeles has continued to emphasize the role of transportation innovations and transportation infrastructures as a driving force of rapid horizontal expansion in the first half of the twentieth century.\textsuperscript{24} Powered by the gas-guzzling internal combustion engine, the widespread adoption of the automobile as a preferred mode of transportation has had an enormous impact on the development of North American cities. As argued by Scott L. Bottles, “Los Angeles’ close association with the automobile and its sprawling urban form make it a natural case study of twentieth-century urban development.”\textsuperscript{25} Using the \textit{Major Traffic Street Plan as evidence}, the 1920s are regarded by urban historians a formative decade when the voting citizens of Los Angeles made a long-term commitment to the automobile as a dominant mode of transportation and determining consideration of major urban planning decisions.\textsuperscript{26}

Going beyond transportation, recent scholarship on the historical geography of Los Angeles has developed a perspective that views the rapid and horizontal development of the first half of the twentieth century as a reflection of the complex dynamics of industrial decentralization.\textsuperscript{27} For example, the research of Greg Hise challenges the “prevailing suburban history” by emphasizing the extent to which the decentralization of Los Angeles in the first half of the twentieth century was a planned and coordinated process.\textsuperscript{28} According to Hise, “design professionals, industrialists, developers and residents” in Los Angeles “viewed and understood

\textsuperscript{25} Bottles, \textit{Los Angeles and the Automobile}, 4.
\textsuperscript{26} Wachs, “The evolution of transportation policy in Los Angeles,” 106-159; Bottles, \textit{Los Angeles and the Automobile}, 92-121.
dispersion as an advantage, something to be planned for.” In other words, innovations and investments in transportation did not dictate urban growth, but rather, were among numerous considerations behind the planned expansion of the metropolis.

The extent of urban development in Los Angeles was not limited to existing transportation corridors, but in many cases also corresponded with more dispersed geographies of residential and industrial suburbanization. By analyzing journey-to-work patterns, urban historical geographers have emphasized the extent to which most working-class suburbs in Los Angeles were relatively self-contained with a balance of residential and industrial land-uses. In *My Blue Heaven*, urban historian Becky M. Nicolaides provides an in-depth analysis of the working-class suburbs of South Gate, Watts, and Bell Gardens. “In contrast to upper- and middle-class suburbs seeking distance from the industrial city,” describes Nicolaides, “South Gate purposely emphasized the connection between residence and workplace.” Accordingly, this strand of research on Los Angeles goes beyond a focus on transportation to consider the more comprehensive dynamics of industrial capitalism in the first half of the twentieth century.

In the context of established accounts of decentralized metropolitan development, particularly in research that focuses on local processes of urban governance in the first half of the twentieth century, historians of Los Angeles emphasize how planned dispersion was viewed as a marketable advantage by city-builders, civic boosters and municipal leaders. “From their conception of congested eastern and midwestern metropolises…” argues Fogelson, the planners of Los Angeles, proposed, as an alternative, “…residential dispersion and business decentralization – carefully supervised so as to foster self-sufficient satellite cities instead of

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29 Ibid., 10.
31 Ibid., 73-74.
sprawling suburban subdivisions.”³³ Under the careful oversight of the Chamber of Commerce, Los Angeles was marketed to eastern investors and prospective migrants as a modern urban environment where space was of abundance for low-density residential and industrial development.³⁴ To use the words of Sarah Schrank, “decentralization was envisioned as a strategy for maintaining a coherent city in the face of large-scale, unrestricted growth.”³⁵ When the emergence of oil-based energy is considered, we gain valuable insight into how the decision to embrace decentralized metropolitan expansion was essential to the establishment of an oil-based spatial fix in Los Angeles: not only by legitimizing the private automobile as the dominant mode of transportation, but also by promoting the low-density development of the regional petroleum industry.

Based on an integrated political, economic and ecological approach to oil-based energy, this dissertation adds a new perspective to existing accounts of the urban and industrial expansion of Los Angeles in the first half of the twentieth century. The objective to illustrate how oil-based energy is a complex category that provides important insights into how built landscapes of the past continue to represent a major source of geographic inertia that sustains the dominance of fossil fueled capitalism.

Of course, the historical geography of Los Angeles is a story that can be told from multiple perspectives, human and non-human. In other words, oil was only one element, albeit a formative one that shaped processes of metropolitan development in the first three decades of the twentieth century. Like all cities in North America, the development of Los Angeles was dependent on the provision of material inputs such as water, building supplies and food. When it

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³³ Fogelson, 250.
comes to energy however, the role of oil as a formative element in the production of urban and industrial space in Southern California is a story that still needs to be told.\textsuperscript{36} Focusing on the first three decades of the twentieth century, culminating in the Great Depression, this dissertation aims to tell the story of how Los Angeles shaped the emergence of oil-based energy, and how the emergence of oil-based energy shaped the distinctive metropolitan development of Los Angeles.

**Research overview**

With the objective of investigating the complex, multi-layered and contradictory qualities of oil-based capitalism, this dissertation is comprised of six chapters that emphasize themes and processes rather than a strictly chronological narrative. In combination, the chapters that follow emphasize the regional dynamics of energy transition and establishment. Building on a historical materialist approach to energy systems as the culmination of conjoined ecological factors and political economic influences, the first chapter uses the concept of the “spatial fix” to gain theoretical insight into how oil-based capitalism in North America has been sustained and made increasingly resilient through the ongoing production (and reproduction) of urban and industrial space at the regional scale. Beginning initially with coal in the middle of the nineteenth century, the transportability of fossil fuels has been a critical factor that has severed the age-old geographic restriction between energy production and energy consumption. The historical geography of fossil fueled industrialization in North America has been dependent on fixed capital investments into landscapes and infrastructures that have facilitated efficient and economical flows of fossilized energy.\textsuperscript{37}

\textsuperscript{36} Beyond a focus on oil, the importance of hydroelectricity as an entangled element of the second industrial revolution in Los Angeles also needs to be acknowledged. For a detailed history of hydroelectricity in Los Angeles, please see James C. Williams, *Energy and the Making of Modern California* (Akron: The University of Akron Press, 1997), 168-198.

Based on the theoretical foundation established in the Chapter One, the second chapter examines how the emergence of oil-based energy as a dominant fossil fuel in Southern California was a complex process that spanned decades and was dependent on considerable fixed-capital investment and extensive environmental transformation. The resulting landscapes, institutions and power relations have contributed immensely to the historical and geographical inertia that continues to sustain oil-based capitalism. Powered by cheap and abundant flows of fossil fuel energy and supported by a vast, region-wide transportation system, Los Angeles emerged in the first three decades of the twentieth century as the first oil-based metropolis in North America, a fragmented and decentralized urban-industrial landscape that clearly reflected the dominance of the automobile as a primary mode of transportation. The aim of the second chapter is to provide the necessary geographical context for the more detailed case studies that proceed.

In Chapters Three and Four, this dissertation emphasizes the role of fixed-capital investment in the development of networks, nodes and landscapes of oil-based energy in the Los Angeles region. In Chapter Three, I examine the influence of the Southern Pacific Company in stimulating the development of an oil-based, urban-industrial economy in Los Angeles. In a region where coal was scarce, the Southern Pacific Railroad became a pioneering consumer, producer and transporter of unrefined fuel oil. Due to the critical issue of transportability in the production and consumption of fossil fuels, the Southern Pacific was uniquely capable of providing the technology, infrastructure and organizational network necessary to stimulate the emergence (and gradual establishment) of oil-based energy in Southern California. Due to the railroad, Los Angeles was provided with the people and energy needed for rapid urban and industrial development in the first three decades of the twentieth century.

In the Chapter Four, I examine the gradual development of Los Angeles Harbor, a manufactured landscape and spatial fix that became essential to the expansion of the petroleum
industry in Southern California. For a city and region without a natural deep-water harbor, this was a complex process that was overseen by an array of political and economic influences, ranging from the Southern Pacific Company to the United States federal government. In the context of the regional energy system, Los Angeles Harbor was developed over the course of several decades into a primary node for the storage and transportation of oil. When overproduction became an issue in the 1920s, the harbor also functioned as a critical outlet for the export of surplus oil to distant markets. In the context of growing oil abundance, the development of an export market was essential for maintaining the structured coherence of the regional oil market.

In the case studies provided in the final two chapters, I examine the role of the state in shaping the emergence of oil-based capitalism in Southern California. “For the energy historian,” argues Melosi, “there is nothing more difficult to grasp and explain than the interaction between energy, the economy, and government.” In Chapter Five, I examine how a series of decisions made at the municipal level were significant in shaping the rapid development of Los Angeles as the first oil-based city in North America. In the early 1890s, the discovery of a massive oil deposit beneath the streets of Los Angeles presented a problem of municipal governance that was unprecedented in the context of North American urban history. Rather than exclude drilling from the urban environment, Los Angeles City council instead assumed an active role in formulating municipal ordinances that embraced oil-based development. In the short-term, sections of the city became a mess of oil derricks as the field was rapidly depleted by town-lot drilling. Over the longer-term, however, Los Angeles remained a fractured metropolitan landscape, one that continues to express the dominance of oil-based energy as the primary fuel for transportation in North America.

38 Melosi, Coping With Abundance, 10.
Whereas Chapter Five looks at the development of a municipal regulatory structure, Chapter Six examines how the emergence of oil-based energy in Southern California and Los Angeles was a direct focus of federal efforts to conserve natural resources in the first three decades of the twentieth century. According to David W. Miller, “the rapid exploitation of oil in Southern California from 1903 to 1928 made it the focal point in the formulation of a national policy for the public oil lands.”

When the advent of mechanized world warfare in the first decades of the twentieth century, the oil-based economy of Los Angeles became a direct focus in federal efforts to conserve fossil fuel energy resources. As will be argued in Chapter Six, the established trajectory of oil-based metropolitan development in Los Angeles was not reducible to the logics of centralized, federal intervention. In this regard, the passing of the Mineral Leasing Act of 1920 can be interpreted as an adaptation of the federal government to the competitive realities of oil-based capitalism.

The dissertation concludes by assessing the cumulative structure of oil-based energy in Southern California and Los Angeles by the onset of the Great Depression. By this time, oil was firmly established as the dominant fuel for industry and transportation in Southern California. In the first three decades of the twentieth century, the rapid development of Los Angeles became a captive market for oil-based energy, which was fixed and literally embedded in vast landscapes of production and consumption. From the perspective of fossil fueled accumulation, the onset of the Great Depression represented a crisis of industrial capitalism that was eventually resolved with an extensive, nation-wide interstate building program that solidified the dominance of oil as

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the primary fuel for transportation and everyday life in North America. Over the course of the twentieth century, the spatial fixes of oil-based capitalism have become continental in scale.

**Research methodology and primary sources**

With the aim of developing a relational understanding of oil-based energy as a complex web of political, economic and ecological relationships that must be situated in the historical context of capitalist accumulation, this research is based on an extensive qualitative analysis of primary source documents. In addition to investigate first-hand perspectives, this research is also based on important historical context from established literatures on Los Angeles and the Southern California petroleum industry. In this section on methodology, I describe the research process of this dissertation as a succession of three main stages: the identification of archives, the collection of sources, and the synthesis of findings. With an emphasis on qualitative analysis, this historical geography of oil-based energy in Los Angeles is based on a methodology that incorporates a wide range of political, economic and cultural perspectives.

Over the last few decades, the convenience of being able to use the Internet to conduct primary and secondary research has profoundly impacted the discipline of historical geography. This dissertation is no exception. In the early stages of conducting this research on oil-based energy, I relied heavily on Internet search engines to compile a preliminary listing of relevant primary and secondary sources. The most important was WorldCat, an online search-engine that offers access to a database comprised of the combined catalogue holdings for thousands of libraries. In addition to providing access to a comprehensive listing of primary documents that

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are available online, WorldCat was incredibly useful for locating archival sources that are only available in hardcopy form. While arguably most important for identifying (and in some instances accessing) a wide range of primary sources, WorldCat was just one of many online databases that were used in the process of identifying primary sources. Google Scholar, Internet Archive and the Online Archive of California are other examples of online databases that were useful for locating a vast array of published and unpublished documents.

The Internet was also useful in the second stage of the research process, which involved the collection of primary sources that provide historical insight into the emergence of oil-based energy in Southern California. As argued above, search engines like WorldCat, Google Scholar and the Online Archive of California offer direct access to a wide-range of published and unpublished documents. In the context of this dissertation, newspapers, government reports (at the federal and state-level) and industry publications were the main types of primary source documents that were collected using online channels. For published documents that were not available online, the ability to order sources through interlibrary loan was indispensable to the process of collecting primary sources. When it comes to oil, arguably the most documented of the “natural resources,” there is an extensive documented history of published primary sources that can either be accessed online or ordered in hardcopy though interlibrary loan.

Accessible from online databases, newspaper articles comprise a major grouping of primary sources that inform this historical geography of oil-based energy in Southern California. As will be illustrated in this dissertation, the pervasive influence of the Los Angeles Times as a “stalwart friend of the state’s oil interests” needs to be emphasized in historical and geographical context. In addition to acknowledging and emphasizing the role of the Los Angeles Times as a prominent booster organization, and therefore a biased perspective, this dissertation makes

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42 Quam-Wickham, “Cities sacrificed on the altar of oil,” 193.
extensive use of its newspaper articles for important details and data relating to the development of the petroleum industry in Southern California. These details range from perceptions of regional economic development to important information on corporate mergers, labor disputes and the environmental impacts of oil-based capitalism.

Regarding the collection of primary sources, it must be emphasized that this dissertation is based on a critical assessment of unpublished documents that are located in several archives across California. In the process of consulting online databases and finding aids, I made the decision that focusing on the role of the state at different geographic scales would be the most effective way of gaining insight into the complex political economy of oil-based capitalism that emerged in Southern California and Los Angeles in the first three decades of the twentieth century. From the perspective of federal government, this dissertation contains extensive analysis of primary documents that are located at the National Archives and Records Administration in San Francisco. In particular, the Records of the Bureau of Land Management (Record Group 49), the Records of the District Courts of the United States (Record Group 21) and the Records of the United States Fuel Administration (Record Group 67) provide a rich source of primary information that informs this analysis.

At the municipal level, I examine the Records of Los Angeles City Council in an effort to gain insight into the development of petroleum within municipal boundaries. Comprised of petitions, minutes of City Council meetings, and municipal ordinances, these records express a wide range of perspectives and conflicting interests regarding the drilling for oil in Los Angeles City Field. The multiple perspectives contained in these records provide invaluable detail into how elected officials, private citizens and oil companies identified problems and implemented solutions associated with oil production in an urban environment. The result of this pioneering example of urban politics was a municipal regulatory structure that committed Los Angeles to a
path of oil-based metropolitan development. In this regard, the emergence of Los Angeles as the first oil-based city in North America was not inevitable: regulations implemented by City Council provided important structure to the otherwise chaotic process of energy development.

In the archives, I relied heavily on a digital camera to facilitate the process of document collection. Compared to the option of taking detailed notes on site, the use of a camera allows for the collection of a large volume of primary data. In addition to simply the process document indexing in the archives, the use of a digital camera was also conducive to the generation of electronic files that could be compiled into a database to facilitate textual analysis outside of the archives.

To summarize the research process thus far, this dissertation is based on an extensive qualitative analysis of primary sources that were collected in three main ways: online repositories, interlibrary loan and by visiting a number of archives in California. Two main types of primary documents were collected: published sources and unpublished manuscripts. In the process of conducting the third stage of research (synthesis of findings), I compiled an electronic database consisting of over 10,000 pages of primary source documents. With the use of computer database software called Papers, I was able to organize and process a large volume of data that could be searched by keyword, data and author.

In addition to facilitate the efficient organization of primary sources, Papers was also useful for compiling and maintaining an extensive library of secondary sources. The ability to effectively synthesize and triangulate information between documents is one of the main advantages of using database software to organize an extensive library of primary and secondary sources. With one keyword search, Papers generates a listing of relevant primary and secondary sources in a way that greatly facilitates the process of qualitative historical (and geographic) analysis.

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CHAPTER ONE

Oil, spatial fix and landscapes of fossil fueled capitalism in Southern California

The idea that capitalism survives and is reproduced through the production of urban and industrial space remains a foundational concept in Marxist approaches to historical and economic geography. Writing in the *Grundrisse*, it was Karl Marx who first painted a picture of industrial capitalism as a dynamic and unrelenting process that “drives beyond every spatial barrier,” resulting in the “annihilation of space by time.”¹ In this context, commodification is understood as a process of production and exchange that takes places across, is constituted by, and transformative of geographic space. “The more production comes to rest on exchange value, and hence on exchange,” explains Marx, “the more important do the physical conditions of exchange – the means of communication and transport – become for the costs of circulation.”² In this way, the friction of distance has been gradually overcome through long-term investments into built environments that have facilitated expanded circulation and enhanced production.

Building on the theoretical foundation established by Marx, research on the historical geography of urbanization has emphasized the historical role of fixed capital investment and built landscapes as a necessary aspect of (and precondition for) expanded capital circulation. In particular, David Harvey introduced the concept of the “spatial fix” to capture the complex process through which the contradictions of capital accumulation are temporarily resolved through the ongoing production and reproduction of urban and industrial space. Regarded by scholars as a major contribution to Marxist historical geography, the concept of spatial fix has

² Ibid.
been expanded upon in subsequent research that has focused on the expansion of capitalism to overseas markets. Without question, more research is needed that examines the less-understood role of spatial fixes in facilitating processes of regional development at particular points in the history of North American industrial capitalism. Focusing on the development of oil-based energy in Southern California, one of the aims of this dissertation and this chapter in particular is to address this gap in the research.

Embedded in built landscapes, sustained by technology and supported by governments at all geographic scales, oil remains a dominant source of energy that sustains the capitalist mode of production. Since the turn of the twentieth century, the production of urban and industrial space in cities across North America has culminated in a strong inertia that sustains the dominance of oil-based energy, especially as a fuel for transportation. With the aim of gaining insight into this inertia, this chapter develops a framework that situates oil-based metropolitan development in the context of successive and overlapping spatial fixes. Focusing on the metropolitan development of Los Angeles in the first three decades of the twentieth century, I argue that the concept of spatial fixity can and should be applied to the historical geography of oil-based energy in North America. When understood as a process implicating the coproduction of natural resources, regional landscapes, technology and political economy, the spatial fixity of oil becomes an important concept for gaining insight into the structural resilience and persistence of oil-based capitalism.

This chapter is divided into five sections. The first section elaborates on the concept of the spatial fix to emphasize the influence of fixed-capital investment and the long-term development of built landscapes as major sources of geographic inertia that sustain the capitalist mode of production. In the second section, I review a batch of recent scholarship on the political
ecology of fossil fuel to develop an understanding of oil-based capitalism as a complex web of relationships and infrastructures that must be situated in time and place.

Then, building on a dialectical approach to oil-based energy, the third section of this chapter reviews literature spanning environmental history and urban political ecology that offers insight into the historical geography of fossil fueled capitalism in North America. In the fourth section, this chapter surveys research on the historical geography of Los Angeles that has emphasized dynamics of decentralized urban and industrial development that are consistent with a dialectical understanding of an oil-based spatial fix. In the fifth and final section of this chapter, I examine how the spatial fixes of oil-based energy that emerged in Los Angeles and Southern California in the first three decades of the twentieth century were effective to a degree in displacing crises of overproduction that incessantly plagued local and regional petroleum markets. As will be illustrated, no spatial fix can ever be considered a permanent solution to the unrelenting and expansive dynamics of capital accumulation.

Spatial fixes and the geographical inertia of capital accumulation

The history of capitalism is a tale of relentless yet uneven geographic expansion through dynamics of creative destruction. The creation of outlets through which to divert surplus capital has been a necessary prediction for this growth. Although it was first introduced in an earlier essay on Hegel, Von Thunen and Marx, the concept of the “spatial fix” is regarded as one of the primary theoretical insights developed by David Harvey in The Limits to Capital and The Urbanization of Capital, two pioneering works on the historical geography of the capitalist system.3 In these books, Harvey builds on the foundation established by Marx in an effort to

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better understand the role of fixed-capital investment, landscape development and market expansion in the history of capital accumulation. Built landscapes and transportation technologies not only play a role in the establishment, integration and re-articulation of capitalist production in place, but also in the physical circulation of capital across geographic space.

In *The Limits to Capital*, Harvey makes a significant analytical distinction between two types of spatial fixes, each corresponding to a particular geography. According to Bob Jessop, who explains this distinction succinctly, “these perspectives correspond to two different types of fix: a more literal fix in the sense of the durable fixation of capital in place in physical form; and a more metaphorical ‘fix’ in the sense of an improvised, temporary solution, based on spatial reorganization and/or spatial strategies, to specific crisis-tendencies in capitalism.”⁴ For the most part, subsequent research by Harvey and other geographers has invoked the concept of spatial fix to explain the expansionary tendencies and globalizing logic of capital accumulation (referred to by Marxist geographers as outer transformations).⁵

In a subsequent reworking of the concept, the idea of a “spatio-temporal fix” is one of the main themes that Harvey invokes in *The New Imperialism*, which begins, not surprisingly, with a chapter entitled “All About Oil.”⁶ By displacing production and opening up new markets overseas, the argument goes, capitalism has been able to survive and reproduce by expanding on a global scale. According to Erica Schoenberger, this emphasis on global expansion and the forging of a new division of labor could be explained by the fact that “*Limits* appeared at more or less the same moment as other influential works focused far more specifically on the contemporary restructuring of manufacturing industries in the advanced capitalist economies and

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⁵ Ibid., 147.
the relocation of some of this activity to low-wage, underdeveloped regions of the globe.”

Although this research has yielded important insights into the expansionary dynamics of global capitalism in recent decades, especially since the oil crisis of 1973, the historical and geographic influence of spatial fixes as investment into (and reconfiguration of) the built landscape at the regional scale has been overshadowed. Indeed, the concept of spatial fix is far too important to be limited to a narrow understanding of global restructuring and the international division of labor.

More importantly for the purpose of this historical geography of oil-based energy in Southern California, spatial fix also refers to the ability of capital to physically transform regions, landscapes and territorial configurations (referred to as inner transformations). Before reaching a point where spreading out across global space became necessary to resolve inherent tendencies of over-accumulation, industrial capitalism had to first become established and embedded in place. In this regard, the concept of the spatial fix offers a dialectical approach that captures how processes of investment into social and physical infrastructures (necessary for production to proceed) has culminated in a “geographic inertia” that has become increasingly resilient over time. As explained by Harvey, “the circulation of capital is increasingly imprisoned within immoveable physical and social infrastructures which are crafted to support certain kinds of production, certain kinds of labour process, distributional arrangements, consumption patterns, and so on.” In this way, the crisis tendencies inherent in accumulation are displaced as long as capital is able to circulate in a productive way.

The problem is that built environments, large scale and long-term, have a limited and specific capacity to keep capital circulating in productive ways. Despite the expansionary

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9 Harvey, *Limits to Capital*, 428.
tendencies of capitalism, the necessary process of investing into landscapes that facilitate accumulation eventually culminates in a geographic inertia that builds over time and increasingly acts as a barrier to further expansion. As described by Harvey, “the geographical landscape which fixed and immobile capital comprises is both a crowning glory of past capital development and a prison which inhibits the further progress of accumulation.” Indeed, these tensions between fixed and circulating capital ensure that every spatial fix, historical and contemporary, must be viewed in terms of opportunity and eventual constraint. This is a fundamental contradiction of capital accumulation that applies to fossil fuels and oil-based energy in particular. Due to the influence of history and geography, landscapes of capital accumulation are necessarily overlapping and layered.

After publishing *Limits to Capital* in 1982, Harvey went on to develop a comprehensive theory of urbanization as an ongoing process as spatial manifestation of the tensions between fixed and circulating capital. “Whatever else it may entail,” explains Harvey, “the urban process implies the creation of a material physical infrastructure for production, circulation, exchange and consumption.” The tensions between fixity and motion are a fundamental contradiction of the urbanization process under capitalism. In other words, fixed capital investment into a built landscape to facilitate circulation according to conditions at a particular point in time increasingly act as a barrier that limits the potential for expanded circulation in the future. “In order to overcome spatial barriers and to annihilate space with time,” argues Harvey, “spatial structures are created that themselves act as barriers to further accumulation.” When it comes to landscape, there is no such thing as a clean slate – only uneven geographic development.

12 Ibid., 83.
Politics are the means through which streams of capital reinvestment are organized and coordinated. “Territorial alliances, which become increasingly powerful and more deeply entrenched,” explains Harvey, “arise to protect and enhance the value of capital already committed to the region.”\(^\text{14}\) Behind every spatial fix are political, economic and regulatory structures that emerge historically as culminations of a wide array of interest groups ranging from local capital to the national state. In North America, the visible hand of federal, state and local governments have been instrumental in directing investments towards established and new spatial fixes with a degree of coordination that could not be achieved at the level of local capital. With each subsequent wave of capital reinvestment, guided by a regional political economy committed to a particular vision of development, the geographic inertia of established landscapes and territorial alliances becomes increasingly resilient and highly resistant to change.

**Structures and dynamics of fossil fueled capitalism: towards a dialectical perspective**

In recent decades, scholarship spanning resource geography and political ecology has made considerable progress in developing a dialectical understanding of energy as a complex web of socio-ecological relationships that must be situated in time and place. “The scarcity or abundance of oil is ultimately a social-spatial relationship,” argues Mazen Labban, “not merely a geological fact or technical appraisal.”\(^\text{15}\) In large part, this renewed enthusiasm for energy has examined how perceptions of scarcity and abundance have contributed to the current geopolitical situation surrounding oil, especially since the energy crisis of 1973.

As with research that has applied the concept of the spatial fix, the overwhelming focus of this literature on oil is on making sense of what is interpreted to be a current crisis of global capital accumulation. According to David Harvey in *The New Imperialism*, this “oil question”

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\(^{14}\) Harvey, *Limits to Capital*, 428.

can be captured in the proposition that “whoever controls the Middle East controls the global spigot and whoever controls the global oil spigot can control the global economy, at least for the near future.”

Most scholars agree that the age of oil is approaching its peak and the search for alternative sources of energy needs to become an important priority of national governments and worldwide corporate capital. Otherwise, perceptions of scarcity and distributional conflicts will result in an increasingly tense geopolitical situation whereby imperialism and warfare will continue to be used as means of securing the energy resources that are necessary to sustain established spatial fixes and global power structures. These are the dominant themes in most recent research on the geopolitics of oil.

One important exception to this focus on the geopolitics of oil is a strand of research that emphasizes the complex historical and geographic relationships between fossil fuel energy and industrial capitalism. Most notably, Matthew T. Huber has developed a theoretical argument that explains how “fossil fuel represents a historically specific and internally necessary aspect of the capitalist mode of production.” By focusing on current-day distributional conflicts and geopolitics, argues Huber, scholarship under the banner of historical materialism has not gone far enough with research that looks at fossil fuels as a necessary foundation of industrial capitalist accumulation.

This theorization of fossil fueled capitalism draws from emerging literature on the political economy of nature to provide a dialectical conception of energy as a dynamic social

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20 Ibid., 107.
relationship that must be situated in time and place. “While ecological economists stress the
transhistorical laws of thermodynamics,” argues Huber, “a historical materialist analysis would
emphasize both the particular conditions through which ‘fossil fuel’ became such a useful source
of energy and the social consequences of its peculiarly prolific capacities for enhancing
productivity.”\textsuperscript{21} Indeed, energy historians regard the transition from biological sources of energy
to fossilized hydrocarbons (beginning with coal) as a formative shift that stimulated the
emergence of industrial capitalism in the late-eighteenth and early twentieth-centuries.\textsuperscript{22} Fossil
fuel energy is a product (and problem) of historical geography.

From the perspective of historical materialism, argues Huber, fossil fuels have
contributed to the expansion of industrial capitalism in two main ways. The first way relates to a
sweeping transformation in the labor process. In the early stages of coal-powered
industrialization, the transition to fossilized sources of energy culminated in the “displacement of
human muscle power as the core productive force of production.”\textsuperscript{23} Prior to the age of coal, the
productive capacity of society was limited to the biological capabilities of human and animal
muscles. Although innovations in harness and plowing technologies resulted in considerable
advances in agricultural productivity in preindustrial societies, the steam engine was a
revolutionary technology that made it possible to convert concentrated thermal energy (in the
form of coal) into useful mechanical energy. This revolutionary process, which Marx referred to
as the real subsumption of labor under capital, could not have happened without the abundant
source of concentrated thermal energy that coal represented.\textsuperscript{24}

Historical revolutions in productivity have been augmented by technological revolutions
in transportation. According to Huber, a second major way that fossil fuels have contributed to

\textsuperscript{21} Ibid., 106.
\textsuperscript{22} Smil, \textit{Energy in World History}, 157-222.
\textsuperscript{23} Huber, “Energizing historical materialism,” 108.
\textsuperscript{24} Ibid., 110.
the historical and geographical expansion of industrial capitalism has been in their capacity to
drastically reduce “the costs of circulation.” In this regard, the innovation of fossil fueled
 locomotion had revolutionary implications on the ability of capital to overcome the friction of
distance. Before the railroads, the speed and range of commodity circulation was limited to
walking, horse-drawn carriages and major waterways. “Thus, just like the biological constraints
of muscle in the realm of production,” explains Huber, “the biological constraints of transporting
goods were overcome with the use of fossil fuel and coal powered locomotives.”

Powered by fossil fuel, the development of railroad transportation on a mass scale beginning in the late-
nineteenth century represented an essential spatial fix that expanded the scale and scope of
industrial capitalism in North America.

Despite the early importance of coal, the widespread adoption of the internal combustion
group eventually solidified the status of oil as the dominant fuel for transportation in modern
capitalist society. Compared to coal, a relatively higher energy density and liquid form made
oil easier to store and more economical to transport. “From the perspective of circulation,”
concludes Huber, “the fossilization of transport should be conceptualized as an internal and
necessary aspect of the capitalist mode of production.” Beginning with rail and water, but
eventually ending up with asphalt-paved roads, new spatial fixes would be necessary to sustain
this trajectory of fossil fueled capitalism.

In his theoretical account of fossil fueled industrial capitalism and fossilized
transportation, Huber draws heavily from the concept of energy systems developed by Debeir et
al. in their largely overlooked book In the Servitude of Power. They define an energy system as

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26 Huber, “Energizing historical materialism,” 112.
29 Huber, “Energizing historical materialism,” 112.
“the original combination of diverse converter chains which draw on determined sources of energy and depend on each other, initiated or controlled by classes or social groups which develop and consolidate on the basis of this control.”

Dialectical in approach, this is an integrated political economic and ecological conceptualization of energy systems as being comprised of three interdependent elements: the crude energy resource(s) in question (emphasizing biological characteristics and quality); technologies associated with the extraction, conversion and transportation of energy for human consumption; and political economic structures developed to oversee and regulation processes of energy appropriation, conversion and transition. Accordingly, the interdependence of these elements in forming a particular energy system requires that “economic, political and ecological regulations be considered simultaneously.”

Despite being overlooked by historical geographers and environmental historians, the role of fossil fuels in the context of North American industrial capitalism needs to be understood as a dynamic coproduction of energy, landscape and political economy.

Energy systems are a product of incremental and cumulative development over long periods of time. In this regard, the sheer magnitude of social and fixed-capital investment required of a society to produce energy is responsible for the strong historical inertia that characterizes fossil fueled capitalism. Debeir et al. describe industrial capitalism as the “age of networks,” emphasizing the foundational role of transportation networks (canals, pipelines, etc...) to the efficient and economical distribution of fossil fuel energy. Subsequent research on energy systems and energy transitions has continued to emphasize the networked and interconnected qualities of fossil fueled capitalism. Indeed, North American cities in the nineteenth and early-twentieth centuries were energy poor sites, and the high energy density of

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31 Ibid., 2.
32 Ibid., 108-133.
fossilized hydrocarbons justified making long-term investments into complex and comprehensive infrastructural systems for the transportation, storage and distribution of fossil fuel.\textsuperscript{33}

According to Debeir et al., the historical inertia produced through continuous reinvestment into an established, yet deteriorating, energy system is sustained through the cumulative support of varied institutional structures and political economic interests who use their extensive resources and influence to slow the pace of technological innovations that could have the potential to stimulate an energy transition: “the dead weight of the vested interests and social groups involved in the system causes great passivity.”\textsuperscript{34} In the context of fossil fueled energy systems, this understanding of “vested interests and social groups” is consistent with the “territorial alliances” that Harvey argues are essential for overseeing (and coordinating reinvestment into) into established spatial fixes. In the age of fossil fuel, control over the production and distribution of energy flows is the ultimate expression of power. The political and economic structures in support of an established spatial fix become increasingly resilient over the span of decades, becoming a major source of historical and geographic inertia.

\textbf{Spatial Fixes and historical geographies of fossil fueled capitalism}

Despite having strong geographic implications, \textit{In the Servitude of Power} does not provide a direct analysis of the historical geography of fossil fuel energy system. When viewed from the perspective of spatial fixity, however, we gain valuable insight into how the “geographical inertia” of oil-based energy has been sustained and made increasingly resilient through the ongoing production of urban and industrial space. Whereas most approaches to the concept of spatial fixity emphasize fixed-capital investments and territorial alliances as major sources of


\textsuperscript{34} Debeir et al., \textit{Servitude of Power}, 12.
“geographic inertia,” Debeir et al. develop a more comprehensive understanding of “historical inertia” as comprised of built landscapes, politics and economy, but also on considerations such as resource abundance and the evolving state of conversion technologies. According to Debeir et al., the historical inertia of fossil fueled capitalism is a function of the “multiplicity of factors and conditions” that must be assembled for energy to be produced and consumed by human society. In this context, the long-term development of urban and industrial landscapes to facilitate the production and consumption of oil needs to be understood as a major source of historical and geographical inertia.

From the perspective of historical geography, empirical research in environmental history and political ecology has made important contributions in demonstrating the dynamic coproduction of natural resources, economy and landscape. In his sweeping environmental history of Chicago, for example, William Cronon undertakes detailed commodity chain analyses of timber, wheat and meat to illustrate how the rapid industrial growth and competitive successes of the industrial city was inseparably bound to a vast rural hinterland abundant in natural resources. In the case of Chicago, canals and railroads were the “artificial corridors” that reinforced the advantages of natural waterways. The fossilization of transportation was vital in facilitating this process of time-space compression. “In economic and environmental terms,” explains Cronon in reference to the late-nineteenth century growth of Chicago, “we should think of a city and its hinterland not as two clearly defined and easily recognizable places but as a multitude of overlapping market and resource regions.” This insight is especially apt when considering the city of Los Angeles, which emerged in the first decades of the twentieth century as the urban core of a vast energy system that was scattered over parts of adjoining counties and

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bound by transportation networks, localized production systems, a common labor market and complex circulations of capital and labor.

Building on the pioneering insights of Cronon, subsequent research in urban political ecology has emphasized the essential role of networks in providing growing cities with materials necessary for expanded urban and industrial growth. In particular, the concept of “urban metabolism” has been developed as a dialectical approach to understanding the complex interactions and networked relationships that bind city and countryside. As explained by Erik Swyngedouw, “metabolism” in this context is borrowed from the writings of Adam Smith and Karl Marx, who conceived of a capitalist economy “as a metabolic system of circulating money and commodities, carried by and structured through social interactions and relations.” Capitalist urbanization, historical and present, is conceived of as an ongoing and dynamic circulatory process. The industrial city is understood as a landscape of networks.

Despite being a foundational metabolic process, circulation is a theme that has been engaged in surprisingly narrow ways by research in urban political ecology. The dominant focus of this research has been on water and the historical development of networks that facilitate the circulation of water through the hybrid urban landscape. For example, Matthew Gandy in Concrete and Clay examines how New York’s urban metabolism is sustained by a water supply system that extends deep into a vast rural hinterland. “The provision of water for New York City is one of the most elaborate feats of civil engineering in the history of North American urbanization,” claims Gandy, who argues, “the history of cities can be read as a history of

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Similar to Cronon in *Nature's Metropolis*, Gandy seeks to capture the complex socio-ecological processes that sustained the growth of a major city during a formative state in the history of North American urban and industrial development. Although vital to cities, and especially Los Angeles in its early stages of urban development, water is not the only material input that sustains the capitalist urbanization process. In particular, the historical and geographical importance of fossil fuel energy in sustaining processes of urban and industrial development remains largely overlooked.

When understood in the context of spatial fixes, the historical inertia of oil-based capitalism has been sustained in three main ways. First, fossil fuel energy systems are complex structures that require continuous infusions of capital reinvestment in order to remain efficient and economical. Second, the continuous need to reinvest capital into established energy systems have contributed to the development of regional and national political economies that have been highly resistant to change. Third and finally, the structural resilience of oil-based capitalism has been maintained through the production of new spatial fixes that have built on the foundation of existing spatial fixes.

The system becomes increasingly embedded with each subsequent round of territorial development: culture, ideology and everyday life become a reflection of (and commitment to) established spatial fixes. In the case of oil, the spatial fixes of early industrial networks were gradually complemented by the emergence of new urban landscapes that reflected a material culture that was becoming increasingly dependent on the private automobile as a dominant mode of transportation. As will be illustrated in this dissertation, this was a process that started in Southern California, before expanding across North America.

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Los Angeles: the fragmented and decentralized energy system

“Fragmented” and “decentralized” are two themes that are commonly invoked by urban historians and historical geographers to describe the rapid and largely horizontal expansion of the Los Angeles metropolitan region in the first decades of the twentieth century.\(^1\) According to Robert M. Fogelson in *The Fragmented Metropolis*, Los Angeles “differed markedly in its landscape, transportation, community, politics, and planning from the great American metropolis of the late nineteenth and early twentieth century.”\(^2\) For a city without a natural port, extensive river system or any other apparent locational advantage, the urban and industrial expansion of Los Angeles in the early twentieth century was nothing short of extraordinary. The regional development of oil-based energy was one way that Los Angeles was able to overcome a supposed lack of locational advantages.

In a classic account of the region published in 1946, journalist Carey McWilliams observed how “Southern California lacks nearly everything: good soils, natural harbors (San Diego has the one natural harbor); forests and mineral resources; rivers, steams and lakes; adaptable flora and fauna; and a sustaining hinterland.”\(^3\) Based on a perceived lack of locational advantages, McWilliams offers a perspective on Southern California and the Los Angeles region that captures the extraordinary ability of industrial capitalism to offset “natural limitations” through the application of technology and the transformation of regional landscapes.

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\(^3\) Carey McWilliams, *Southern California: An Island on the Land* (Layton, Utah: Gibbs Smith, Publisher, 1973 [1946]), 6.
Urban historians have argued that timing was a major factor that contributed to the rapid horizontal development of Los Angeles in the first decades of the twentieth century. Innovations and investments in transportation played an important role in what was perceived at the time as exceptional urban development. Whereas older (and established) cities like New York and Boston had deep-water harbors that spurred early phases of regional development in the nineteenth century, Los Angeles did not experience considerable population growth until a connection with the Southern Pacific Railroad was established in 1876. Between 1880 and 1900, the population of Los Angeles rapidly expanded from 11,200 to 102,000, a nearly ten-fold increase that clearly reflected the stimulating influence of the railroads to move people and cargo.

Municipal government, lacking significant borrowing power and capital in the late nineteenth century, looked to private companies and utilities to provide the basic services needed to accommodate this extraordinary increase in population. In addition to demand for water, transportation emerged as a lucrative business (and captive market) in Los Angeles. In combination with extraordinary population increase, the privatization of municipal transportation had direct implications in the rapid horizontal expansion of the metropolitan region in the first three decades of the twentieth century.

The modern transportation history of Los Angeles begins with electrified railroads and culminates with the widespread adoption of the private automobile. “Despite the popular image of Los Angeles as an “automotive city,” argues Michael Dear, “Southern California’s signature

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urban sprawl *originated* as a diverse polycentric system of streetcar lines.”47 At the turn of the twentieth century, streetcars and real estate worked in tandem in Los Angeles to create a new, decentralized urban form that stood in contrast with older cities like New York, Boston and even Chicago. “Real estate developers were the principle stockholders of the new street railways [in Los Angeles]” explains Martin Wachs, “and the increased accessibility that those railroads gave to their landholdings made that land much more valuable.”48 Following the example of his uncle Collis, president of the Southern Pacific Railroad, Henry Huntington assembled the Pacific Electric Railroad System by taking control of seventy-two companies that were unable to compete and on the verge of bankruptcy in the first decades of the twentieth century. By 1925, the “Big Red Cars” of the Pacific Electric, which offered service on 1,164 miles of track, gave Los Angeles the largest interurban transit system in the world.49

In Figure 1.1, a map illustrating the system in 1920, the Pacific Electric is advertised as "the ideal way to see the Southland." With tracks extending from San Fernando to the north, San Pedro and Newport Beach to the South, Santa Monica to the west and San Bernardino to the east, the railroad was clearly focused on Los Angeles as the core of the metropolitan region. According to Richard S. Weinstein, “the Red Cars of Huntington provided a decentralized mass transit network of trolleys that facilitated the pattern of linked suburban village settlements dispersed over the landscape which irreversibly established the fundamental pattern of Los Angeles’ regional growth.”50 In terms of geography, the Pacific Electric Railroad bears a striking resemblance to the network of roads and freeways proposed in the *Major Traffic Street Plan*.

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In the first three decades of the twentieth century, the widespread adoption of the private automobile displaced the electric streetcar as the driving force of urban and industrial decentralization in Los Angeles. Urban historians agree that the fragmented and decentralized expansion of Los Angeles was in many ways a reflection of the technological possibilities and cultural preferences that existed at the turn of the twentieth century. This history has accurately emphasized the failure of the electric streetcar system to compete with the widespread adoption of the automobile as determining factors in the horizontal development of Los Angeles. According to Fogelson, “automobile registration in Los Angeles County, less than 20,000 in 1910, exceeded 100,000 in 1920, and approached 800,000 a decade later.”\(^{51}\) The local real estate industry, a consistent factor in the rapid residential settlement of the metropolis, adapted to the

\(^{51}\) Fogelson, *The Fragmented Metropolis*, 92.
possibilities afforded by the automobile by actively promoting an exclusive suburban ideal beyond the reach of the electric streetcar tracts.52

Based on the available transportation options at the time, the approval of the Major Traffic Street Plan in 1924 represented a formative moment in urban politics when Los Angeles became committed to an official policy of automobile-dependent, planned decentralization. To borrow the words of historian Kevin Starr, “the automobile became both the planning problem and the planning solution.”53 In a display of aggressive civic boosterism, the vested political and economic interests involved in the process of planned decentralization boasted of seizing an unprecedented opportunity to apply modern planning principles to improving on the structural flaws of the congested nineteenth century industrial city.54

The idea of turning Los Angeles into an automobile-friendly city turned out to be popular among voters, who approved a bond issue of $5,000,000 to implement the vision expressed in the Major Traffic Street Plan. Later that year, an additional $1,000,000 was also secured from council to maintain existing street pavement.55 “By approving decentralization,” argues Mark S. Foster, “planners in Los Angeles certainly challenged what they believed to be old-fashioned concepts.”56 This path to a spatial fix based on an emerging culture of automobility and internal combustion technology was not inevitable: decisions were made and opportunities were missed.

The Major Traffic Street Plan (Figure 1.2) "called for the widening, opening, and extending of several hundred miles of streets in the county and city."57 In this map, which served as the frontispiece of the report, we see a clear distinction between minor roads intended to

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52 Greg Hise, Magnetic Los Angeles: Planning the Twentieth-Century Metropolis (Baltimore: Johns Hopkins University Press, 1999); Bottles, Los Angeles and the Automobile, 175-210; Foster, “The Model-T, the hard sell,” 460-1; Fogelson, The Fragmented Metropolis, 164-185.
54 Ibid.
55 Bottles, Los Angeles and the Automobile, 113.
56 Foster, “The Model-T, the hard sell,” 482.
57 Bottles, Los Angeles and the Automobile, 109.
service local traffic and a system of wide streets and boulevards spanning the entire city and metropolitan region. The emphasis on the automobile as a dominant mode of transportation and as an integrating element of regional economic development in Southern California is clear.

Figure 1.2. Proposed road network for Los Angeles, 1924 (Source: Frederick Law Olmstead, Harland Bartholomew and Henry Charles Cheney, *Major Traffic Street Plan, Los Angeles, California*. Los Angeles: Traffic Commission of the City and County of Los Angeles, 1924).

In hindsight, it is easy to condemn the actions of a municipal leadership and voting public who embraced the automobile as a modernizing technology and means towards a new urban form that improved on the flaws of nineteenth-century industrial urbanization. “In each period,” explains Wachs, “a particular transportation technology was presented to the public as the epitome of modernity and inventiveness.”58 In the first decades of the twentieth century, the

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automobile provided a viable alternative to electric streetcars as a dominant mode of transportation in Southern California. “While Henry Huntington was portrayed as a villain,” argues Wachs, “Henry Ford was seen as a savior, and his profits were to a far lesser extent the object of derision by popular activists.”

Compared to the private freedoms offered by the automobile, streetcars were portrayed in local media as greedy corporate monopolies with little regard for customer satisfaction. The streetcars were seen as overcrowded and had difficulties maintaining operating schedules due to having to share streets with automobiles. Internal combustion was also making inroads into the electric streetcar business. By 1926, the Pacific Electric system was serving 15 percent of its ridership with busses, which were newer and cleaner and becoming increasingly popular among patrons of public transit in Southern California.

With a sprawling landscape tailored to the capacities of the automobile as a dominant mode of transportation, Los Angeles is often invoked as a prototypical form of decentralized metropolitan development that would become common in the decades after World War II. In the words of Fogelson, Los Angeles had “emerged by 1930 as the fragmented metropolis par excellence, the archetype, for better or worse, of the contemporary American metropolis.” Indeed, the structural logic of mid-nineteenth century urbanization did not seem to apply to the early-twentieth century expansion of Los Angeles. Unlike the older cities back east, oil-based energy formed the basis for expanded urban and industrial development in Southern California in the first decades of the twentieth century.

59 Ibid., 118.
60 Ibid., 124; Foster, “The Model-T, the hard sell,” 464.
62 Fogelson, The Fragmented Metropolis, 2.
Urban historians and historical geographers have acknowledged the enormous influence of the petroleum industry as a pillar of regional economic development in Southern California. Yet, existing research on the history of Los Angeles has not gone far enough in providing an integrative understanding of how its extraordinary growth in the first decades of the twentieth century was based on the possibilities afforded by a seemingly inexhaustible abundance of oil-based energy. Through the process of making long-term investments in conversion technologies and transportation infrastructures, resulting in new regional landscapes, oil was transformed into a useful and increasingly invaluable commodity for human society. Marketed as a superior fuel for transportation, oil created new possibilities for expanded urban and industrial development in a region where coal was scarce. The prototype may have been fragmented, but its decentralized urban structure has proven to be a resilient spatial fix for oil-based capitalism.

Managing abundance: the spatial fixes of oil-based energy in Los Angeles

At the turn of the twentieth century, the spatial fixes of oil-based energy were largely confined to the transportation networks (rail, water and pipeline), storage infrastructures and refineries that facilitated the production and consumption of liquefied fossil fuel. In the first three decades of the twentieth century, however, the market expansion of the Southern California petroleum industry was sustained through the gradual development of an urban environment tailored to the automobile as a dominant form of transportation. In other words, the establishment of oil-based energy in Los Angeles was facilitated by a spatial fix that took the form of a sprawling, suburban metropolis that was integrated by a regional system of roads.

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As I argue above, the concept of spatial fixity is a valuable theoretical framework for explaining why “geographical solutions” are generated as a means of displacing the inherent crisis tendencies that plague the process of capital accumulation. For most of the twentieth century and since the 1970s in particular, the politics of oil conservation, particularly at the national scale, have been motivated by the looming specter of impending resource scarcity. Oil, after all, is a finite natural resource. In the formative decades of the Southern California petroleum industry, however, the problem was never scarcity in a strictly material sense, but rather, the social production of scarcity as a means of managing resource abundance.

In the first three decades of the twentieth century and in the 1920s in particular, the successive discoveries of major oil fields across Southern California resulted in chronic bouts of extreme overproduction and excessive waste. Whereas the massive consumption of fossil fuel energy by regional railroads sustained a consistent demand for unrefined fuel oil produced in Southern California, the widespread adoption of the private automobile in the first three decades of the twentieth century created a massive new market for gasoline. “The development of motor transportation during the past two decades has been one of the most rapid and spectacular economic developments in all of history,” wrote economist John Ise in 1926, “comparable in its magnitude with the development of steamships, railroads, or electric utilities.” Even with the development of new markets, however, the ongoing production of urban and industrial space was essential to the process of managing abundance in Southern California. Whereas the development of Los Angeles Harbor into an industrial space of oil transshipment made the export of regional surpluses possible, the development of a decentralized metropolitan

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environment tailored to the automobile solidified the status of oil as a dominant fuel for transportation. In this dissertation, I argue that Los Angeles provides the first example of oil-based metropolitan development in North America.

Urban and industrial, the spatial fixes of oil-based energy that emerged in Southern California in the first three decades of the twentieth century presented different problems to vested political and economic interests at different geographic scales.\textsuperscript{67} To be sure, the urban and industrial networks that shaped the emergence of Los Angeles as the first oil-based metropolis in North America were regional in scale: from the tracks of the Southern Pacific Railroad, to the pipelines of private oil companies and to the roads that sustained a massive demand for private automobiles. From a regional perspective, government at the municipal and state levels oversaw the emergence of oil-based energy in Los Angeles. Beyond the interests of regional economic development, however, the oil-based energy system that emerged in Los Angeles in the first three decades of the twentieth century became a strategic geographic focus of federal efforts to conserve what were perceived to be dwindling supplies of vital fossil fuel energy resources.

In Chapters Five and Six of this dissertation, I examine how the spatial fixes of oil-based energy in Los Angeles had different implications at different geographic scales, exposing huge gaps between local, state and federal priorities. “In California,” explains Nancy Quam-Wickham, “local politics diverged significantly from federal policies.”\textsuperscript{68} Since the earliest stages in the development of Los Angeles Harbor, made possible an enormous outlay of capital from the federal government, the national state has assumed a vested interest in the emergence of oil-based energy. With the outbreak of modern world warfare in the first decades of the twentieth

\textsuperscript{67} Brenner, “Between fixity and motion,” 459-481.

\textsuperscript{68} Nancy Quam-Wickham, “Cities sacrificed at the altar of oil: popular opposition to oil development in 1920s Los Angeles,” \textit{Environmental History} 3 (2) (1998): 189-209, 190.
century, particular in the Pacific, the history of federal investment into the development of Los Angeles Harbor became a major asset of National Security.

Despite the ongoing process of managing abundance through the production of urban and industrial space, the spatial fixes of oil-based energy that shaped the development of Los Angeles into a sprawling metropolis were never absolute in their capacity to completely displace crises of capital accumulation. With the discovery of new fields, the market for oil in Los Angeles was prone to rapid and drastic price fluctuation. From the perspective of oil-based energy, the production of scarcity has never been an easy task for municipal state and federal governments. In the words of energy historian John C. Clarke, “the inescapable risks involved in discovery, the migratory nature of the oil locked far beneath the earth’s surface, the customary methods of recovery, the judicial concept of law of capture, leasing and royalty practices, the processing required, the wide variety of products that refining produced, the great distance separating the producing and central consuming areas – [all of these] describe the substantive components of oil politics.” As will be illustrated in Chapters Five and Six, there were many factors and contingencies that could have a formative impact on the politics of oil-based energy.

Over the span of several decades, the spatial fixes of oil-based energy have had the cumulative impact of locking into place a destructive and unsustainable form of capital accumulation. “Oil, more than any other raw material,” explains Labban, “demonstrates the spatio-material contradictions of capital and the importance of the extension of capital into natural resources for the continued accumulation of capital as a whole.” In a strictly material sense, this form of expansion is unsustainable over the long run because it is dependent on a nonrenewable source of fossil fuel energy.

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Here it must be emphasized that the contradictions of oil-based capitalism are more than a function of increasing dependence on a nonrenewable resource. In Southern California, the political, economic and ecological complexities of oil culminated in an extremely volatile market where unpredictable spurts of overproduction following the discovery of new fields was a major factor that contributed to the extreme wasting of oil in the first decades of the twentieth century. “When oil is so cheap as to be hardly worth saving,” observed economist John Ise in 1926, “there are many ways in which it is wasted.”\(^71\) During periods of overproduction, maintaining structured coherence was an ongoing process that was dependent on using artificial mechanisms to enforce scarcity amid a seemingly inexhaustible abundance of oil.\(^72\)

When it erupted like an angry volcano on 15 March 1910, the Lakeview Gusher sprayed a column of oil nearly 200 feet into the air over the Midway-Sunset Field of Southern California. “It grew stronger and stronger,” wrote Frank J. Taylor and Earl M. Welty in a 1950 publication, “blasting out a crater so deep and wide that the derrick and all the drilling equipment disappeared.”\(^73\) In Figure 1.3, a newspaper image from 1910, the Lakeview Gusher is reflected in the foreground by a massive lake of oil. Due to a lack of storage capacity, only a small portion of this oil could be salvaged before it either evaporated or was soaked up into the earth. The sheer force of the gusher is evident by how nearby derricks are easily dwarfed by the massive column of oil. Still regarded as the largest accidental oil spill in history, the Lakeview Gusher lasted for 18 months before it could be brought under the control in September of 1911. By this time, an estimated 9 million barrels of crude oil was released into the environment.

\(^71\) Ise, The United States Oil Policy, 154.
In retrospect, the Lakeview Gusher can be interpreted as a reflection of the emerging state of oil production in Southern California. In addition to emphasizing the importance of adequate storage and transportation infrastructures, the 4 million barrels of oil that were eventually salvaged from the gusher, to use the words of Talyor and Welty, “hit the market like a sledgehammer.” The oil that could not be recovered either soaked into the earthen ground or evaporated into thin air. Despite the extreme waste and the damage to the market that eventually resulted, the Lakeview Gusher forever changed the reputation of “Dry Hole Charlie,” the man responsible for drilling it.

Ibid., 141.
Despite periods of market stability, the history of the petroleum industry in the United States has been punctuated by spectacular events where the contradictions of oil-based capitalism would literally come exploding to the surface. The imagery of the oil gusher is often associated with immediate and unlimited material wealth, “a powerful symbol in the history of the American Southwest.” Yet, for the prospectors and investors involved, gushers were unexpected disasters that needed to be controlled as soon as possible with adequate storage and transportation infrastructures.

Conclusion

Developing a dialectical perspective of oil-based energy that must be situated in time and place, this chapter argues that the spatial fix is a perspective that offers more than insight into the expansionary and universalizing tendencies of capital accumulation. At the regional scale, the dynamics of the spatial fix also explains the ways in which fixed capital investment has sustained an increasing dependency on oil-based energy. From this perspective, the regional development of fossil fueled energy systems in North American can be viewed as a major source of historical and geographic inertia.

In Southern California and Los Angeles in particular, the spatial fix associated with oil-based energy was implicated in the production of urban and industrial spaces, culminating in a sprawling, fragmented and decentralized metropolitan landscape. To be sure, there is an established urban history on Los Angeles that has offered important insights into the structural dynamics of fractured and decentralized metropolitan development. Yet, the role of energy in the development of the first automobile-dependent city in the United States has not received due attention. Paved with asphalt produced in Southern California, city streets and eventually an

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extensive freeway system functioned as a spatial fix for the internal combustion engine. Development was fixed, layered and literally embedded in space. The next chapter examines these themes in greater detail.
CHAPTER TWO

Fueling metropolitan development: landscapes and layers of oil-based energy in Southern California

Public opinion and market price have always been important considerations in the oil business. In 1958, Standard Oil of California published an advertisement in several newspapers across the United States that addressed both of these factors. If the title is any indication, the purpose of this advertising campaign was to explain to consumers how “Standard’s busy transportation system helps hold down prices of petroleum products” (Figure 2.1). According to the ad, a complex yet “carefully scheduled” transportation network consisting of steamships, pipelines, trucks and railroads is the primary reason why prices for petroleum products have remained cheap in California: “this far-flung transportation job is done at a cost so low it amounts to a fraction of the price per gallon –generally less than you pay to mail a postcard.” Beginning with coal in the middle of the nineteenth century, the expansion of urban-industrial capitalism in North America has been sustained by (and has become increasingly dependent on) the cheap and abundant resources of fossil fuel energy. As will be illustrated in this dissertation, this was a process of regional development that started before 1958 and extended well beyond the corporate influence of Standard Oil.
Figure 2.1. Relationship between transportation and cheap fuel prices in Southern California (Source: Lodi-News Sentinel. 17 February 1958, p. 14).
Between 1890 and 1930, oil-based energy formed the basis for expanded urban and industrial development in Southern California. The result was a new metropolitan landscape that has been characterized in the literature as “fragmented,” “decentralized,” and tailored to the capabilities of the internal combustion engine. In order to gain insight into the inertia of fossil fuel energy, this chapter examines the emergence of landscapes and layers of oil-based capitalism in Southern California in the late nineteenth and early twentieth centuries. It will be illustrated how processes of metropolitan development in Southern California in the first three decades of the twentieth century were a reflection of a society and culture that was becoming increasingly dependent on oil as a primary source of transportation energy. Los Angeles was the first city in North America where oil-based energy became a formative element of decentralized urban and industrial development: not only as fuel, but also in the infrastructures and networks that sustain fossil fuel dependence.

Comprised of four sections, this chapter opens by sketching a prehistory of oil-based energy in Southern California, emphasizing the complex dynamics of resource abundance and scarcity in shaping a unique regional ecology. The conditions were ripe for an energy transition that culminated in the emergence of oil as a dominant fuel for industry and transportation. The focus of the second section is the evolving geographies of oil production in Southern California between 1890 and 1930, which was shaped by large-scale capital investment, successive field discoveries and emerging patterns of urban and industrial development. In the third section, I explain the role of refining technologies in gradually expanding the market for Southern

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California petroleum in the first decades of the twentieth century. In the context of the oil-based energy system, refining is regarded as an essential piece of technology (and form of fixed-capital investment) that made the production of gasoline possible. Then, in the fourth and final section of this chapter, I examine how the emergence of oil-based energy in Southern California in the first three decades of the twentieth century was sustained by the rapid and decentralized expansion of Los Angeles, the first example of oil-based metropolitan development in North America.

A prehistory of oil-based energy in Southern California

Oil has always been useful to the people of California – just in different ways. Even before Spanish settlement in the sixteenth century, indigenous communities on the Pacific Coast collected oil from natural seepages. The heaviest asphalt was used for a variety of practical purposes, including waterproofing baskets, sealing wooden canoes, attaching arrowheads to shafts and as a hard coating to repair mortars and pestles. By contrast, oils of a lighter consistency were used by native people in California as a medical remedy for coughs, colds, cuts and burns. “This oil was highly prized,” described W.W. Orcutt in a 1926 publication, “and was an article of commerce between the coast tribes and the Indians of the interior, who were remote from the source of supply.”

Building on the localized knowledge of indigenous peoples, the earliest Spanish settlers also made use of the wide range of oils that bubbled to the surface in California. Since oil could be collected easily from the surface and was visible from many California roads, it was often used to lubricate the wheels of wagons.

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In North America, the early capitalist market for oil was stimulated when it was discovered that “rock-oil” extracted in Pennsylvania beginning in the 1860s could be used as an alternative for “coal oil.” Commissioned by eastern capital, the field reports of Benjamin Silliman Jr., a Yale-educated chemist, were instrumental in drumming up speculative enthusiasm for the use of Pennsylvania oil as an illuminant in kerosene lanterns. The advent of hydrocarbon-based illumination represented a serious threat to an existing market in whale oil, which was becoming increasingly scarce.

Based on early market success for rock oil in Pennsylvania, eastern investors immediately turned their attention to seeking out new resource deposits across the continent. Eventually, Silliman was commissioned to investigate the potential of California oil as an illuminant, which was confirmed in a report submitted to investors in 1865. “It is difficult to give a plain statement of the facts thus observed, without seeming to be carried away with enthusiasm or invested with a spirit of exaggeration,” proclaimed Silliman in the report, “so vast are the areas on which oil outcrops are found, and so unmistakable the indications which declare its presence.” The resource abundance observed by Silliman was promising, who made the daring claim that “California will be found to have more oil in its soil than all the whales in the Pacific Ocean.”

In the early 1860s, surface oil throughout California was collected mainly in ditches and tunnels and transported to market in leaky wooden barrels. However, competition for surface oil in the most accessible locations combined with relatively steep operating costs (mainly labor and transportation) had the effect of limiting the scale of seep and tunnel operations. After the

8 Silliman quoted in American Petroleum Institute, *California’s Oil* (API, Department of Information, 1948), 1.
discovery of oil in Pennsylvania, the widespread application of drilling technologies innovated in the east unlocked the potential to extract oil from vertical territory in California. By 1865, there were 65 companies of various sizes drilling for oil across the state; in the eyes of many industry observers, California’s first oil boom was underway.

As explained by energy expert Vaclav Smil, “a plural rather than collective singular is a more accurate designation of crude oils because they encompass substances of considerable heterogeneity and very widely in their appearance, composition, viscosity, flammability, quality and hence in economic usefulness…” Measured in units called Baumés, gravity refers to the density and size of the hydrocarbon molecules – as complex and as varied as they may be – that comprise the crude oil mixture. The higher the degrees on the Baumé index, the lighter the gravity of the oil. In general, lighter gravity oils are considered more valuable because they can more easily be refined into a wider range of high-value products such as gasoline.

Despite early optimism among investors that eastern market success could be emulated on the Pacific Coast, the relatively high viscosity of California oil made it unsuitable as an illuminant. Whereas a low-viscosity, paraffin base made Pennsylvania oil conducive as an illuminant, most of the oil sold commercially in California in the 1860s had a heavy asphalt base, which made it relatively dark and gummy. This oil was considered “heavy” because it contained more carbon and less hydrogen than oil produced in Pennsylvania. “When burned under similar conditions,” observed William Lord Watts in 1900, “California oil gives a more smoky flame

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than does oil manufactured from Eastern petroleum.”\(^{13}\) With a smoky and smelly flame, California oil was simply unable to compete with kerosene produced in Pennsylvania. According to Gerald T. White, “the quality of California lubes, if anything, was even worse.”\(^{14}\) By 1867, overproduction in the Pennsylvania fields brought illuminating oil to California at a price lower than local producers could meet. As a result, drilling activity in California declined significantly in the 1870s and many oil wells capable of producing were left idle.\(^{15}\)

California’s “first oil boom” was a relatively short-lived affair, lasting only a few years until the speculative enthusiasm and capital that motivated it eventually diminished. “But in this brief span of time,” argues White, this early boom “called to national attention the fact that California possibly possessed another great source of mineral wealth besides gold, a promise that in due course would be aptly fulfilled.”\(^{16}\) This promise was realized in the 1890s, when it was discovered that California oil offered a cheap and abundant source of liquid energy that could be used without refining as fuel in steam-powered engines. This discovery was motivated by a relative scarcity of coal in California, which was not regionally abundant and was becoming increasingly difficult and costly to import in the latter decades of the nineteenth century. Just as in Pennsylvania in the 1860s, there was a regional specificity to how oil was produced and consumed in Southern California.

**Geographies and industrial networks of oil production in Southern California**

Until the discovery of the Los Angeles field in the early-1890s, the bulk of oil production for the state came from the Ventura-Newhall district of Southern California. When combined, the output

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\(^{13}\) Watts, *Oil and Gas Yielding Formations of California*, 209.


from these two fields made coastal Southern California the focus of oil production in the state, which by 1898 totaled 2,249,088 barrels of oil. The discovery of the Los Angeles oil field was considered by contemporary observers to be the first major discovery of the modern California petroleum industry.\textsuperscript{17}

In 1900, geographies of oil production in Southern California shifted after the discoveries of the Kern River and Sunset fields in the San Joaquin Valley. By this time, the rapid and wasteful extraction of oil across the town lots of Los Angeles was leading to the rapid depletion of that field. With the San Joaquin Valley discoveries, the focus of oil production drifted from the coastal Los Angeles region to the northern portion of Southern California. Due to the scarcity of coal in the region, the high output of fuel oil from wells in the San Joaquin Valley represented an important source of cheap and abundant energy in the first two decades of the twentieth century. Oil production at Kern River peaked at 17 million barrels in 1904, making the total state production for that year explode to 29,548,634 barrels. By this time, California was leading the nation in terms of oil production.\textsuperscript{18}

In the first two decades of the twentieth century, oil fields in the San Joaquin Valley provided the bulk of production for the California petroleum industry (Table 2.1). Yet, within a span of a few short years, a series of successive discoveries at Huntington Beach (1920), Santa Fe Springs (1921) and Long Beach (1921) shifted the geographic focus of the petroleum industry back to the Los Angeles region. According to a report published by the Los Angeles Chamber of Mines and Oil, “the period from 1920 to 1923 will probably stand out as the most momentous in California’s oil industry.”\textsuperscript{19} By 1923, the combined production from these three fields

\textsuperscript{18} Anthony Kirk, A Flier in Oil: Adolph B. Spreckels and the Rise of the California Petroleum Industry (San Francisco: California Historical Society, 2000), 10-12; Melosi, Coping with Abundance, 47.
\textsuperscript{19} Ibid.
contributed 183 million barrels to a total state output of over 263 million barrels, which was almost twice the amount generated in the previous year. In the words of contemporary petroleum geologist Joseph Jensen, writing for the American Association of Petroleum Geologists in 1924, the discovery and intensive exploitation of these fields in the Los Angeles Basin resulted in “the greatest outpouring of mineral wealth the world has ever known.” Fueled by discoveries in the Los Angeles Basin, the 1920s was a decade of extreme overproduction for the Southern California petroleum industry.

\[^{20}\text{Quoted in Fred W. Viehe, “Black gold suburbs: the influence of the extractive industry on the suburbanization of Los Angeles, 1890-1930,” Journal of Urban History 8 (3) (1981): 3-26, 13.}\]
Table 2.1. Southern California oil field and production data, 1876-March 1928

<table>
<thead>
<tr>
<th>Field</th>
<th>Year of first production</th>
<th>Year</th>
<th>Barrels produced in 1927</th>
<th>Barrels produced in March 1928</th>
<th>No. of wells in production in March 1928</th>
<th>Average daily production per well in March 1928</th>
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</thead>
<tbody>
<tr>
<td>Ventura and Newhall</td>
<td>1876</td>
<td>1925</td>
<td>9,263,427</td>
<td>2,197,644</td>
<td>508</td>
<td>11.2</td>
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<td>Los Angeles - Salt Lake</td>
<td>1894</td>
<td>1908</td>
<td>5,138,959</td>
<td>630,600</td>
<td>333</td>
<td>4.7</td>
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<td>Summerland</td>
<td>1894</td>
<td>1899</td>
<td>208,307</td>
<td>49,475</td>
<td>91</td>
<td>1.4</td>
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<td>Coalinga</td>
<td>1896</td>
<td>1912</td>
<td>19,546,122</td>
<td>7,154,599</td>
<td>985</td>
<td>19.7</td>
</tr>
<tr>
<td>Fullerton (Brea-Olinda)</td>
<td>1897</td>
<td>1911</td>
<td>7,081,165</td>
<td>7,008,934</td>
<td>381</td>
<td>41</td>
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<td>McKittrick</td>
<td>1898</td>
<td>1909</td>
<td>5,807,360</td>
<td>1,855,603</td>
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<td>16.8</td>
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<td>Kern River</td>
<td>1900</td>
<td>1904</td>
<td>17,226,240</td>
<td>6,098,582</td>
<td>1,416</td>
<td>18.2</td>
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<tr>
<td>Sunset</td>
<td>1900</td>
<td>1914</td>
<td>12,546,615</td>
<td>31,607,708</td>
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<td>28.4</td>
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<td>Midway</td>
<td>1901</td>
<td>1914</td>
<td>37,479,228</td>
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<td>Santa Maria - Lompoc</td>
<td>1902</td>
<td>1908</td>
<td>8,669,350</td>
<td>1,999,051</td>
<td>224</td>
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<td>Los Hills - Belridge</td>
<td>1910</td>
<td>1917</td>
<td>6,295,329</td>
<td>1,515,300</td>
<td>308</td>
<td>13.2</td>
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<tr>
<td>Coyote</td>
<td>1912</td>
<td>1918</td>
<td>12,614,598</td>
<td>5,146,864</td>
<td>210</td>
<td>65.1</td>
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<td>Whittier</td>
<td>1912</td>
<td>1917</td>
<td>1,156,752</td>
<td>660,505</td>
<td>179</td>
<td>9.6</td>
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<td>Montebello</td>
<td>1917</td>
<td>1919</td>
<td>12,100,784</td>
<td>5,498,252</td>
<td>175</td>
<td>71</td>
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<td>Richfield</td>
<td>1919</td>
<td>1922</td>
<td>8,314,528</td>
<td>7,884,042</td>
<td>259</td>
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<td>Elk Hills</td>
<td>1919</td>
<td>1921</td>
<td>18,085,425</td>
<td>10,073,073</td>
<td>225</td>
<td>104.5</td>
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<td>Huntington Beach</td>
<td>1920</td>
<td>1923</td>
<td>34,355,642</td>
<td>26,344,697</td>
<td>576</td>
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<td>Santa Fe Springs</td>
<td>1921</td>
<td>1923</td>
<td>79,781,275</td>
<td>15,153,578</td>
<td>308</td>
<td>122</td>
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<tr>
<td>Long Beach</td>
<td>1921</td>
<td>1923</td>
<td>68,810,361</td>
<td>34,541,667</td>
<td>647</td>
<td>193.3</td>
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<tr>
<td>Torrance</td>
<td>1922</td>
<td>1924</td>
<td>17,526,123</td>
<td>8,338,938</td>
<td>649</td>
<td>29.3</td>
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<tr>
<td>Dominguez</td>
<td>1923</td>
<td>1925</td>
<td>13,328,817</td>
<td>5,887,645</td>
<td>74</td>
<td>170</td>
</tr>
<tr>
<td>Wheeler Ridge</td>
<td>1923</td>
<td>1927</td>
<td>374,734</td>
<td>374,734</td>
<td>31</td>
<td>29.2</td>
</tr>
<tr>
<td>Rosencrans</td>
<td>1924</td>
<td>1925</td>
<td>7,263,466</td>
<td>3,506,116</td>
<td>111</td>
<td>60.8</td>
</tr>
<tr>
<td>Inglewood</td>
<td>1924</td>
<td>1925</td>
<td>18,348,395</td>
<td>12,751,556</td>
<td>221</td>
<td>136.2</td>
</tr>
<tr>
<td>Seal Beach</td>
<td>1926</td>
<td>1927</td>
<td>16,424,929</td>
<td>16,424,929</td>
<td>133</td>
<td>301.6</td>
</tr>
<tr>
<td>Ventura Ave.</td>
<td>1926</td>
<td>1927</td>
<td>17,808,704</td>
<td>17,080,704</td>
<td>112</td>
<td>457.3</td>
</tr>
</tbody>
</table>


Piece by piece, a vast industrial transportation network comprised of railroads, pipelines and highways was built to integrate the oil-producing districts surrounding Los Angeles and across Southern California. Compared to coal, the liquid qualities and relatively high energy
density of oil made it incredibly cheap and easy to transport.\textsuperscript{21} Beginning in the second half of the nineteenth century, the development of a regional network of pipelines added a significant layer to the spatial fixity of oil-based energy in Southern California. Completed in 1880, the first pipeline in California was a 2-inch line that extended from Pico Canyon to the Newhall refinery of the Pacific Coast Oil Company. After 1896, a massive pipeline built by Union Oil from the Whittier-Fullerton fields to a refinery in Los Angeles formed a major linkage that integrated widely dispersed fields and refinery sites at San Pedro, El Segundo and Vernon into a regional transportation system that spanned city, town and countryside. “In a remarkably short time,” describe Frank J. Taylor and Earl M. Welty, “Union had the beginning of a pipeline network connected the oil fields with refineries, a system that grew into Union’s Southern Division network, blanketing 1,000 square miles in the Los Angeles and Ventura basins.”\textsuperscript{22} In the context of the emerging energy system, pipelines were significant because they challenged and effectively ended the monopoly that railroads (and Standard Oil, by extension) had over the regional shipment of oil. Since Union did not use its pipeline system to full capacity, it made strategic arrangements with independent, small-scale producers to move crude oil from inland fields to the Pacific Coast at a rate that undercut the railroads.\textsuperscript{23}

By 1915, a massive pipeline network spanned the vast oil-producing region of Southern California. As shown in Figure 2.2, the San Joaquin Valley was connected to tidewater at San Francisco through a line 275 miles long, with Port Harford and Monterey by lines 80 to 110 miles long, and with Los Angeles Harbor by a line 158 miles long. The coastal oil fields were also well integrated, with lines up to 50 miles in length connecting them with ports at Hartford,

\textsuperscript{21} Matthew T. Huber, “Energizing historical materialism: fossil fuels, space and the capitalist mode of production,” Geoforum 40 (2008): 105-115,
\textsuperscript{23} Ralph Arnold and V.R. Garfias, Geology and Technology of the California Oil Fields. Bulletin No. 87 of the American Institute of Mining Engineers (New York, March 1914), 390-392.
Ventura and Los Angeles Harbor. In combination, this network of pipelines had a total length of 2,500 miles with a daily carrying capacity of 350,000 barrels.\textsuperscript{24}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{pipeline_map.jpg}
\end{figure}

\textsuperscript{24}Arnold, “Petroleum resources and industries of the Pacific Coast,” 78.
By 1928, the regional network of pipelines that facilitated the production of oil in Southern California had expanded to over 5,000 miles. Although California accounted for approximately twenty-five percent of the crude oil produced in the United States at this time, the state ranked seventh in terms of overall pipeline mileage with eight percent of the national total. This was due to the relatively close proximity between points of extraction and transshipment nodes that characterized the geography of oil production in Southern California. The 200 pumping stations that served this system were spaced approximately 40 miles apart. In addition to pipelines, the system that facilitated the economical provision of oil-based energy in 1928 was supported by a nation-leading storage capacity of over 200,000,000 barrels capacity and 80 refineries, many of which were considered world-leading in terms of overall efficiency and modern equipment.²⁵

Despite chronic market instability that resulted from new field discoveries, oil-based industrialization in Southern California emerged as a driving force of regional economic development in the first decades of the twentieth century. By the end of 1927, the grand total of oil produced in California amounted to 2,800,000,000 barrels worth $3,000,000,000. In that year, 500 companies generated an output of 230,750,000 barrels of oil from more than 11,000 wells. In addition, California oil companies employed a labor force of approximately 60,000 people who were paid wages totaling $125,000,000 per year. When related industries were considered, there were 200,000 people in California in 1928 who were dependent on the oil industry for their incomes, a list that included “hundreds of companies supplying equipment and staples, specialists in various lines, attorneys, engineers, chemists, and an almost endless list of individuals who have either services or materials to sell.”²⁶ By the onset of the Great Depression

²⁵ Higgins, California’s Oil Industry, 24.
²⁶ Ibid., 7
in 1930, oil companies based in Southern California were purchasing more than $100,000,000 worth of supplies and equipment each year.\textsuperscript{27}

**Refining the market for oil-based energy**

Refining is the process of extracting a range of useful products from a barrel of crude oil, including various types of fuel, lubricating oils and a range of inputs for petrochemicals manufacture. In the nineteenth century, refining operations focused on the distilling of crude oil to obtain kerosene for illumination purposes. The first refinery in California built at Newhall relied on simple thermal distillation and had a daily capacity of 20 barrels, which had to be put in wooden barrels and hauled by teams to a nearby highway.\textsuperscript{28}

With the invention of internal combustion technology, however, and the widespread adoption of the automobile in the first decades of the twentieth century, the focus of the refining industry shifted from illumination to the production of gasoline. In this regard, the 1913 invention of thermal cracking by William Barton of the Standard Oil Company of Indiana represented a major leap forward in refining technology that increased the yield of gasoline that could be extracted from a given quantity of crude oil. “His thermal cracking process introduced flexibility into refinery output,” explains Yergin, “something the industry had never had before.”\textsuperscript{29} Innovations in cracking processes that allowed for a higher recovery of gasoline in refining operations was essential to the process of managing resource abundance and facilitating market expansion in Southern California.

At the turn of the twentieth century, the emerging petroleum industry in Southern California (known for producing heavy crude) was sustained by an enormous demand for

\textsuperscript{27} Ibid. Data expressed in 1928 dollars.
\textsuperscript{28} Orcutt, *Early Days in the California Fields*, 8.
unrefined fuel oil, which was burned in the boilers of railroads, steamships and public utilities. Despite the dominant market for fuel oil, which accounted for 80 percent of total state output as late as 1917, the application of the thermal cracking process in refineries throughout Southern California resulted in a notable increase in the production and marketing of refined petroleum products. The 1920s were a particularly formative decade in the development of the gasoline market in the Los Angeles area. “In 1927,” according to Edwin Higgins, “more crude oil was treated in California refineries than in any other major oil region of the country.”30 Higgins, who was writing for the Chamber of Mines and Oil at the time, then goes on to break down the range of products that could be refined from a 42-gallon barrel of crude oil, out of which “may be obtained approximately 14.7 gallons of gasoline (35 percent), 3.3 of kerosene (8 percent), 1.7 [gallons] of distillate (4 percent), and 6.3 gallons of gas oil (15 percent).”31 Whereas the demand for gasoline and other refined products continued to increase in the first decades of the twentieth century, the general demand for unrefined fuel oil remained relatively stable. The market for gasoline and diesel, rather than unrefined crude, is the reason why oil remains the dominant energy for transportation that fuels the capitalist mode of production.

In the first three decades of the twentieth century, refineries comprised a major technological component of the oil-based energy system that emerged in Southern California. Los Angeles Harbor, which handled the bulk of export activity for the state in the late 1920s, became a major geographic focus (or node) of refining operations for the greater industrial region. By 1924, California was second to Texas in terms of refining plants but first in terms of overall refining capacity. According to the New York Times, the overproduction of crude oil in Southern California in the first two decades of the twentieth century and especially in the early

30 Edwin Higgins, California’s Oil Industry: An Outline of its History, Development, Present Importance and Inherent Hazards (Los Angeles: Chamber of Mines and Oil, 1928), 8.
31 Ibid., 32.
years of the 1920s was a driving force behind the overbuilding of refineries in the region. The refineries represented hundreds of millions of dollars in fixed capital investment, with the largest facilities costing upwards of twelve million dollars to build. The modern refining facilities built in California in the late 1920s were considered by industry observers at the time to be “world leaders in efficiency and capacity.” Yet by August of 1928, out of a total of 78 refineries built in California, only 46 were in operation at 71 percent of total capacity. In Southern California, the overproduction of refining capacity (a reflection of depressed market conditions for crude oil at particular points in time) happened despite extreme and oftentimes short-term fluctuations in the market price for crude oil. Landscapes of oil-based energy were fixed, but the markets for oil and refined petroleum products were not.

The example of refining illustrates how the emergence of oil-based energy in the first decades of the twentieth century was predicated on the ability of oil companies to develop technological solutions to complex ecological problems. “The biophysical world does indeed present all sorts of obstacles to accumulation,” argue Boyd, Prudham and Schurman, “and the development of nature-based industries is very much a product of the efforts of firms to overcome such obstacles.” Moving energy in the form of crude oil across space was one such obstacle. Completed by the Standard Oil Company in 1903, the first 8-inch pipeline in California was a 300-mile channel that connected Bakersfield to San Francisco Bay. Compared to eastern oils, the high-viscosity of Kern River crude forced the engineers of Standard Oil to develop pumping stations equipped with heaters to thin the oil sufficiently so it could flow readily through pipeline. This plan was initially unsuccessful because the oil did not retain heat when

32 “Oil refineries record expansion,” New York Times (June 22, 1924), W16.
33 Edwin Higgins, California’s Oil Industry, 35.
34 Ibid.
being forced through pumping stations spaced 30 miles apart. However, this problem was eventually solved when the distance between pumping stations was reduced to 15 miles. According to an analysis of the industry published in 1928, “the successful outcome of this project, in spite of the mechanical difficulties involved and the record low price prevailing for oil, was regarded as a remarkable achievement.”

In 1925, the Pan American Petroleum Company pioneered the use of diesel engines for pumping oil through a 137-mile line that connected the Midway Field to the harbor at San Pedro. Also in that year, the Associated Oil Company, the major oil-interest of the Southern Pacific Railroad, laid the first submarine lines for loading tankers at Los Angeles Harbor, one from Ventura and the other from Monterey. Innovations in transportation technologies were essential to the emergence of a modern petroleum industry in Southern California. Small-scale, independent producers may have been a mainstay of the California petroleum industry between 1890 and 1930, but large corporations like Standard Oil played an essential role in providing the capital and organizational structure needed to develop and implement new technologies. The following chapter on the Southern Pacific Company will examine the influence of corporate structure on regional economic development in greater detail.

**Fossil fueled urbanization in Southern California**

In Southern California, the geographic industrialization of oil had direct implications on the production of urban space and the expanded metropolitan development of Los Angeles in the first decades of the twentieth century. As we see in Table 2.2, Los Angeles had a population of 102,497 by 1900 and was the hub of a relatively localized machine and metalworking sector devoted to the extraction and processing of oil, with hundreds of small firms providing

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37 Higgins, *California’s Oil Industry*, 25.
38 Ibid., 26.
equipment and offering services.\textsuperscript{39} Over the next three decades, Southern California became the fastest growing industrial economy on the Pacific Coast and Los Angeles was the fastest growing metropolitan region. By 1930, the population of the City of Los Angeles had reached over 1.2 million people and the population of Los Angeles Country exploded to over 2.2 million people, making it the largest industrial economy on the Pacific Coast with 4,908 manufacturing establishments employing a workforce of 114,480.\textsuperscript{40} In other words, the problem of cheap fuel that limited and urban and industrial expansion in Southern California throughout most of the nineteenth century seemed to be solved.

<table>
<thead>
<tr>
<th>Year</th>
<th>City population</th>
<th>County population</th>
<th>Industrial plants</th>
<th>Industrial workers</th>
<th>Value of Products ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1880</td>
<td>11,183</td>
<td>33,391</td>
<td>172</td>
<td>706</td>
<td>1,668,450</td>
</tr>
<tr>
<td>1890</td>
<td>50,395</td>
<td>101,454</td>
<td>534</td>
<td>5,173</td>
<td>15,134,000</td>
</tr>
<tr>
<td>1900</td>
<td>102,497</td>
<td>170,298</td>
<td>814</td>
<td>10,424</td>
<td>34,814,000</td>
</tr>
<tr>
<td>1910</td>
<td>319,198</td>
<td>504,131</td>
<td>1,325</td>
<td>17,327</td>
<td>68,586,000</td>
</tr>
<tr>
<td>1920</td>
<td>576,674</td>
<td>936,455</td>
<td>3,514</td>
<td>61,665</td>
<td>417,808,804</td>
</tr>
<tr>
<td>1930</td>
<td>1,238,048</td>
<td>2,202,510</td>
<td>4,908</td>
<td>114,480</td>
<td>1,130,386,486</td>
</tr>
</tbody>
</table>


The steam engine was foundational, but the development of the internal combustion engine solidified the importance of oil as the dominant form of motive energy in modern capitalist society. In the first decades of the twentieth century, the Los Angeles metropolitan area was the first region in North America to reflect the burgeoning influence of automobile-based culture. “By 1920 the citizens of Los Angeles had one automobile per nine people,” describes Wachs, which was “by far the highest rate of automobile ownership in any major American city.”\textsuperscript{41} In his fictional yet revealing account of oil development in Southern California, Upton

\textsuperscript{39} Walker, “California’s golden road to riches,” 185.


Sinclair captures the liberating feeling of “an engine full of power, magically harnessed, subject to the faintest pressure from the ball on your foot. The power of ninety horses – think of that!”

Powered by internal combustion, a new, automobile-dependent culture was emerging in Southern California: culture, energy and landscape were co-determining elements in this historical geographical process.

To be sure, urban historians have noted the formative influence of the automobile in shaping metropolitan development in Southern California. “Fifty-five thousand autos plied the streets of Los Angeles by 1915,” observes James C. Williams, “increasing to 140,967 in 1919, and to 776,677 ten years later.” After becoming established on the asphalt-paved streets of Los Angeles, the automobile found its way across California and eventually the entire nation. By 1925, a statewide vehicle ownership of over 1.4 million was nearly twice the national average.

In the construction of a statewide transportation network, California was a pioneer in the development of a user-financed system that included taxation on automobile registration and gasoline consumption. “When automobile ownership began to surge in the late 1910s and early 1920s,” explains Christopher W. Wells, “gas taxes provided a new, almost magically large source of revenue that allowed states to embark on aggressive road-construction campaigns.” According to Paul Sabin, this was the first example of “transportation by taxation” in North America. Under strong pressure from automobile clubs in California, in 1909 the legislature authorized an $18 million bond issue for the construction of a paved state highway system. Voters approved the first of many bond issues in 1910. California was also able to take advantage of the Federal Highway Act of 1914, which authorized dollar-sharing grants to states.

42 Sinclair, Oil!, 5.
Overall, the system of highway financing pioneered and implemented in California in the first decades of the twentieth century was extremely effective. By 1922, California led all states in terms of paved road mileage with 3,246 miles completed, and an additional 820 mileage under construction.46

As vital as material networks are to the functioning of an oil-based energy system, paved roads were only one element in the emergence of an oil-dependent culture in Southern California in the first decades of the twentieth century. In a major effort to cater to the burgeoning demand for automobile transportation, major oil companies operated full-service gasoline stations across the Los Angeles area. In Figure 2.3, a photograph from 1928, we see an example of a full-service gas station operated by Standard Oil at Adams and Vermont Street in Los Angeles. The customer does not even need to exit the automobile as the attendant adds oil to the internal combustion engine. “California, and specifically Los Angeles, was the true incubator of the modern service station,” argues Yergin, “a standard structure with huge signs, restroom facilities, canopies, landscaped grounds, and paved entrances.”47

46 Williams, Energy and the Making of Modern California, 155.
47 Yergin, 193.
The first station in Los Angeles was opened on Wilshire Boulevard, and competition between companies was immediately aggressive. By 1916, describes Harold F. Williams, motorists in Southern California “could expect station attendants to check their vehicle’s oil and water, clean their windshields, and inflate their tires.” A level of service established by competing service stations in Los Angeles, this expectation was quickly projected across the state. By 1920, Standard Oil operated the most gasoline stations across California with 150 outlets, followed by Associated Oil with seventy-seven. Indeed, the flashy signs of full-service

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49 Williams, *Energy and the Making of Modern California*, 156.
gasoline stations became a fixed element and enduring cultural symbol of the vast Southern California landscape.

Internal combustion became an immediate source of pollution. In a report submitted to Los Angeles City Council on 4 January 1910, the Oil Inspector called attention to the damage caused to asphalt-paved streets by automobiles and motorcycles leaking oil. “The constant dripping of these oils [used in automobiles] on pavements soften the asphalt,” reads the report, which argues that “the City of Los Angeles would not be taking an arbitrary stand in prohibiting this oil from being spilled as most of the Eastern cities have laws governing this nuisance.” Based on these recommendations, the City Attorney was instructed to prepare an ordinance prohibiting the leaking and spilling of automobile oil on city streets. City Council had to respond accordingly as the automobile resulted in new forms of oil-based, urban nuisances.

The oil-based regional development that characterized Southern California in the first decades of the twentieth century was supported by a confluence of civic organizations based in Los Angeles. In particular, the Los Angeles Times and the Los Angeles Chamber of Commerce emerged as unwavering supporters of oil-based regional development in Southern California. Considering the essential role of private capital in the long-term development of a regional energy system, the ability to influence public opinion was critical for vested interests and “territorial alliances” associated with the emergence of a Southern California petroleum industry. As automobiles became a popular mode of transportation in the first decades of the twentieth century, the Automobile Club of Southern California became an important booster group that championed the interests of motorists.

In Southern California more broadly, the widespread adoption of the automobile in the first decades of the twentieth century acted as a powerful force of decentralization that picked up

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where the electric railroads left off. As described by Kevin Starr, “the automobile, and then the freeways, completed what Huntington’s big red cars started.”

Laid out in the wagon days of the 1870s, the historic streets of downtown Los Angeles were extremely narrow and congested. The vast hinterlands of Southern California, by contrast, could be molded to suit the spatial requirements of the automobile, offering an escape from the congested inner-city. “Southern California was ideal for autos,” argues James C. Williams, “a mild, nearly rainless climate in which muddy roads were an anomaly, population density was low, and life was lived largely on a coastal plain that facilitated automobile travel.”

Powered by fossil fuel, the process of internal combustion emerged as an important force of decentralized urban development in the Los Angeles Basin. By 1930, nearly ninety percent of all new retail businesses in Los Angeles were being built in suburban locations. With the development of the internal combustion technology and the widespread appeal of the private automobile, oil became the dominant form of transportation energy in modern capitalist society. The spatially intensive automobile also became an important source of modern environmental pollution, first noticed in Southern California.

In Figure 2.4, a photograph from 26 July 1943, we see the environmental implications of an urbanized culture dependent on the private automobile as a dominant mode of transportation, the first such example in North America. According to Mike Davis, “the first smog attack in 1943 – an eerie ‘darkness at noon’ over the Los Angeles Basin – caused almost as much consternation as had Pearl Harbor.” Los Angeles introduced the nation to the “modern scourge

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54 Ibid., 157.
of smog.”57 In Southern California as elsewhere in North America, the dynamic codetermination of culture, energy and landscape had significant and lasting environmental consequences.58


**Figure 2.4.** Los Angeles gets first big smog, July 26, 1943 (Source: http://www.wired.com/thisdayintech/2010/07/0726la-first-big-smog. Date accessed: 31 May 2013).

In conjunction with industrial landscapes, the development of extensive road networks to facilitate a consumer culture based on internal combustion was reflective of market expansion and the gradual emergence of oil as a dominant source of motive power in Southern California, and eventually the United States. Originating in Southern California in the first three decades of the twentieth century, the spatial fix of oil-based energy was regional in scale before it gradually expanded across the continent. In the early days of the industry, asphalt produced in Southern

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California was used to harden the surface of roads used by horse-drawn wagons. Beginning in the 1890s, oil was used to pave the narrow streets in downtown Los Angeles. With the advent of the internal combustion engine, however, the extensive road networks built throughout Southern California in the first decades of the twentieth century was reflective of a consumer culture (and urban form) that was becoming increasingly dependent on the automobile.\(^{59}\)

**Conclusion**

Oil provided the cheap and abundant energy that powered the rapid urban and industrial expansion of Los Angeles in the first decades of the twentieth century. In a region where coal was scarce, the development of oil-based energy was a complex process that was dependent on making long-term, fixed-capital investments into built landscapes to facilitate the efficient and economical provision and use of oil and its derivative products. As illustrated in this chapter, this was a gradual process of incremental yet cumulative development that had long-term social, political and environmental implications.

In the case of the oil-based energy system that emerged in Southern California between 1890 and 1930, initial investments into pipeline and other industrial distribution systems were eventually complemented by subsequent investments into a regional transportation network tailored to the capacities of the private automobile. Development was fixed, layered and cumulative. “Gradually the wagon was displaced by the pipeline and subsequent improvements developed the modern transportation system of today,” wrote Higgins in 1928, “involving mammoth storage, pipeline, and ocean transport systems, the latter extending to all parts of the civilized world.”\(^{60}\)

\(^{59}\) Bottles, *Los Angeles and the Automobile*, 175-234.

\(^{60}\) Higgins, *California’s Oil Industry*, 25.
This chapter also illustrates how the resource abundance that resulted from the discovery of new oil fields was a driving force in the market expansion of the Southern California petroleum industry in the first decades of the twentieth century. Despite the regional significance of fuel oil in promoting rapid industrialization, the widespread adoption of the internal combustion engine solidified the status of oil as the dominant form of motive energy in capitalist society. This process was further facilitated by the development of electricity, a flexible form of energy that diminished the relative importance of oil as an illuminant in the United States.\footnote{Vaclav Smil, \textit{Energy in Nature and Society: General Energetics of Complex Systems} (Cambridge and London: The MIT Press, 2008).} Beginning with the discovery of lighter-gravity crudes in the Los Angeles area, the increased production of refined gasoline emerged as the dominant trend in market expansion in Southern California in the first decades of the twentieth century. By 1930, a new metropolitan geography and spatial fix for oil-based energy had emerged in the Los Angeles Basin: fragmented, decentralized and critically dependent on the internal combustion engine.

The next two chapters provide detailed case studies that emphasize the coproduction of energy, built landscapes and regional political economy in Southern California. The objective is to examine how the spatial fixes of oil-based energy are overlapping and cumulative, and have resulted in a strong historical and geographical inertia. Whereas the Southern Pacific Company assumed a pioneering influence in the late nineteenth and early twentieth centuries, the gradual building of Los Angeles Harbor became instrumental in the development of an export market for surplus energy, especially in the early-1920s when the discovery of massive new oil fields gave rise to extreme overproduction. As a spatial fix, the harbor was effective in displacing the periodic crises of overproduction that plagued the Southern California petroleum industry in the first three decades of the twentieth century.
CHAPTER THREE

Displacing coal: the Southern Pacific Company and the emergence of oil-based energy in Southern California

The decades following the Civil War were a period of intensive railroading across the United States, culminating with the building of the first transcontinental transportation network in North America. According to historian Richard White, “these railroads formed a lever that in less than a generation turned western North America on its axis so that what had largely moved north-south now moved east-west.”1 Based in California, the Southern Pacific Railroad comprised an integral segment of the transcontinental system. As managers of the largest corporate structures in the late-nineteenth century, the earliest railroad executives placed an enormous emphasis on maintaining operational efficiency as the foundation for a competitive business strategy. 2

Energy has always been a primary consideration in the competitive business of railroading. Although the earliest regional railroads in North America burned wood in their fireboxes to generate steam, an eventual transition to coal demonstrated the superior capacity of fossil fuels as concentrated stocks of chemical energy that could be unleashed through combustion. The concentrated energy of fossil fuels made transcontinental railroading possible. However, the lingering problem with fossil fuels is that they are not evenly distributed across geographic space. In Southern California, the Southern Pacific Company faced the challenge of

operating competitively in a region where coal was scarce and increasingly expensive to import in the latter decades of the nineteenth century.³

This chapter examines the formative role of the Southern Pacific as a pioneering developer of oil-based energy in Southern California. With extensive financial resources and considerable political economic influence, the corporation that muckraking novelist Frank Norris called “The Octopus” had the ability to undertake the development of oil-based energy at a scale that greatly exceeded the relatively limited capabilities of local government and small-scale capital.⁴ At the turn of the twentieth century, the Southern Pacific assumed a dominant position in the Southern California petroleum industry as a major producer, consumer and transporter of unrefined fuel oil.

In the context of the emerging energy system, the Southern Pacific Company provided a durable foundation for subsequent market expansion in the first three decades of the twentieth century. As the energy system became established, the pillars of rail and fuel oil were eventually complemented by pipeline and gasoline. By emphasizing the role of the Southern Pacific as a pioneering developer of oil-based energy in Southern California, the aim of this chapter is to gain insight into the complex regional dynamics of energy transition and establishment. In particular, this chapter illustrates how energy transitions need to be stimulated by significant (and coordinated) investments in conversion technologies and transportation infrastructures. The conversion of the Southern Pacific from coal to oil as a primary fuel, combined with the railroad’s possession of extensive land-holdings containing significant oil deposits, became a formative influence on the geography of oil-based capitalism in Southern California.

This chapter is divided into five sections. In the first section, I review research in historical geography and political ecology that examine how the emergence of industrial capitalism in particular regional contexts across North America was predicated on the essential needed to make long-term investments into transportation infrastructure. In the second section, this chapter provides a brief history of the building of the Southern Pacific Railroad and the corporate consolidation of the Southern Pacific Company in the second half of the nineteenth century. Faced with a scarcity of coal, the energy problems of the Southern Pacific Company assumed particular dimensions in California, and corporate strategy had to be adapted to regional context. The first railroad to link Los Angeles to the transcontinental system, the investments made by the Southern Pacific Company had direct implications on the scale of scope of urban-industrial development in Southern California.

In the third section, I assess the regional influence of the Southern Pacific as a major producer, transporter and consumer of fuel oil at the turn of the twentieth century. In an age of corporate consolidation and vertical-integration, the Southern Pacific Company entered the business of oil production with the primary objective of providing fuel for its railroading operations. Through the market dominance of its oil-producing subsidiaries, I argue that the Southern Pacific Company assumed a formative influence in stimulating the emergence of oil-based energy in Southern California. Since becoming connected with the Southern Pacific in the 1870s, Los Angeles was the urban nucleus of this emerging petroleum industry and oil-based energy system.

In the fourth section, I argue that the market dominance of fuel oil in the first decades of the twentieth century, largely a product of the pioneering efforts of the Southern Pacific Company, provided the basis for subsequent waves of market expansion for the regional petroleum industry. Even after the widespread adoption of the internal combustion engine
stimulated massive demand for refined products, unrefined fuel remained the dominant market of the petroleum industry in Southern California – a testament to the inertia of oil-based energy. Lastly, the fifth section assesses the strategy of the Southern Pacific Company to exit the oil business in 1926, which resulted in the transferring of significant assets and land-holdings to the Standard Oil Company of California. Formerly Standard Oil of California, the Chevron Corporation now operates at a multinational scale and remains one of the largest energy producers in the world.  

**Railroads as energy networks**

Railroads were the first modern business enterprise in North America, particularly as business operations became increasingly complex in the latter decades of the nineteenth century. The first transportation corporations to operate within as well as between regions, the railroads were instrumental in many of the innovations that facilitated the emergence of industrial capitalism in North America. Indeed, existing literature that examines and assesses the impact of the development of the early transcontinental railroad network has emphasized how the “annihilation of space by time” accelerated processes of population settlement and regional development across the North American west.  

In his study of Chicago, William Cronon illustrates how a focus on commodity flows (grain, lumber and meat) provides insight into the fundamental relationship between

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5 *Fortune 500*, “Our annual ranking of America’s largest corporations, 2012,”  
transportation infrastructure and regional economic development. Since the speculative operations of nineteenth century railroads often resulted in tracks being extended into undeveloped territory, these companies were instrumental in building and managing irrigation systems that stimulated and sustained early phases of agricultural and urban development. Railroads provided the essential link that bound city and hinterland. Despite an established literature that emphasizes the historic role of transportation systems in stimulating processes of regional development, the formative influence of railroads in shaping the emergence of fossil fuel-based energy systems across North America has not received due attention.

In particular, two qualities make railroad companies an important optic for providing historical and geographic insight into the emergence of fossil fuel energy systems in North America. First, a focus on railroads emphasizes the essential relationship between transportation networks and the production, distribution and consumption of fossil fuel energy under capitalism. Beginning in the middle of the nineteenth century, the development of coal-based energy in North America had the revolutionary impact of severing the age-old relationship between energy consumption and the productive capacity of the land. As Christopher F. Jones explains, “the high energy density of fossil fuel depots justifies investing in infrastructure to transport energy long distances, thereby separating sites of energy production and consumption.” Beginning with coal in the nineteenth century, the development of complex systems of fossil fuel extraction, transformation and circulation made dense agglomerations of people and industry possible. As transportation corporations, railroads developed and administered extensive networks that spanned cities, hinterlands and regions. Accordingly, railroad networks were decisively influential in the configuration of oil-based spatial fixes that

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facilitated flows of liquefied fossil fuel energy from points of extraction to points of consumption.

Second, steam-powered locomotives were significant consumers of fossil fuel energy. As we learn from Chandler, late-nineteenth century railroads were vanguards of economic modernization, spawning technological and organizational innovations that extended beyond the corporation to impact society more broadly.\textsuperscript{10} Whether powered by coal or oil, the conversion process that made locomotion possible generated considerable market demand for fossil fuel energy in particular regional contexts. In a competitive business environment where corporate success depended on minimizing energy costs and maximizing operational efficiencies, adapting to regional context was a necessary process that involved investing considerable amounts of speculative capital into the development of conversion technologies and transportation infrastructures. Whereas some railroads purchased fuel on the open market, the first transcontinental railroads – funded, as they were, by generous federal subsidies – had the unique capacity to undertake initiatives in energy development at a scale that exceeded the abilities of individual capitalists and even fledgling municipal governments.

**Building the Southern Pacific**

At the end of the Civil War, federal governments in the United States and Canada passed legislation facilitating the construction of a transcontinental railroad system as a strategy of facilitating the rapid settlement and regional development of western frontiers, all part of nation-building and territorial integration. In the United States, the lucrative prospect of generous government subsidies for constructing a transcontinental link culminated in the passing of the Pacific Railway Act in 1864. To satisfy demand for immediate capital, the Act authorized a loan

\textsuperscript{10} Chandler, *The Visible Hand*, 79-205.
of $50 million worth of government bonds to railroad companies for a period of thirty years. In order to encourage immediate and timely construction, the act also granted railroad companies 12,800 acres of land for every mile of track built. The theory behind the land grants was to provide railroad companies with a durable source of capital (through land sales) that could be gradually liquidated to settle long-term mortgage debts, while also providing a basis for subsequent expansion of demand for transportation services provided by the railways through settlement and economic development of the land. For nineteenth century railroad companies, settlers represented a captive market for future freight revenues.11

Due to the lucrative federal subsidies that it provided to fledgling companies, the 1864 Pacific Railway Act became an immediate source of reckless speculation and political corruption in the second half of the nineteenth century.12 In California, the potential of a transcontinental link to stimulate processes of regional economic development resulted in the organization of dozens of railroad companies in the late 1860s and 1870s. During this period of intensive speculation, most of the railroads organized in California were not successful and were eventually swallowed up by the Central Pacific Railroad, the line organized by the “Big Four” Sacramento merchants (Collis P. Huntington, Leland Stanford, Mark Hopkins and Charles Crocker) to form the western segment of the proposed transcontinental link.13 This link was eventually established on 10 May 1869 when the tracks of the Central Pacific merged with the tracks of the Union Pacific at Promontory Summit in Utah Territory (Figure 3.1). With locomotives brought face-to-face on Promontory Summit, Samuel S. Montague of the Central Pacific Railroad (left of centre) shook hands with Grenville M. Dodge of the Union Pacific

11 White, Railroaded, 1-37; Orsi, Sunset Limited, 56-62.
12 White, Railroaded 22-24.
13 Orsi, Sunset Limited, 3-44.
Railroad (right of centre). For a nation looking for identity, the completion of the first transcontinental railroad in North America was the cause of great celebration.

Figure 3.1. Meeting at the “Golden Spike,” Promontory Summit, Utah Territory, 10 May 1869 (Source: National Archives and Records Administration, Record Group 16: Records of the Office of the Secretary of Agriculture. ARC identifier: 594940).

The Southern Pacific Railroad was among the companies that eventually became part of the burgeoning Central Pacific Empire. Founded by competing railroaders in 1865, the Southern Pacific Railroad was organized with a state charter, federal franchise and extensive land grant to build the western portion of the proposed transcontinental link between San Jose and the Colorado River. Although the Southern Pacific line remained to be built when absorbed by the Big Four in 1868, the acquisition of the proposed right-of-way for the southern transcontinental
link was critical to maintaining the monopoly of the Central Pacific in California. From the beginning, however, managing the Southern Pacific and Central Pacific as separate companies was not an effective strategy for the Big Four. In an act of corporate reorganization, the Southern Pacific Company was established in 1884 as a holding company to more effectively manage the complexities of this burgeoning transportation empire.

In California, the formidable political economic influence of the Southern Pacific was augmented by extensive landholdings provided by the federal government. In the latter decades of the nineteenth century, these landholdings were expanded considerably as competing railroads were consolidated into the burgeoning Southern Pacific network, which is illustrated by the map in Figure 3.2. As estimated by historian Richard Orsi, the Southern Pacific Company had accumulated between 3 and 5 million acres in California by the turn of the twentieth century. By this time, the Southern Pacific Company was the largest private landholder and dominant regional presence in Southern California.

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14 Ibid., 18-19.
15 Ibid., 24.
16 Ibid., 73.

In Southern California, the extraordinary ability of “The Octopus” to influence processes of regional development was illustrated in the 1870s with the building of the western portion of the southern transcontinental link. In exchange for a generous subsidy, the Big Four railroaders
agreed to extend a trunk line from the San Joaquin Valley to Los Angeles. This critical link was completed in 1872. In order to attract the Southern Pacific, the county of Los Angeles donated five percent of the assessed valuation of its property to the railroad, which amounted to approximately $527,720. In addition, the city contributed $75,000 in Los Angeles and San Pedro railroad stocks, and sixty acres of land for a depot. Considering that only 15,309 people resided in Los Angeles County in 1870, a total railroad subsidy of $602,000 represented a significant investment.\footnote{Edna Monch Parker, “The Southern Pacific and settlement in Southern California,” \textit{Pacific Historical Review} 6 (2) (1937): 103-119.}

To be sure, the strategic decision by Southern Pacific executives to extend a trunk line to Los Angeles rather than San Diego was critical in establishing a major trajectory of regional economic development in Southern California. In 1937, Edna Monch Parker wrote how “the story of Los Angeles might today be totally different it had not acceded to the railroad’s demands.”\footnote{Ibid., 117.} In Figure 3.2, we see how the lines of the Southern Pacific Railroad (illustrated in red) integrated Los Angeles into the transcontinental network, not only to the north but also eventually to the south. Before the transcontinental link was established, Los Angeles was a small frontier town with few locational assets. Once established in Southern California, the Southern Pacific executives went about the business of acquiring local railroads, integrating them into a regional system that centered upon Los Angeles. The railroads provided the needed integration to jump-start the regional development of energy resources.

Between 1870 and 1880, the population of Los Angeles increased from 5,728 to 11,183, reflecting the stimulating influence of the transcontinental link. “The city of Los Angeles, which, before the advent of the road, was a quiet town,” proclaimed the Southern Pacific Company in its

\footnote{Ibid., 117.}
1883 Annual Report, “has now become a busy metropolis.”\(^{19}\) By contrast, a meager population increase from 2,300 to 2,637 between 1870 and 1880 reflected the continued regional isolation of San Diego.\(^{20}\) The complete monopoly exercised by Southern Pacific Company over regional transportation in Southern California remained intact until San Diego became the Pacific terminus of the Atchison, Topeka and Santa Fe Railroad in 1885.\(^{21}\)

In the late-nineteenth century and early twentieth century, railroad terminals in the largest North American cities became nodes for subsequent industrial expansion. The urban historical geography of Los Angeles is no exception. When the Southern Pacific Railroad arrived in 1876, it took over the existing infrastructure of the Los Angeles and San Pedro Railroad, which had freight yards that were located at the banks of the Los Angeles River at the southern limits of the municipality. “Within a few years,” writes historical geographer Blake Gumprecht, “a small manufacturing complex made up of a gas plant, flour mills, slaughter houses, and freight yards developed in the vicinity.”\(^{22}\) This development only intensified in 1886, when Los Angeles City Council granted the Atchison, Topeka, & Santa Fe a right-of-way on the west side of the river. “Industry was most heavily concentrated in the area between Macy and Seventh Streets from Alameda Street to the river,” describes Gumprecht, “this area was home to planning mills, foundries, lumber yards, fuel plants, food and beverage manufacturers, warehouses, and the like.”\(^{23}\) The railroad infrastructure and facilities along the banks of the river formed the basis of an emerging industrial geography in Los Angeles.

\(^{19}\) Southern Pacific Railroad Company of California, Annual Report of the Board of Directors for the Year Ending December 31\(^{st}\), 1883 (San Francisco: H.S. Croker & Co., Printers, 1884), 44-45.
\(^{21}\) Parker, “The Southern Pacific Railroad and Settlement in Southern California,” 118.
\(^{23}\) Ibid.
The Southern Pacific energy system

The development of steam-powered locomotives in the nineteenth century provided a spatial fix that severed the age-old relationship between biological energy and overland transportation.\(^{24}\) Although the first engines burned wood in their fireboxes to produce the intense heat needed to generate steam, the eventual transition to coal in the middle of the nineteenth century demonstrated the superior capacity of fossil fuels as concentrated stocks of thermal energy. But whereas a regional abundance of coal provided cheap energy to railroads based in the Atlantic northeast, coal was scarce to California and was becoming increasingly expensive to import in the latter decades of the nineteenth century. Not only did coal have to be imported across vast distance at considerable expense, but labor disruptions also made supplies increasingly unreliable.\(^{25}\)

For California-based railroads, the development of oil-burning technology for steam-powered locomotives was essential to maintaining a competitive economical balance between energy costs and operational efficiency. Due to their considerable energy demands, both the Southern Pacific and Santa Fe railroads became early interests in the development of oil-based energy as an alternative to coal in Southern California. A new conversion technology had to be developed to stimulate the emergence of an oil-based energy system. According to William W. Orcutt, a pioneering authority in petroleum geology, “the Union Oil Company was the first to undertake the work of demonstrating the desirability of liquid fuel for locomotives.”\(^{26}\) Lyman Stewart, cofounder and president of Union Oil, developed a theory for improving the combustibility of high-gravity California oil by mixing it with pressurized steam in the fireboxes of steam-powered locomotives.

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In the latter decades of the nineteenth century, Union Oil was one of the largest clients of the Southern Pacific, and it perplexed Stewart that the locomotives that hauled his company’s oil were burning coal as fuel. Despite the business opportunity, the Southern Pacific was unwilling to lend Stewart a locomotive to test his theory. Eventually, Stewart was successful in securing a locomotive from the California Southern Railroad. However, the problem remained that the Union Oil Shops, located thirty-five miles north of Los Angeles in Santa Paula, happened to be on the main line of the Southern Pacific. Engineers employed by the Southern Pacific watched intently and took notes as Union Oil conducted experiments with an air injector that transformed crude petroleum into a fine mist that could be burned economically and cleanly.27

The earliest attempts to run a locomotive using crude petroleum were disastrous because the fuel was injected out of sprayer too fast and was not evenly distributed in the firebox. With assistance from the Santa Fe Railroad, Union Oil technicians were eventually successful in developing a burner that sprayed a fine mist of oil into all corners of the firebox.28 As described by Gerald T. White, “a cooperative experiment in October 1894 using Union’s fuel oil in a Santa Fe engine driven by a Southern Pacific engineer on a track of the Southern Pacific near Los Angeles showed saving over coal of more than twenty-five percent.”29 Despite early setbacks, however, the successful development of oil-burning locomotives by California-based railroad companies in the latter decades of the nineteenth century was the harbinger of a new area of petroleum-based transportation.30 By the turn of the twentieth century, both the Southern Pacific and Santa Fe had converted all of their locomotive engines from coal- to oil-burning, establishing...
a huge, concentrated new market.\textsuperscript{31} “There being no longer any question about the feasibility of burning it in locomotives,” reported the \emph{Los Angeles Times} in 1903, “there is no reason why there should not be an enormous consumption of...California petroleum.”\textsuperscript{32} With the help of the railroads, the age of oil-based energy had arrived.

Compared to coal, oil presented several advantages to railroad companies based in California. The primary advantage was that oil burned more efficiently than coal on a per unit basis.\textsuperscript{33} “It is claimed, on what appears to be good authority,” explained the state mineralogist in 1914, “that in practice one pound of average oil will do the work, in a locomotive, of one and three-fourths pounds of average coal.”\textsuperscript{34} Less bulky and more efficient, liquid fuel oil was also easier to transport than coal as well as cheaper, because the source was much closer. “When one remembers that three and a half or four barrels of [California oil] are equivalent to a ton of coal,” boosted the \emph{Los Angeles Times} in 1903, we “can see what a revolution has been initiated.”\textsuperscript{35}

Even though oil was cleaner burning and overall more efficient than coal on a per unit basis, proper engine upkeep remained an integral aspect of efficient railroad operations; skilled engineers and firemen had to work in harmony to minimize the buildup of carbon within the furnace, which not only caused waste, but also overheating and destruction.\textsuperscript{36} With oil, company firemen gained the distinct advantage of being able to focus their attention on boiling water and regulating the fire, rather than spending time and energy shoveling coal.\textsuperscript{37} Despite the efficiencies gained in the transition from coal to oil, however, the process of locomotion remained an imperfect science. “Of course, burning oil in this country is in its infancy, and there

\textsuperscript{31} Orcutt, \textit{Early Days in the California Fields}, 14.
\textsuperscript{32} “Use of petroleum largely increases,” \textit{Los Angeles Times} (27 October 1903), 1.
\textsuperscript{34} Lewis E. Aubury, \textit{Production and Use of Petroleum in California}. Bulletin No. 32 of the California State Mining Bureau (Sacramento: California State Printing Office, 1904), 103.
\textsuperscript{35} “Use of petroleum largely increases,” \textit{Los Angeles Times} (27 October 1903), 1.
\textsuperscript{36} Aubury, \textit{Production and Use of Petroleum in California}, 60-1; \textit{Southern Pacific Bulletin} (September 1922), 18.
\textsuperscript{37} \textit{Southern Pacific Bulletin} (September 1922), 104.
is room for a great deal of improvement,” noted a Southern Pacific fireman, “but considering the
length of time we have been at it, it is certainly remarkable to see how those engines go up hills
with their heavy trains, with plenty of steam, no smoke, no dust, no cinders and no sweating
fireman.”38

Armed with an extensive portfolio of government land grants, the Southern Pacific
emerged at the turn of the twentieth century as the largest private owner of proven oil lands in
Southern California.39 In order to locate and more accurately assess the mineral value of its
landholdings, the company established a geological department in 1898. The earliest work of this
department was done in Mexico and Texas, but after 1902 company geologists turned their
attention to Kern County in California, where it was discovered that oil-bearing lands were being
sold by the railroad at grazing-prices.40

Once the mineral value of its lands were confirmed by company geologists, the Southern
Pacific became directly involved in the production of California crude by establishing the Kern
Trading & Oil Company in 1903 and by acquiring a controlling stock interest in the Associated
Oil Company in 1909. As a wholly owned subsidiary, the Kern Trading & Oil Company was
responsible for developing Southern Pacific oil lands.41 By contrast, the Southern Pacific
Company acquired a dominant interests in Associated as a strategy for gaining access to the
assets of an established oil company.42 Organized in 1901 by large independent producers in the
Kern River and McKittrick fields, the Associated Oil Company emerged as a major developer of
pipelines in the latter decades of the nineteenth century, even building a few refineries.43

38 Ibid., 107.
40 Hofsommer, The Southern Pacific, 113-114.
41 “Much interest in sale rumor,” Los Angeles Times (26 March 1911), V18.
43 Mansel G. Blackford, The Politics of Business in California, 1890-1920 (Columbus: Ohio State University Press,
155-169.
Although the main function of Associated after 1909 was to provide Southern Pacific locomotives with fuel oil, the company continued to produce and market refined petroleum products along the West Coast.\textsuperscript{44}

Since the primary interest of the Southern Pacific was fuel oil, the company also signed long-term leasing agreements with Los Angeles-based natural gas companies in an effort to fully exploit the energy potential (and value) of the land grants it managed. In a 1912 leasing agreement, the Southern California Gas Company was granted exclusive rights to produce natural gas on proven oil lands owned by the Southern Pacific in the Midway Field for a period of twenty years. As per the terms of this agreement, the Gas Company was obliged to fund the construction of a natural gas pipeline link to the existing Southern Pacific transportation network in the Midway Field, as well as pay all applicable land improvement taxes for the entire duration of the lease. Whereas the gas company owed the Southern Pacific a royalty for all gas produced on the lands, any significant oil discoveries made in the process immediately became the responsibility of the Kern Trading & Oil Company. By maintaining this alliance with the Southern California Gas Company, the Southern Pacific retained control over any significant oil discovered for the entire term of the lease. Since natural gas was considered a byproduct of fuel oil, the Southern Pacific was able to maximize the full energy potential of its land grants by allowing other companies to undertake the work, make the improvements, and assume the most significant risks.\textsuperscript{45}

For the executives of the Southern Pacific Company, corporate and operational control of Associated Oil pipelines was critical to maintaining a dominant market position in the transportation of fuel oil in Southern California. “As the major trunk railroad in California and,

\textsuperscript{44} Andreano, “The structure of the California petroleum industry,” 187.
\textsuperscript{45} Southern Pacific Railroad Directors’ Meeting – March 16, 1912. Department of Special Collections, Stanford University. Southern Pacific Railroad Records (M1010), Record Group 1: Board of Directors (Volume 3: December 15 to April 9, 1912), 354-372.
consequently, the largest individual consumer of fossil fuel,” argues Ralph Andreano, “Southern Pacific’s ownership and production of oil lands represented an important vertical extension of its business operations.”46 Once consolidated into the existing Southern Pacific transportation network, the lines of the Associated Pipe Line Company were used to full capacity, one half by the Kern Trading & Oil Company and the other half by the Associated Oil Company.47

By consolidating and controlling an extensive region-wide transportation network comprised of rail and pipe, the development initiatives of the Southern Pacific Company were fundamental to the emergence of an integrated oil-based energy system in Southern California in the first decades of the twentieth century. As illustrated by Figure 3.3, the pipeline networks of other oil companies added layers of complexity (and integration) to the regional energy system. To the north, the pipelines of Associated Oil, Standard Oil and the Producers Transportation Company connected the Coalinga, Kern River, Midway Sunset and McKittrick fields. To the south, the shared pipelines of Union Oil and the Producers Transportation Company integrated the vast oil-producing region surrounding Los Angeles. This extensive transportation network became an important part of the spatial fix that integrated points of extraction with points of consumption across the vast oil-producing region.

Figure 3.3. California pipelines and producing districts, 1911 (Source: Ralph Andreano, “The structure of the California petroleum industry, 1865-1911,” Pacific Historical Review 39 (2) (1970), 176).
The fuel oil market: a foundation for expansion

In Southern California, the dominant market position of unrefined fuel oil in the first decades of the twentieth century was reflective of the pervasive regional influence of the Southern Pacific Company as a pioneer developer of oil-based energy. In Figure 3.4, the advertisement makes the bold claims that the Southern Pacific uses oil in “a thousand different ways” and “is probably the largest individual consumer of California oil in the world.” In other words, the Southern Pacific Company had the unique ability to operate as a relatively self-contained energy system, particularly in the early years of the petroleum industry. Furthermore, the unrefined character of fuel oil provided an important foundation for subsequent rounds of market expansion with the development, production and marketing of refined petroleum products and technologies.48 In Southern California and elsewhere, continuous market expansion through technological innovation and the development of new converters in particular became an important component of maintaining resource scarcity and competitive oil prices.49

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48 Johnson, “California and the national oil industry,” 164.
The dominant position of the Southern Pacific as producer, transporter and consumer of fuel oil at the turn of the twentieth century was based on the possession of vast territories of proven oil lands. Indeed, railroad land grants provided by the federal government in the latter decades of the nineteenth century emerged as an important factor determining the ownership of oil lands in Southern California. R.P. McLaughlin, the state oil and gas supervisor, noted the modernizing influence of the Southern Pacific Company as a scientific developer of proven oil lands in 1918:

The company is the pioneer in systematic or scientific oil field work in California, having used such methods from the time of its first operations nearly ten years ago. The public, and particularly the oil producers, are unquestionably indebted to the company for the introduction and widespread demonstration of scientific methods of oil land development.\(^\text{50}\)

For the Southern Pacific, the systematic and scientific fieldwork conducted by company geologists was critical to the process of energy development. “In general,” described E.T. Dumble, a consulting geologist for the company, “geologists are supposed to act as an intelligence department and to keep the Drilling Department informed as far ahead of the drill as possible.”\(^\text{51}\) With a Geology Department that provided accurate and timely field information to the Drilling Department, the Southern Pacific Company was among the first oil producers in Southern California to demonstrate the efficiencies of corporate vertical-integration in the sphere of energy development.

As a Southern Pacific subsidiary, the Kern Trading & Oil Company was the largest private oil-land owner in the California in 1914, controlling 23 percent (18,267 acres) of proven oil lands. The Southern Pacific-dominated Associated Oil Company was also a significant owner


\(^{51}\) Ibid.
of proven oil lands, controlling 7,347 acres.\textsuperscript{52} Accordingly, the Southern Pacific Company was also the largest producer of oil in 1914 at 17,319,452 barrels. In comparison, Standard Oil in California produced 13,550,809 barrels and Union Oil produced 6,329,978 barrels as the second and third-largest producers in Southern California.\textsuperscript{53}

In addition to exercising influence as a major industry producer, the Southern Pacific Company was a leading consumer of fuel oil in the first decades of the twentieth century. “From 1900 to 1905,” explains Pratt, “the fuel consumption of the Southern Pacific Railroad’s operations west of El Paso rose from 100,000 barrels annually to more than 5 million, while its consumption of coal dropped to about half of its 1900 total of more than 1.2 million tons.”\textsuperscript{54} Accordingly, the primary interest that the Southern Pacific Company had in the development of regional energy resources was to provide company locomotives with a cheap and reliable source of fuel oil. As reported by the \textit{Los Angeles Times} in 1916, “today there is being derived from the oil lands of the railroad company an amount of oil equivalent to that annually consumed by the railroad.”\textsuperscript{55} Compared to the amount of fuel produced and consumed directly by the railroad, the Southern Pacific Company marketed relatively little oil on the open market, opting to store it when possible.\textsuperscript{56}

Following the railroads, steamships provided a second major market for unrefined fuel oil in the first decades of the twentieth century. In addition, fuel oil was also used by oil companies to produce the intense heat needed for the refining process as well as an important source of heat in private homes. Public utilities scattered throughout Southern California and the Los Angeles Basin in particular also became significant consumers of fuel oil. In general terms, however, fuel

\textsuperscript{52} Ise, \textit{The United States Oil Policy}, 259.
\textsuperscript{53} Ibid., 261.
\textsuperscript{55} “Railroad largest producer of oil,” \textit{Los Angeles Times} (22 March 1916), II5.
\textsuperscript{56} “Railroad Record,” \textit{Los Angeles Times} (3 August 1897), 7.
oil made the most significant inroads in industrial markets that had previously been dominated almost exclusively by coal.57 As described in an industry pamphlet published in 1900, “the method of utilizing oil for fuel is extremely simple.”58 The unrefined qualities fuel oil made it a cheap and convenient form of energy in Southern California.

Table 3.1. Consumption of fuel oil in California, 1919

<table>
<thead>
<tr>
<th>Class of use</th>
<th>Average per month (barrels)</th>
<th>Total for year (barrels)</th>
<th>Percent of total excluding steamships</th>
</tr>
</thead>
<tbody>
<tr>
<td>Railways</td>
<td>9,544,000</td>
<td>11,453,000</td>
<td>39.66%</td>
</tr>
<tr>
<td>Government and municipal</td>
<td>101,869</td>
<td>1,222,000</td>
<td>4.23%</td>
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<tr>
<td>Public utilities</td>
<td>459,726</td>
<td>5,517,000</td>
<td>19.11%</td>
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<tr>
<td>Heating</td>
<td>118,950</td>
<td>1,427,000</td>
<td>4.94%</td>
</tr>
<tr>
<td>Agriculture</td>
<td>9,485</td>
<td>114,000</td>
<td>0.39%</td>
</tr>
<tr>
<td>Industrial</td>
<td>664,534</td>
<td>7,974,000</td>
<td>27.62%</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>97,357</td>
<td>1,168,000</td>
<td>4.05%</td>
</tr>
<tr>
<td>Total, exclusive of steamships</td>
<td>2,406,321</td>
<td>28,875,000</td>
<td>100.00%</td>
</tr>
<tr>
<td>Steamships</td>
<td>346,724</td>
<td>4,161,000</td>
<td></td>
</tr>
<tr>
<td>Grand total</td>
<td>2,753,045</td>
<td>33,037,000</td>
<td></td>
</tr>
</tbody>
</table>


At the turn of the twentieth century, the Los Angeles Times emerged as a vigorous promoter of the potential of fuel oil as an engine of urban-industrial growth. By 1895, the Los Angeles oil field was the leading producer in the state.59 In 1898, the Times reported that the transition from coal to fuel oil was saving consumers in Los Angeles a total of 8,000 dollars per day. The discovery of major Los Angeles-based oil fields in the early 1890s was noted for reducing the cost of oil to an economical rate relative to the price of coal, from $2.50 to one dollar per barrel. Among contemporaries, a rule of thumb in gauging the cost differential between coal and oil was that if the former exceeded two dollars a barrel, it ceased to be

57 Pratt, “Ascent of oil,”17.
58 Lionel V. Redpath, Petroleum in California: A Concise and Reliable History of the Oil Industry of the State (Los Angeles: Published by L.V. Redpath, 1900), 96.
59 American Petroleum Institute, California’s Oil (API Department of Information, 1948), 23.
competitive with coal. On account of the high price of oil and coke,” reported the *Times*, “many kings of manufacturing could not thrive in Los Angeles before the advent of oil, and doubtless many new enterprises have sprung up as the result of this cheapening of power.” In a 1914 publication issued by the State Mining Bureau, R.P. McLaughlin, State Mineralogist and former geologist for Associated Oil, estimated that the burning of oil in California was displacing coal at a rate of 2,000,000 tons a year.

The fuel oil industry remained dominant in Southern California even after gasoline became the leading oil product in the United States after 1916. As late as 1918, about 80 percent of the fuel produced in California was consumed as fuel oil, with the remaining 20 percent marketed as refined products, including gasoline. “Nationally, these proportions were reversed,” observes Johnson. Between 1921 and 1925, the percentage of gasoline obtained from total crude production in California increased from 14 to 23 percent. Meanwhile, the production of fuel oil during these years remained consistent at approximately 70 percent. The resilience of the fuel oil market in Southern California in the first decades of the twentieth century was reflective of the pervasive regional influence and considerable energy demands of the Southern Pacific Company and other large-scale consumers in the early stages of geographic industrialization. In the words of Gerald T. White, the California railroads “were gluttons for fuel oil.”

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60 *Oil Investors Journal* (18 October 1906), 16.
63 Johnson, *California and the National Oil Industry*, 157 and 164.
65 Gerald T. White, “California’s other mineral,” 142.
The exit strategy

During the first two decades of the twentieth century, the federal government in the United States underwent a significant transformation in policy with regards to energy development. With the support of leading conservationists and an array of national political and military leaders, geologists and lawyers employed by the federal government started to take a closer look at the nineteenth-century property regime that created the conditions whereby the Southern Pacific Company could emerge as the largest private owner of proven oil lands in Southern California. After all, what did the business of transcontinental railroading have to do with the oil industry?

In a series of court battles between 1910 and 1919, the Justice Department launched concerted effort to reclaim title to valuable oil lands owned by the Southern Pacific Company in California’s San Joaquin Valley. From the beginning, lawyers for the federal government developed a strategy based on the conditions of the nineteenth century land-grant policy that had given the Southern Pacific the right to choose alternating sections of land along its railroad right-of-ways. In particular, the Pacific Railroad Act specifically excluded known mineral lands (except those containing coal and iron) from the properties that railroads could claim. Between 1894 and 1904, the Southern Pacific Company obtained patents for lands in the Elk Hills as

<table>
<thead>
<tr>
<th>Year</th>
<th>Gasoline and distillate</th>
<th>Kerosene</th>
<th>Fuel oil</th>
<th>Lubricating oils</th>
<th>Miscellaneous</th>
<th>Shortage</th>
</tr>
</thead>
<tbody>
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<td>1922</td>
<td>16.03</td>
<td>4.51</td>
<td>69.97</td>
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<td>1923</td>
<td>20.34</td>
<td>3.43</td>
<td>64.98</td>
<td>1.54</td>
<td>8.21</td>
<td>1.5</td>
</tr>
<tr>
<td>1924</td>
<td>21.4</td>
<td>4.76</td>
<td>70.13</td>
<td>1.7</td>
<td>0.69</td>
<td>1.32</td>
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<tr>
<td>1925</td>
<td>22.74</td>
<td>3.41</td>
<td>69.68</td>
<td>1.36</td>
<td>1.64</td>
<td>1.17</td>
</tr>
<tr>
<td>1926</td>
<td>24.35</td>
<td>3.31</td>
<td>67.48</td>
<td>1.3</td>
<td>2.07</td>
<td>1.49</td>
</tr>
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<td>1927</td>
<td>27.18</td>
<td>2.53</td>
<td>65.53</td>
<td>1.05</td>
<td>2.19</td>
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</tr>
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<td>1928</td>
<td>29.87</td>
<td>3.75</td>
<td>60.76</td>
<td>1.08</td>
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<td>35.2</td>
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<td>54.87</td>
<td>0.91</td>
<td>3.87</td>
<td>1.95</td>
</tr>
<tr>
<td>1930</td>
<td>38.06</td>
<td>2.85</td>
<td>51.76</td>
<td>1.14</td>
<td>3.62</td>
<td>2.57</td>
</tr>
</tbody>
</table>

substitute for lands along the railroad right-of-way in the San Joaquin Valley that that were known to contain petroleum.\footnote{Paul Sabin, \textit{Crude Politics: The California Oil Market, 1900-1940} (Berkeley and Los Angeles: University of California Press, 2005), 20-23.}

In the first decade of the twentieth century, discoveries made by the Associated Oil Company confirmed that lands chosen by the Southern Pacific Company in the Elk Hills also contained valuable petroleum reserves. By 1910, lawyers for the federal government faced the daunting task of proving that executives for the Southern Pacific operated under full knowledge of this petroleum when obtaining patents for lands in the Elk Hills. The semi-arid lands of the Elk Hills were, after all, an odd choice for agriculture. One of the main objectives of the land grant policy of the nineteenth century was to provide railroads with properties that could be sold-off in an ongoing process of generating revenue. On a per acre basis, lands sold for farming purposes were considerably more valuable than lands sold for grazing purposes. Yet, the actions of the Southern Pacific in the Elk Hills seemed to confirm ignorance with regards to knowledge of petroleum deposits as the railroad continued to liquidate valuable oil-bearing lands at grazing prices in the final years of the nineteenth century.\footnote{Ibid.}

The contest over the Elk Hills was elevated in 1912 when President William Taft, concerned about the long-term availability of energy for the United States Navy, issued an executive order designating the region as the nation’s first Naval Petroleum Reserve. Through drainage across alternating sections of territory owned by the federal government, the checkerboard holdings of the Southern Pacific threatened to deplete valuable oil reserves that were now being claimed by the United States Navy. Based on this perceived need to reserve petroleum for the Navy, the United States Supreme Court issued a decision in 1919 that divested the Southern Pacific Company of 6,100 acres of proven oil territory in the Elk Hills. “With the
court victory,” explains Sabin, “the government had retained the oil located in land claimed by
the Southern Pacific and enhanced its ability to control oil development on surrounding
government lands.” 68 Most importantly, drainage caused by competitive drilling was no longer a
threat in the Elk Hills.

To be sure, the Elk Hills case represented a small victory for the federal government in a
larger effort to reclaim valuable oil-bearing lands from the Southern Pacific Company. Although
successful in Elk Hills, the strategy of the Justice Department eventually faltered when deployed
in a larger suit to challenge the validity of sixteen patents issued to the Southern Pacific
Company between 1894 and 1904. The government estimated that these patents, covering
165,000 acres of land in the oil-rich San Joaquin Valley between Coalinga and the Midway-
Sunset oil field, were worth more than $400 million. 69 On 29 August 1919, District judge
Benjamin Bledsoe issued a decision that affirmed the title of the Southern Pacific to these
valuable oil lands while ridiculing the position maintained by the government. “It seems hardly
within the realm of possibility,” exclaims Bledsoe’s ruling, “that through a period of say thirty
years, some of the most prominent, most forceful, most far-seeing men that our state has
produced, were engaged in the diabolical plan of consummating one of the greatest frauds of the
age.” 70 With this major victory, the Southern Pacific Company managed to retain control of vast
expanses of proven oil territory in the San Joaquin Valley. 71

Understandably, the public exposure associated with almost one decade of federal
litigation did not bode well with the shareholders of the Southern Pacific Company. 72 Although
the Octopus was ultimately successful in retaining title to a valuable portfolio of proven oil

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68 Ibid., 22.
69 Ibid.
70 District Court of the United States, United States of America vs. Southern Pacific Company, et al., Opinion of
Judge Bledsoe (28 August 1919), 6.
71 Sabin, Crude Politics, 23.
territory in the San Joaquin Valley, the possibility remained that subsequent action by the federal government could threaten the value of the company’s oil properties. Eventually, the entire oil interests of the Southern Pacific Company were transferred to the Pacific Oil Company, a subsidiary organized in 1921 as a strategy to protect shareholder equity by formally separating oil production from the business of railroading. In this transaction, Pacific Oil gained 25,000 acres of proven oil territory in California as well as a 50.48 percent controlling interest in the Associated Oil Company. In addition, stockholders in the Southern Pacific Company were given priority opportunity to purchase shares in Pacific Oil on a one-to-one basis for $15 each. When a total of 3.5 million shares were issued for Pacific Oil in 1921, shareholders in the Southern Pacific Company were eventually responsible for purchasing nearly 98 percent of the offering. The outstanding 85,396 shares were owned directly by the Southern Pacific. With the establishment of Pacific Oil as an independent company, the federal government no longer posed a threat to the vested oil interests of the Southern Pacific Company.

In the brief period of time it operated between 1921 and 1926, the Pacific Oil Company turned out to be an incredibly lucrative investment for its corporate shareholders. However, as a publically traded company, the ability to participate in the business of Pacific Oil was now a possibility that extended beyond the vested interests of the Southern Pacific nexus. By 1926, Standard Oil (California) had managed to achieve a majority share of stock ownership in Pacific Oil. The result was a forced merger whereby Pacific Oil was consolidated into a large, integrated enterprise that had shed its parenthetical name to be re-designated the Standard Oil Company of California. Even before the merger was announced, the Wall Street Journal forecasted that the

73 Daggett, History of the Southern Pacific, 448-449.
“proposed grouping of Standard Oil Co. of California and the producing properties of the Pacific Oil Co.” would be “one of the most important consolidations in the oil industry in years.”

The acquisition of Pacific Oil added 35,000 barrels to the daily output of Standard Oil, which by 1926 was responsible for nearly 25 percent of total production in California. Even more important than production added, however, was the potential for future expansion in 261,000 acres of territory that Pacific Oil held in the San Joaquin Valley, only 25,000 of which had been developed at the time of the merger. As the Wall Street Journal explained, it had been the “company’s policy to drill only offset wells when necessary so that it has innumerable locations for inside wells which have not been drilled.” In other words, the Standard-Pacific merger resulted in the establishment of a new company with unprecedented production capacity.

In addition to the transfer of valuable and undeveloped oil properties, the merger between Pacific and Standard also resulted in the consolidation of significant company assets. As the successor to Pacific Oil, Standard of California gained control of a 33 percent interest in the Associated Pipe Line Company. Consistent with its business of providing an essential transportation service in Southern California, the Southern Pacific Company strategically retained a one-third interest in the Associated Pipe Line Company. Associated Oil owned the remaining third of the pipeline company. Overall, the merger with Standard turned out to be a lucrative transaction for shareholders in Pacific Oil. At a market valuation of $273 million in 1926, the stock of Pacific Oil was worth more than five times the offering price to Southern Pacific shareholders just five year prior. In a letter to stockholders, president K.R. Kingsbury described the new conglomeration as a “company well balanced as to oil reserves, transportation, manufacturing and distribution facilities.”

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75 Ibid.
Conclusion

One year before his untimely death in 1900, Collis P. Huntington wrote a letter to a newspaper responding to critics who dismissed the Southern Pacific Company as a malevolent and destructive force in California. According to Huntington, a company that had paid taxes of over seven and a half million dollars and paid wages of over one hundred million dollars over the previous ten years was not deserving of the “bitter and malicious hostility” that was being directed towards his railroad. Rather, by providing “a much cheaper and easier means of transportation to markets,” explained Huntington, the Southern Pacific functioned as a “great civilizing, and wealth-producing agent” in Southern California. Whereas “the ten million acres in the San Joaquin Valley had an actual value before railroad facilities were put there of, say, twelve and a half million,” he estimated, “with railroad facilities…I think no one would venture to deny that the land would be worth a hundred dollars an acre and one billion dollars for the whole great tract.”77 Without question, oil formed the basis of these calculations. As early as 1893, Huntington was informed that the proven oil lands owned by the Southern Pacific were likely worth more than the entire railroad.78

This analysis of the Southern Pacific Company yields a number of important insights regarding how and why oil emerged as a dominant energy resource in Southern California in the first decades of the twentieth century. As a transcontinental transportation corporation with modern organizational capabilities, federal subsidization and considerable political economic influence, the Southern Pacific Company was uniquely capable of developing oil-based energy as an alternative to coal, which was scarce to Southern California and increasingly expensive to import in the latter decades of the nineteenth century. The development of oil-burning

77 Collis P. Huntington to Mr. James Speyer, 6 December 1899, Collis P. Huntington Papers 1856-1901 (Microfilm: Series 1, Reel 54).
78 Hofsommer, The Southern Pacific, 114; Stuart Daggett, Chapters on the History of the Southern Pacific, 442.
technology for steam-powered locomotives unlocked the energy potential of California oil, which could be consumed by railroads without being refined. In the first decades of the twentieth century, the mass-market for unrefined fuel oil that fulfilled the enormous energy demands of the Southern Pacific and Santa Fe railroads established a durable foundation upon which the regional petroleum industry could expand into refined products. Compared to the lighter-gravity oils produced in Pennsylvania, the specific mineral qualities of oil produced in Southern California made it particularly suitable for burning as unrefined fuel oil.

This chapter provides important historical and geographical insights into the regional dynamics of the complex systems and spatial fixes that support and sustain energy transition. Whereas California-based railroads quickly converted to oil-based burners once the technology was made available, locomotives based in the east continued to run on coal well into the twentieth century. In Southern California, the transportation network of the Southern Pacific Company became an integral part of the emerging oil-based energy system, establishing a firm foundation for subsequent regional development. As a major producer, transporter and consumer of fuel oil, “the Octopus” had many tentacles in the sphere of energy development. In the absence of private companies and government agencies willing and able to undertake large-scale development programs at the turn of the twentieth century, the Southern Pacific emerged in Southern California as a dynamic and innovative regional influence with modern organizational capabilities.

The Southern Pacific Company also exerted influence in the way it exited the business of oil production. In 1921, Pacific Oil was organized as an independent company by the Southern Pacific board of directors as part of a strategy to preserve shareholder equity by formally separating the business of railroading from the business of oil production. By 1926, however,

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Standard Oil (California) had managed to acquire a majority share of Pacific Oil stock, resulting in a merger between two of the largest oil companies in Southern California. Building on the solid foundation established by the Southern Pacific Company, Standard Oil of California was able to achieve unprecedented levels of vertical integration following the 1926 merger with Pacific Oil. Given the magnitude of this influence, it is easy to understand why the metaphor of “the Octopus” has also been applied to Standard Oil.

In the next chapter, a case study of Los Angeles Harbor, I look beyond the corporate influence of the Southern Pacific (and eventually Standard Oil of California) to develop a more comprehensive understanding of the spatial fixity of oil-based energy. Whereas the Southern Pacific stimulated the emergence of oil-based energy at the turn of the twentieth century, the long-term development of Los Angeles Harbor as a major regional node of energy storage, refining and transshipment was critical in facilitating the geographic expansion of the Southern California petroleum industry.
CHAPTER FOUR

Built on purpose: Los Angeles Harbor as a spatial fix for oil-based energy

In the first decades of the twentieth century, the Los Angeles metropolitan area emerged as the fastest growing urban-industrial economy on the Pacific Coast. This was a significant achievement for a region and city without a natural harbor. Whereas San Francisco and San Diego both had deep-water bays that helped attract ocean-based commerce in the nineteenth century, Los Angeles, by contrast, was located twenty-miles inland from a coast where deep-water anchorage was not possible. Indeed, before the development of Los Angeles Harbor in the late-nineteenth and early-twentieth centuries, no deep-water anchorage existed in the 450-mile span between San Francisco and San Diego.¹

Despite formidable barriers presented by physical geography and regional ecology, the gradual development of a harbor district in the Los Angeles metropolitan area was fundamental to the emergence of oil-based energy in Southern California. “In the early planning of what is now Los Angeles harbor there was little thought of the mineral riches that lay underneath adjacent territory,” argued Clarence H. Maston in 1945, one-time secretary of the Los Angeles Board of Harbor Commissioners, because “…the great value of petroleum in the world economy had not yet became apparent.”²

In this chapter, I examine how the development of Los Angeles Harbor in the late-nineteenth centuries provided a spatial fix for the emergence of oil-based energy in Southern California. In particular, the built environment of the harbor functioned as a spatial fix that

² Maston, Building a World Gateway, 15.
facilitated the efficient circulation, storage and transshipment of oil-based energy in Los Angeles. Developed gradually over the course of several decades, Los Angeles Harbor needs to be understood as a long-term, fixed-capital investment into oil-based energy as fuel for industry and transportation in Southern California.

As a spatial fix for oil-based energy, Los Angeles Harbor also provided a critical outlet for surplus energy produced in Southern California, and thus became essential to the process of managing energy abundance and maintaining the market of the regional petroleum industry. With the exception of Wilmington, all of the major oil fields in the Los Angeles Area were discovered between 1920 and 1923. These include Huntington Beach (1920), Long Beach and Santa Fe Springs (1921) and Dominguez (1923). The rapid development of these fields caused a flood of oil to reach the market, reducing the price. By 1923, Los Angeles surpassed San Francisco as the leading port facility on the Pacific Coast due to the necessary export of large amounts of surplus oil from the fields of Southern California.³

This chapter is divided into four sections. The first section invokes the concept of energy systems to illustrate how an emphasis on harbor districts as key nodes of energy conversion, storage and transshipment provides insight into the role of oil-based spatial fixes in shaping historical geographies of urban and industrial development in North America. In the second section, I focus on the early development of Los Angeles Harbor beginning in the late-nineteenth century. The gradual development of an artificial deep-water harbor for the city of Los Angeles was a contentious political process that involved extensive environmental transformation and the expenditure of massive amounts of public and private capital. The investment was intended to be long-term.

³ City of Los Angeles Board of Harbor Commissioners, Annual Report: Fiscal Year Ending June 30, 1925 (Los Angeles, 1925).
In the third section, I outline the multiple functions of Los Angeles Harbor as an oil-district in the first decades of the twentieth century. With deep-water access, even if artificial, the harbor became the geographic focus of fixed-capital investments into infrastructures to facilitate the storage and transshipment of oil produced throughout Southern California. Accordingly, the fourth and final section emphasizes the increasing importance of Los Angeles Harbor as a regional outlet for surplus oil produced in the 1920s. For local producers faced with the ongoing threat of overproduction after the discovery of large oil fields surrounding Los Angeles, the development of an export market was necessary for managing energy abundance in Southern California.

**Harbors as energy nodes**

Urban historians have emphasized the importance of deep-water harbors to the nineteenth-century development of North American cities. For coastal settlements like New York, Boston and San Francisco, the building of port facilities for ships to load and unload cargo was critical to the early development of commercial markets when economical overland transportation options did not exist. In this age of commercial mercantilism, the extent of urban development remained a reflection of the primary means of transportation: waterways. Especially before the development of transcontinental transportation beginning in the middle of the nineteenth century, harbors sustained the earliest North American cities with crucial material inputs such as energy and building materials that made subsequent rounds of urban and industrial expansion possible.

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Despite being limited to natural and artificial waterways, steamships were the first mass-mode of transportation in North America.\(^5\)

The importance of harbors to the establishment and growth of early North American urban economies cannot be overestimated. Yet, urban and environmental historians have largely overlooked the critical function of harbors in the provision of coastal cities with fossil-fuel energy inputs in the late nineteenth and early twentieth centuries. In the eastern mid-Atlantic, artificial waterways facilitated nineteenth-century urban and industrial expansion by creating a new built environment whereby coal could be economically transported in ever-increasing quantities. The energy demands of nineteenth-century industrialization were extensive, and growing cities were dependent upon the efficient transportation and storage of fossil fuel. Indeed, a focus on harbors as key nodes of energy conversion, storage and transshipment provides insight into how spatial fixes of oil-based energy have shaped the historical production of urban and industrial space in North American cities.\(^6\)

In developing a theory of energy systems as complex networks of conversion and provision, Debeir et al. emphasize the critical importance of transportation networks and storage facilities in the provision of fossil fuel in capitalist society, which they refer to as the “age of networks.”\(^7\) Beginning in North America in the second half of the nineteenth century, complex networks of human-built infrastructures provided growing industrial cities with cheap and abundant supplies of fossil fuel energy. Whereas canals were the first major transportation networks developed to provision cities with abundant supplies of fossil fuel, railroad and pipeline systems increasingly became important towards the turn of the twentieth century. These

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\(^7\) Debeir et al., *Servitude of Power*, 108-133.
infrastructures represented fixed-capital investments beyond the reach of individual capitalists and even fledgling municipal governments, and were thus dependent upon extensive federal subsidies. Indeed, the visible hand of the state was fundamental to the emergence of fossil-fuel energy systems across North America in the late-nineteenth and early-twentieth centuries.

The emphasis that Debeir et al. place on the interconnected and networked elements of energy systems provides important insight into how spatial fixes of fossil fuel energy have shaped processes of metropolitan development during a formative period of industrial capitalism in North America. For costal cities in particular, harbors and port facilities represented vital nodes of energy provision. In the days of coal, the storage facilities of harbor cities provided the bunker fuel that powered water-based commerce. In addition to offering storage facilities, the unique water-access that harbors provided made them important terminals for overland transportation networks. These networks spanned cities and hinterlands, providing burgeoning metropolitan economies with vital energy inputs needed for rapid urban and industrial expansion in the late-nineteenth and early twentieth centuries.

**Developing Los Angeles Harbor**

For much of the nineteenth-century, the city of Los Angeles was located twenty-miles inland from a coastline without a natural, deep-water harbor. The eventual site of Los Angeles Harbor, the south-facing San Pedro Bay, was originally a mudflat too shallow to support a wharf. Since no deep-water harbor existed in the 450-mile span between San Francisco and San Diego, the federal government designated San Pedro an official port of entry in the 1850s. Even with federal endorsement, however, San Pedro remained one of many receiving-areas on the Pacific Coast that sustained early urban development in Southern California; Santa Monica and Redondo

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8 Prudham, Gad and Anderson, “Networks of power,” 175-200.
Beach were others. Lack of deep-water access in these coastal areas forced merchants to use small boats, known as lighters, to transfer cargo from massive ships anchored miles offshore. The transporting of lumber (an essential input to the growth of towns in Southern California) via this method was particularly cumbersome.9

Among the local merchants frustrated by lack of deep-water access in the Los Angeles area was Phineas T. Banning, the prominent entrepreneur who founded the town of Wilmington, California in 1857. Banning was in the transportation business, and had a lucrative monopoly over the operation of ‘lighters’ in nearby San Pedro Bay. In order to promote the development of his town and the commercial success of his freight business, Banning was influential in the building of a 21-mile stretch of railroad between Los Angeles and San Pedro. With services beginning in 1869, the Los Angeles and San Pedro Railroad was the first of its kind in Southern California, initiating a new era of development for the harbor region. The enormous potential of this early transportation linkage to stimulate further regional development was immediately acknowledged at a federal level, and Banning was successful in soliciting Congress for appropriations to fund the first improvements to the site that would become Los Angeles Harbor.10

Beginning with the first improvements in 1871, the development of Los Angeles Harbor was an ongoing process that involved considerable amounts of capital and extensive environmental transformation. After an investigation by the Army Engineering Corps determined that a sand bar obstructed the entrance to San Pedro Bay, Congress allocated $550,000 for the construction of a 6,700-foot jetty capable of dredging the main channel to Wilmington to a depth of ten feet and width of two hundred feet. In the early 1880s, Banning was successful in further

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9 Deverell, Railroad Crossing, 93; Fogelson, Fragmented Metropolis, 108-109; Maston, Building a World Gateway, 19.
10 Deverell, Railroad Crossing; 93; Fogelson, Fragmented Metropolis, 108.
petitioning Congress for an additional $200,000 to deepen the channel to sixteen feet by extending the existing jetty and building a new one.\textsuperscript{11} To be sure, these early large-scale improvements to San Pedro Bay were immediately effective in generating increased commercial activity for the region. Whereas 54,937 tons of lumber, coal and other commodities were shipped through the improved port facilities in 1871, shipping at San Pedro Bay/Wilmington had increased to nearly 200,000 tons annually by the time of Banning’s death in 1885.\textsuperscript{12}

From the time of the earliest improvements, the Los Angeles Chamber of Commerce and the \textit{Los Angeles Times} were influential proponents of San Pedro as the leading port facility in Southern California. Even the Southern Pacific Railroad supported the early development of San Pedro into a competitive, deep-sea harbor.\textsuperscript{13} By the late 1880s, the Southern Pacific had gained control of the strategic San Pedro and Los Angeles Railroad as well as most of the waterfront acreage at San Pedro/Wilmington. As late as 1888, the future of San Pedro Bay as Los Angeles Harbor seemed guaranteed as the Southern Pacific Railroad was investing in the construction of wharf facilities there.

This situation changed drastically in 1890 when Collis P. Huntington replaced Leland Stanford as president of the Southern Pacific Company, and immediately announced his intention to lead the development of competing port facilities at Santa Monica. “With the Los Angeles Terminal Railway sharing the benefits of a deep-water harbor at San Pedro,” observed Maston in 1945, “Huntington conceived the idea of having the harbor located at Santa Monica instead.”\textsuperscript{14}

Despite the shock and confusion that this sudden change in corporate policy caused, one thing remained obvious: neither San Pedro nor Santa Monica had port facilities capable of handling the

\begin{footnotesize}
\begin{enumerate}
\item Fogelson, \textit{Fragmented Metropolis}, 108.
\item City of Los Angeles Board of Harbor Commissioners, \textit{Annual Report: Fiscal Year Ending June 30, 1927} (Los Angeles, 1927), 66.
\item Larry Mullaly and Bruce Petty, \textit{The Southern Pacific in Los Angeles, 1873-1996} (San Marino, California: Golden West Books, 2002); Ray Miller, \textit{History and Growth of the Port of Long Beach} (Long Beach Harbor Department, 1940), 24-25.
\item Maston, \textit{Building a World Gateway}, 39.
\end{enumerate}
\end{footnotesize}
enormous increase in water-based commerce that Southern California was generating in the final decades of the nineteenth century. Additional federal appropriations were needed for the development of modern deep-water port facilities capable of sustaining new levels of regional economic growth.

The 1890s were a formative period in the development of Los Angeles Harbor. The episode known as the “Free Harbor Fight” was a struggle for federal appropriations that pitted proponents for the continued development of San Pedro against interests in the development of port facilities at Santa Monica. In support of Santa Monica, William Hood, chief engineer for the Southern Pacific Company, claimed that the holding ground below the surface of San Pedro Harbor was irreparably defective and completely unsuitable for the anchorage of deep-water vessels. This was the explanation provided before Congress for the sudden and unexpected shift in company preference from San Pedro to Santa Monica. In the meantime, however, the Southern Pacific was constructing a 4,500-foot “Long Wharf,” as it came to be called, at Santa Monica, which Huntington named “Port Los Angeles.” As to Santa Monica,” wrote a confident Huntington to U.S. Congressman Grove L. Johnson in January 1895, “I think the question is so well understood that that place will get the appropriation and not San Pedro.” After all, Southern Pacific needed good reason to abandon San Pedro and begin construction of the “Long Wharf” at Santa Monica.

Meanwhile, supporters for the continued development of San Pedro, notably the Los Angeles Times, argued that the Southern Pacific favored Santa Monica only because the company possessed a transportation monopoly over the waterfront there. By 1891, the Los Angeles Times, argued that the Southern Pacific favored Santa Monica only because the

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16 Deverell, Railroad Crossing, 100-102.
17 Collis P. Huntington to Grove L. Johnson, January 1895. Collis P. Huntington Papers 1865-1901 (Series 1, Reel 53).
Angeles Terminal Railway had purchased Terminal Island, completed a line between Los Angeles and San Pedro, and was competing directly with the Southern Pacific. At Santa Monica, by contrast, the Southern Pacific Railroad had arranged for exclusive right-of-way access over the waterfront. Furthermore, the existence of coastal palisades surrounding the Santa Monica waterfront made it extremely difficult for competing railroads to gain access to the port.

Alongside the *Los Angeles Times*, the Los Angeles Terminal Railway emerged as important supporters of the continued development of San Pedro as a harbor ‘free’ from the transportation monopoly of the Southern Pacific Railroad.¹⁸

The conflict known as the “Free Harbor Fight” was essentially a battle to influence public opinion in Southern California. With the *Los Angeles Times* expressing unwavering support for San Pedro, Collis P. Huntington and the Southern Pacific Railroad looked to other news outlets to support the case for Santa Monica. Correspondence between Huntington and William Mills, chief land agent for the Central Pacific Railroad, a subsidiary of the Southern Pacific, illustrates the enormous emphasis placed on influencing “the common mind” through carefully written news articles.¹⁹ Referring to an article that was to appear in a special edition of the *Los Angeles Herald* in the summer of 1893, Mills explained to Huntington that the “object is to array Los Angeles and Southern California on the side of Port Los Angeles, and to this end the association of the Nicaragua Canal is introduced.”²⁰

Considerably north of Panama, the proposed Nicaragua Canal would have offered Los Angeles more direct access to the markets of the Atlantic seaboard. However, the strategy of linking Port Los Angeles at Santa Monica to the proposed Nicaragua Canal was still flawed, as Mills explained to Huntington:

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¹⁸ Ibid.
²⁰ Ibid.
The reference made to the Nicaragua Canal will not help that enterprise in the estimation of the people of this State if they are thoughtful enough to see that the trade of the west coast of South America will bear a more intimate relation to New York than it now does to San Francisco. In fact, the map I present is perhaps one of the best arguments against the construction of the canal itself. But its use for the purpose intended will be effective. It gives the article the appearance of thoughtful consideration of the whole subject, and it associates the high expectation which has become attached to the Canal with the establishment of a harbor at Port Los Angeles, and the common mind will come to think of the two in the same connection.21

Mills was careful to assure his boss that the newspaper and not the railroad “takes the moral responsibility for the article.”22 As ‘victims’ of newspaper slander in the San Francisco area, both men recognized that the opinion of a reputable newspaper would be essential to winning over public opinion in Southern California.

Whereas the Times remained an unwavering supporter of a deep-water harbor at San Pedro, the Southern Pacific Company had a difficult time maintaining the consistent support of a regional newspaper. After all, the ability to influence public opinion through the mass medium of print was considered essential to achieving political success. “We have lost relations with the Los Angeles Herald,” wrote Mills to Huntington on 8 September 1894:

> The Herald has been our friend in the Santa Monica situation, and in every respect has done whatever it could to promote the interests of the Southern Pacific Company. We have been liberal to it—not beyond what was just, however—and it has now passed into the management and control of the Terminal Railroad Company, which is a collateral branch of the A.T. & S.F. and will hereafter advocate the establishment of a harbor at San Pedro instead of Santa Monica.23

The Southern Pacific Railroad eventually regained control of the Los Angeles Herald by acquiring control of the Terminal Railroad Company.24 By this time, however, Mills was admitting to Huntington how the “sentiment at Los Angeles is almost unanimous against Santa

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21 Ibid.
22 Ibid.
23 William H. Mills to Collis P. Huntington, 8 September 1894. Collis P. Huntington Papers 1856-1901 (Series 1, Reel 53).
24 Dervell, Railroad Crossing, 93-122.
“The Times under [Harris Gray] Otis has taken a strong position against the Company in everything,” admitted Mills to Huntington. Both men acknowledged that the marketing strategy for Santa Monica needed to change quickly “in the way of correcting public opinion on the Harbor Question.”

The marketing strategy of the Southern Pacific Company grew more desperate as public sentiment in Los Angeles grew increasingly antagonistic towards the idea of a deep-water harbor at Santa Monica. “During my last stay at Los Angeles,” wrote Mills to Huntington on 2 March 1896, “I tried to infect the people there with the idea that a deep sea harbor at Santa Monica would invite the construction of a railroad from Los Angeles toward the heart of the continent, absolutely force it, as it were, by reason of the deep sea outlet nearly 400 miles farther East than San Francisco.” According to Mills, the fact that Santa Monica was located nearly 400 miles inland from San Francisco was a fact “not thoroughly well known” to the voting people of Los Angeles: “I have assured them that the construction of a deep sea harbor, making the sea a factor in the commerce and growth of Los Angeles, would be evolutionary in its character in the way of producing a long rail communication between Los Angeles and the commercial centers of the country.” This argument was intended to be an appeal to simple geography and common sense, and not the proven ability of the Southern Pacific to build transcontinental railroads in exchange for political economic influence. For the executives of the Southern Pacific Company, the “Santa Monica business” remained of “highest importance.”

27 Ibid.
28 Mills to Huntington, 2 March 1896.
29 William H. Mills to Collis P. Huntington, 15 March 1896. Collis P. Huntington Papers 1856-1901 (Series 1, Reel 54).
Eventually, the “Free Harbor Fight” was settled in 1897 after a five-person committee headed by Admiral John C. Walker recommended San Pedro instead of Santa Monica. This final decision confirmed and reinforced previous recommendations of San Pedro made by government engineers assembled to investigate the suitability of each location as deep-water harbors for commerce and refuge. “While the physical advantages of the San Pedro location naturally lead to its selection,” reads the report filed by the Walker Board, “the advisability of that choice is materially strengthened by the consideration of the extensive improvement of its interior harbor already made, conditionally provided for or contemplated as the object of future appropriations.”

The Walker Board also addressed the main technical objections raised by engineers of the Southern Pacific Railroad regarding the San Pedro location. “The character of the holding ground within the protected area of San Pedro is admitted by all parties to be good,” reads the report, “…it is perhaps in places a little too hard, but not enough to form any substantial objection.” With the formal recommendation of the Walker Board, federal appropriations in the amount of $3,000,000 were allocated for the construction of a deep-water breakwater at San Pedro. In Figure 4.1, a photograph taken in December of 1902, we see a view of the construction of the government breakwater at San Pedro. Early government involvement in the building of Los Angeles Harbor formed the basis for subsequent investments in the first three decades of the twentieth century. The inertia of oil-based energy needs to be understood in the context of long-term streams of investment that span decades and even centuries.

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30 Willard, *Free Harbor Contest*, 177.
31 Ibid., 174-5.
The Los Angeles Harbor Commission was founded in December 1907, officially establishing the Port of Los Angeles.\textsuperscript{32} Yet, the problem remained that Los Angeles had no formal municipal authority over the improved harbor. Even when advocating for a deep-water harbor at Santa Monica in the 1890s, the Southern Pacific Railroad had accumulated a majority ownership of waterfront property at Wilmington, and even gained strategic control over the Terminal Island Corporation. To observers, it seemed likely that San Pedro was going to become

\textsuperscript{32} Ibid., 117.
another Oakland, where the Southern Pacific had managed to maintain monopoly control over the waterfront in the latter-decades of the nineteenth century.33

By the turn of the twentieth century, the Southern Pacific Company had accumulated approximately one thousand acres of prime Wilmington tidelands, more than enough to support a regional harbor. In an effort to ensure that the improved harbor remained free from corporate monopoly, civic leaders in Los Angeles proposed the annexation of San Pedro and Wilmington, which happened in 1909. Since municipal law in Southern California prevented the political consolidation of non-contiguous jurisdictions, the twenty-mile span of territory that once separated city and harbor also became part of the greater Los Angeles region. Illustrated in Figure 4.2, a map from 1916, this narrow strip of territory that connected the city with the harbor became known as the "shoestring district." The annexation of this narrow strip of land had significant implications on the metropolitan development of Los Angeles, which was now a city with its own deep-water harbor. According to Michael Dear, the annexation of the shoestring district “expanded the city’s area by almost 50 percent and became the prototype for L.A.’s subsequent campaign of infrastructure-based territorial development.”34

Figure 4.2. The Los Angeles “shoestring district.” This 1916 Map shows the thin strip of land down to San Pedro that was annexed to the city of Los Angeles. Homer Hamlin, City Engineer; compiled under the direction of J.R. Prince, chief draftsman (Source: Library of Congress, Geography and Map Collection, Washington D.C. Call number: GR364.L8F7 1916.H3).
Upon consolidation, the city of Los Angeles also gained control of the Wilmington tidelands owned by the Southern Pacific once the California Supreme Court determined that the railroad possessed imperfect title to the tract. In addition to providing port facilities, the Los Angeles Harbor Commission was also made responsible for collecting wharfage fees and administering the leasing of waterfront property to private companies. Most leases issued granted private companies access to the harbor for a period of thirty years. Although susceptible to political corruption, this leasing system was implemented to ensure that municipal authority rather than corporate enterprise controlled the long-term development of Los Angeles Harbor.  

Los Angeles Harbor as a spatial fix for oil-based energy

With modern facilities and a deep-sea harbor, the Port of Los Angeles emerged in the first decades of the twentieth century as a regional and nation-leading hub of oil-based development and transshipment. As an industrial district, the port was comprised of warehouses, railroad terminals and wharfs to support commercial activity. Within the context of the regional energy system, the built environment of Los Angeles Harbor functioned as a spatial fix comprised of infrastructures and land-uses that were dedicated to the transportation, storage and refining of oil and oil-based products. Indeed, the regional networks of railroads and pipelines that converged on the harbor district established physical linkages between natural resource deposits in distant hinterlands and the burgeoning metropolitan economy of Los Angeles, providing the city with vital energy inputs required for rapid industrial and urban expansion. Focusing on the formative first decades of the twentieth century, this section examines the multiple functions and

35 City of Los Angeles Board of Harbor Commissioners, *Los Angeles, The Great Seaport of the Southwest* (Los Angeles, 1921); City of Los Angeles Board of Harbor Commissioners, *The Port of Los Angeles: Past, Present and Future* (Los Angeles, 1 November 1913).
implications of Los Angeles Harbor as a spatial fix for Southern California’s oil-based energy system.

Considering the essential role of transportation networks to the production and consumption of fossil fuel energy sources, the significance of Los Angeles Harbor as a regional terminus of competing railroad systems needs to be emphasized. Indeed, the first railroad in Southern California was a 21-mile stretch that connected Los Angeles with the harbor district at San Pedro/Wilmington. Commencing service in 1869, the Los Angeles and San Pedro Railroad was responsible for initiating a new era of development for the expanding urban and industrial region. Although the Southern Pacific had attempted to secure exclusive access at Santa Monica in the 1890s, the possibility of a transportation monopoly controlled by the “Octopus” was extinguished with the eventual decision to locate the Port of Los Angeles at San Pedro/Wilmington in 1897. For harbor promoters, competing railroad companies translated into reduced transportation rates for prospective tenants. Among the prominent membership of the Free Harbor League that lobbied for competitive transportation rates was William Lacy, president of the Puente Oil Company, and Union Oil of California.\(^{37}\) By 1902, a modest 7,150 barrels of oil was shipped through the harbor at San Pedro/Wilmington. The lumber needed to sustain rapid urban growth in Southern California remained the dominant import well into the twentieth century.\(^{38}\)

With competitive rail integration and a pledge from the federal government to build a deep-water harbor, the Port of Los Angeles became a primary node for oil-based development in the first decades of the twentieth century. In addition to functioning as a railroad terminus, the

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Port of Los Angeles became a major hub for regional pipeline networks in Southern California. By 1914, the General Pipe Line Company operated an eight-inch main line that linked San Pedro with the Midway oil fields of Kern County, an overall distance of 156 miles. In addition, the company also operated an 8-inch, 52-mile-long branch line between Lebec in Los Angeles County and Mojave in Kern County. This massive transportation system was capable of handling between 25,000 and 30,000 barrels of oil per day.

The General Pipe Line Company produced no oil itself, but rather, was operated as a subsidiary of the General Petroleum Company, which produced approximately 9,000 barrels per day from lands tributary to the pipeline network. The remaining capacity of the lines was used to transport oil purchased by the General Pipe Line Company. The Standard Oil Company, located near the main turning basin of Los Angeles Harbor, also maintained a direct pipeline connection with regional oil fields. Representing significant investments of private fixed-capital, the pipeline network that physically linked the harbor with distant hinterlands was critical to the emergence of an oil-based energy system in Southern California.

In the context of regional energy systems, the effective provision of fossil fuel is more than a function of effective transportation. Indeed, the efficient and economical distribution of fossil-fuel-based energy within urban areas also depends on the establishment of adequate storage facilities. In this regard, Los Angeles Harbor was developed to function as a critical node of energy storage in Southern California. In the first decades of the twentieth century, both the

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41 Ibid., 486-487.
42 Ibid., 487.
43 Los Angeles Board of Harbor Commissioners, *Great Seaport of Southwest*, 46.
General Petroleum Company and the Standard Oil Company built storage facilities with respective capacities of 962,500 and 460,000 barrels. In addition to storage located at the port, Standard Oil of California also maintained a tank farm in Watson, an emerging industrial suburb located two miles from Los Angeles Harbor. In the outer harbor, these companies operated filling stations capable of loading deep-sea tankers at rates of 12,000 barrels per hour. In addition, the port maintained a significant supply of bunker coal for visiting tankers that had yet to convert to oil-based energy.

The 1920s were a particularly busy decade for Los Angeles Harbor. The discovery of three major oil fields in the Los Angeles area between 1920 and 1923 placed an enormous stress upon existing transportation and storage facilities. By this time, the export of regional surpluses had become the most important business at the port. With existing storage and refining facilities overwhelmed by a sudden flood of oil, “the only thing to do was to pipe it through the Harbor as fast as ships could carry it away, with the result that the sea lanes from Los Angeles to Panama became a veritable procession of tankers,” reads an Annual Report published by the Board of Harbor Commissioners. For oil companies stationed at the harbor, investment into the most modern and efficient transshipment technologies was essential.

To be sure, the transition of Los Angeles Harbor from a crude oil shipping port in the 1890s to a modern transshipment facility for refined oils, gasoline and other petroleum products by the 1920s was dependent upon extensive fixed-capital investment into state-of-the-art loading stations. With three pipelines direct from its refinery and eight lines servicing the wharf, the Associated Oil Company maintained facilities capable of loading three vessels simultaneously. With five pipelines from its refinery and five pipelines at the dock, the General Petroleum

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44 Ibid., 47.
45 Ibid., 54.
Corporation of California maintained facilities capable of loading two boats simultaneously at a rate of 17,000 barrels per hour. In terms of sheer loading capacity, the Standard Oil Company of California emerged as a clear leader at Los Angeles Harbor. Occupying two wharfs located near the Main Turning Basin, Standard Oil maintained facilities capable of loading five tankers simultaneously.47

In addition to offering modern equipment that speeded up the loading of tankers for transshipment to distant markets, many of the oil companies located at Los Angeles Harbor were also in the lucrative business of selling bunker fuel. Whereas the General Petroleum Corporation maintained a small barge for providing bunker fuel in limited capacity, the Associated Oil Company operated two modern barges that, when combined, offered a service of 10,000 barrels capacity with the state-of-the-art capability of supplying bunker fuel at an astonishing rate of 2,000 barrels per hour. Standard and Union were also in the business of selling bunker fuel, with each company having three barges in operation. In 1920, Union Oil completed construction on a modern steel barge with an unprecedented 7,000 barrels capacity. As of 1930, the Western Oil and Refining Company was undertaking construction of a “first-class” steel barge of 10,000 barrels capacity. Within the port, oil lines were also installed on some commercial wharfs so vessels could load cargo and take on fuel simultaneously.48

Despite offering modern transshipment facilities to speed the flow of oil, congestion became a serious issue at Los Angeles Harbor in the early 1920s, and proposals were being considered by the Board of Harbor Commissioners to implement a degree of land-use regulation at the port. “Harbor engineer Nicholson has evolved a plan for bringing order out of chaos in Los Angeles Harbor,” reported the Times in 1925:

48 Ibid., 30-1.
He has prepared a zoning plan for locating industries and businesses around the harbor so that, for example, passengers and fisheries may be kept far apart; so that oil and lumber will not be jammed up against each other and in general he has provided for future development of the harbor along lines of efficiency and decreased fire and congestion hazards.49

The primary objective of the plan proposed by Nicholson was to legitimize pre-existing land-uses at the port, with oil-based uses prominently located at the opening of the outer harbor (Figure 4.3). However, land-use zoning alone had limited potential for alleviating the mounting congestion at Los Angeles Harbor. “Owing to the congestion at the harbor, due to lack of adequate facilities” reported the Times in 1923, “it is impossible for a sufficient number of tankers to berth simultaneously, thereby making it difficult to keep surplus stocks moving.”50

Indeed, additional substantive improvements were needed to improve access to the port and increase the depth of the harbor. More federal appropriations were needed to expand the capacity of Los Angeles Harbor.

49 “Plan provides for zoning of harbor,” Los Angeles Times (4 October 1925), B12.
50 “Oil increases harbor needs,” Los Angeles Times (25 April 1923), II8.
Figure 4.3. Proposed land-use zoning plan for Los Angeles Harbor, 1925 (Source: “Plan provides for zoning of harbor” Los Angeles Times. 4 October 1925, p. B12).

A higher degree of coordination between the competing railroad companies that serviced Los Angeles Harbor was also needed. Into the 1920s, the Southern Pacific, Santa Fe, Pacific
Electric, Union Pacific and Municipal Terminal railroads each operated independent lines to different wharves in the Port of Los Angeles. In an effort to improve flow and transportation, these independent systems were eventually consolidated into a single Harbor Belt Line Railroad, which was managed as a partnership between the city and representatives from each company.\textsuperscript{51} By 1932, the Harbor Belt Line Railroad managed 125 miles of track that effectively integrated the waterfront with the expanding Los Angeles region.

In the first three decades of the twentieth century, the improvements to Los Angeles Harbor had an impact on wider regional geographies of industrial suburbanization in Southern California. After all, the gradual decentralization of industry was necessary to take advantage of waterfront locations in Los Angeles.\textsuperscript{52} By 1920, the development of a regional transportation infrastructure consisting of major truck highways and a consolidated harbor railroad system facilitated the movement of commodities from industrial suburbs along the shoestring district to Los Angeles Harbor. Torrance and South Gate are two examples of industrial suburbs that sprung up along railroad tracks between Los Angeles and the improved harbor at San Pedro/Wilmington in the first three decades of the twentieth century. “The proximity of southern suburbs to the port helped seal their industrial future,” argues Becky M. Nicolaides, “since it would be cheaper to move manufactured goods for export from these sites.”\textsuperscript{53} In addition to the draw of improved transportation facilities, the discovery of massive oil fields in the vicinity of


the improved harbor in the early-1920s had the impact of reinforcing established patterns of industrial suburbanization in the Los Angeles Basin.\textsuperscript{54}

The critical importance of Los Angeles Harbor as a regional hub of storage and distribution for the oil industry in Southern California made the port facilities the focus of labor disputes and a target of deliberate acts of destruction. The morning 8 August 1923, a mysterious fire engulfed the 500,000-barrel capacity underground storage facilities of the General Petroleum Company. According to newspaper reports, the vast reservoir overflowed on four separate occasions, sending uncontrolled waves of liquid fire in every direction. Company officials dispatched to the scene immediately blamed the destruction on arson.\textsuperscript{55} On 7 September 1923, the \textit{Los Angeles Times} reported, “the General Petroleum fire at Los Angeles Harbor, which endangered hundreds of lives and caused $650,000 in property damage, was set by a maniac inspired by the Industrial Workers of the World.”\textsuperscript{56} In a confession obtained by police, the accused gave two reasons for his actions: that he had been out of work, and that “he had been ordered by God to burn up the world.”\textsuperscript{57}

Regardless of the cause, the fire had disastrous consequences for the General Petroleum Company. In addition to losing 500,000-barrels of crude oil, the company also faced pressure to remove the storage facility from the harbor due to the threat posed to surrounding residential neighborhoods. In an unsuccessful petition signed by 300 property owners submitted to the San Pedro Chamber of Commerce, the General Petroleum Company was ordered not to reconstruct the huge reservoir and was urged to remove two 55,000-barrel tanks and one 10,000-barrel tank from the harbor.\textsuperscript{58} Of course, the fundamental role of storage facilities to the efficient and

\textsuperscript{54} Ibid., 80-81.
\textsuperscript{55} “Oil fire at harbor temporarily under control,” \textit{Los Angeles Times} (18 August 1923), I1; “Harbor oil fire third attack on petroleum firm,” \textit{Los Angeles Times} (18 August 1923), I2.
\textsuperscript{56} “Admits setting harbor oil fire,” \textit{Los Angeles Times} (7 September 1923), II2.
\textsuperscript{57} Ibid.
\textsuperscript{58} “Oil tank removal is urged,” \textit{Los Angeles Times} (22 August 1923), II8.
The economical provision of fossil fuel energy prevented this possibility. The interests of the petroleum industry demanded that business proceed apace. Despite the destruction it caused, the fire in the storage facilities of General Petroleum represented only a slight deterrent to resuming business as usual for oil firms located at Los Angeles Harbor.

If anything, the experience of the early-1920s motivated oil companies to further expand their storage capacities at Los Angeles Harbor. By 1930, the Associated Oil Company maintained a modest storage capacity of 512,000 barrels at the harbor. In addition, the Richfield, Shell, Texas and Union oil companies each operated storage facilities ranging from 340,000 to 490,000 barrels. At a smaller scale, the Hancock and Sunset Pacific oil companies maintained storage facilities with respective capacities of 275,000 and 190,000 barrels. Despite the destruction caused by the fire in 1923, the General Petroleum Corporation had managed to rebuild to a total storage capacity of 1,155,000 barrels by 1930. Figure 4.4, a photograph from 1924, provides an aerial view of the tank farm of General Petroleum Company on Harbor Boulevard. Following General Petroleum, the Standard Oil Company of California managed a storage capacity of 832,000 barrels at the harbor. In addition, Standard also operated a tank farm of 615,000 barrels capacity, located two miles away in the industrial suburb of Watson, which was used in conjunction with the main terminal at Los Angeles Harbor. In other words, companies were beginning to adopt a regional approach to oil production.59

To be sure, the important function of Los Angeles Harbor as a node within Southern California’s oil-based energy system in the first decades of the twentieth century was not limited to storage, distribution and transshipment. Los Angeles Harbor also became an important hub of oil refining in Southern California. In 1897 San Pedro became the site of a 10,000 barrel per day refinery after the federal government approved plans to improve the adjoining harbor. In the 1920s, Union Oil completed construction of a $1M kerosene refinery on a 260-acre tract at the

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head of the West Basin. Upon completion in 1930, a maximum daily output of 10,000 barrels made this modern facility the largest refinery of its kind in the world. In the process of becoming established at the harbor, Union Oil made greements with the General Pipe Line Company for the use of storage and distribution facilities.

In the first decades of the twentieth century, all of the major oil companies in Southern California had fixed-capital investments in Los Angeles Harbor. The Harbor Commission maintained the leasing system that gave oil companies the right to occupy and further develop waterfront properties. Despite the mandate to ensure that municipal authority rather than corporate influence guided the development of the harbor, this leasing system was nonetheless prone to political corruption. “One of the most curious of the many very curious incidents in the peculiar history of the Los Angeles Harbor management has to do with the Pan American oil wharf,” reported the Times in 1926. In the crosshairs of the Times were industry millionaire Edward L. Doheny, president of the Pan American Petroleum Company but most notable for personally discovering the Los Angeles City Oil Field in 1892, and Edgar McKee, then president of the Harbor Commission. As described by the Times, “it was during the McKee regime that the Pan American company was granted a thirty-year lease on seven acres of city-owned property at Pier 1, a lease which was the subject of severe criticism because the city charter and a city ordinance specifically prohibited the leasing of Pier 1 territory to any private concern or individual.” Doheny was charged with graft, eventually leading to the dismissal of McKee as president of the Harbor Commission. As the case was pending before a grand jury, the Pan American Company built an enormous filling and export station on the lease and continued to

61 City of Los Angeles Board of Harbor Commissioners, Great Seaport of Southwest, 47.
62 “Shipping news and activities at Los Angeles Harbor,” Los Angeles Times (2 October 1930), 19.
64 “The Doheny wharf deal,” Los Angeles Times (14 July 1926), A1.
65 Ibid.
pay the city enormous rental fees. Eventually Pan American relocated to another site at the harbor, leaving the city with a $256,000 bill to cover the construction costs of the filling station.66

Figure 4.5. Loading station of Pan American Petroleum Oil Company at entrance to Los Angeles Harbor, 1925 (Source: City of Los Angeles Board of Harbor Commissioners, Annual Report: Fiscal Year Ending June 30, 1925. Los Angeles, 1925, p. 15).

Figure 4.5, an aerial photograph of the outer harbor from 1925, shows the modern loading station of the Pan American Petroleum Company. The close proximity of storage tanks (situated on the pier) was a design element that facilitated the efficient transshipment of oil and loading of bunker fuels.

So far, this chapter has emphasized two main ways that Los Angeles Harbor functioned as a spatial fix for oil-based energy in Southern California: as a terminus of industrial

66 Ibid.
transportation networks (railroad and pipeline, in particular) and as a built environment comprised of infrastructures for the efficient storage and transshipment of petroleum. In the next section, I focus on the 1920s to emphasize how Los Angeles Harbor fulfilled one more critical function for the regional petroleum industry: as an outlet for the domestic and international export of surplus energy produced in Southern California.

**Developing an export market for surplus energy**

At the turn of the twentieth century, Southern California remained a relatively self-contained regional oil industry. However, this situation changed considerably within the short span of two decades when the discovery of three major oil fields in the Los Angeles area made the export of surplus oil production an increasingly important function of the regional energy system. In 1923, Los Angeles surpassed San Francisco as the leading port on the Pacific Coast in terms of total waterborne commerce. According to a report issued by the United States War Department, total commerce at the Port of Los Angeles in 1923 was 26,548,546 tons, which was over two-and-a-half-times the amount reported in 1922 and over five times the total reported in 1921. The export of vast surpluses of oil produced in Southern California accounted for the dominant share of this increased commercial activity. By this time, Los Angeles was the primary Pacific terminus of the Panama Canal, which received upwards of seventy percent of its total revenue from the port.

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70 Ibid., 53.
Table 4.1 Ship tonnage through Los Angeles Harbor, 1880-1930

<table>
<thead>
<tr>
<th>Year</th>
<th>No. Ships</th>
<th>Ship tonnage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1880</td>
<td>350</td>
<td>102,105</td>
</tr>
<tr>
<td>1890</td>
<td>493</td>
<td>171,261</td>
</tr>
<tr>
<td>1900</td>
<td>508</td>
<td>216,857</td>
</tr>
<tr>
<td>1910</td>
<td>2,450</td>
<td>1,660,975</td>
</tr>
<tr>
<td>1920</td>
<td>2,886</td>
<td>3,528,280</td>
</tr>
<tr>
<td>1930</td>
<td>8,137</td>
<td>23,355,293</td>
</tr>
</tbody>
</table>


Among the main proponents for a “free harbor” at San Pedro/Wilmington in the 1890s, the *Los Angeles Times* remained a dedicated observer of oil-related commercial activity at the Port of Los Angeles in the first decades of the twentieth century, particularly in the booming 1920s. On 22 December 1922, the newspaper proclaimed the previous day to be “…the greatest …in the history of Los Angeles Harbor,” with lumber and oil dominating total commercial activity.  

“Twenty-five lumber carriers were discharging 32,000,000 million feet of the product,” reported the *Times*, “while seven oil tankers were loading approximately 500,000 barrels of fuel oil for every corner of the world.”  

Yet, the importance of Los Angeles Harbor as a regional outlet for surplus oil only continued to increase during the decade. By April 1923, daily oil production in Southern California reached 700,000 barrels, close to one-third of the production for the entire country. According to some estimates, regional markets on the Pacific Coast consumed half of this daily production. “The remaining half, or 350,000 barrels a day, must be shipped out,” explained the *Times*, “chiefly by tankers through the Panama Canal to North Atlantic ports.”  

The chronic coal shortage in New York in the 1920s

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72 Ibid.
was viewed as a particularly important market opportunity for surplus energy produced in Southern California.

By 1924, industry leaders were acknowledging the need to further enhance the capacity of Los Angeles Harbor to accommodate massive exports of oil. Existing storage facilities at the port, with an estimated combined capacity of 100,000,000 barrels, were incapable of handling massive flows of oil from regional fields. The need to move surplus stocks as quickly as possible resulted in dangerous levels of congestion in the harbor. “Accidents have been frequent and costly in the last three years,” reported the Times, referring to a marked increase in harbor collisions. Evidently, the harbor developed to accommodate lumber shipments was becoming less-capable of handling larger deep-sea oil tankers: channels needed to be widened and dredged deeper.

In a 1924 meeting held by the United States Board of Engineers, representatives from the Pan American Petroleum Company and Union Oil emphasized the dire need for further federal appropriations to expand the capacity of Los Angeles Harbor. In his address to the board, Colonel Wilcox, chief engineer for the Pan-American Petroleum Company, explained that “we have had a very remarkable, a very spectacular oil development in the immediate vicinity of the city in the last two or three years, and the only way to care for that very large amount of local oil was by export.” The discovery of new fields resulted in a situation where more oil was being produced than consumed, and Los Angeles Harbor became the critical outlet for regional surpluses.

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75 “Shipping and Los Angeles Harbor news,” Los Angeles Times (25 September 1925), 15.
76 Ibid., 68.
Table 4.2. Increase in oil shipping by barrels for Los Angeles Harbor, 1902-1930

<table>
<thead>
<tr>
<th>Year</th>
<th>Barrels</th>
</tr>
</thead>
<tbody>
<tr>
<td>1902</td>
<td>7,150</td>
</tr>
<tr>
<td>1907</td>
<td>346,294</td>
</tr>
<tr>
<td>1913</td>
<td>1,268,131</td>
</tr>
<tr>
<td>1915</td>
<td>3,262,194</td>
</tr>
<tr>
<td>1920</td>
<td>12,452,466</td>
</tr>
<tr>
<td>1925</td>
<td>126,784,270</td>
</tr>
<tr>
<td>1930</td>
<td>139,036,871</td>
</tr>
</tbody>
</table>


When asked about the long-term prospects for the petroleum industry in Southern California, Wilcox estimated that “oil interests in the last 18 months have expended not less than $50,000,000 looking towards the continued shipment of oil from this port” and that “we have made that large investment with no thought that there is going to be a very quick let-up in the production of oil in this area.”77 According to Wilcox, the extensive fixed-capital investments by private oil companies into refineries, tank farms and pipelines represented proof of a long-term commitment to Los Angeles Harbor. The inertia of past investments was a major consideration in these negotiations. Whereas the chief engineer for the Pan-American Petroleum Company underscored the significance of private fixed-capital investment in the development of the port, Ralph Reid, chief engineer for Union Oil, emphasized the critical importance of Los Angeles Harbor to the continued development of an export market for petroleum products from Southern California. “We are particularly interested in the development of export business in the Orient at the present time,” remarked the representative from Union Oil.78

In early-1928, the Los Angeles Times reported that commercial activity at the harbor was rapidly approaching one billion dollars annually. “Los Angeles Harbor is first in the United States in inter-coastal shipping,” boasted the Times, “first in petroleum exports, first in lumber

77 68th Congress, Letter from the Secretary of War, 67-68.
78 Ibid., 70.
receipts, second in total ocean-borne tonnage, and second in export tonnage.”\textsuperscript{79} According to the newspaper, the most important commodities shipped from the region that year in terms of overall volume were gasoline, fuel oil, illuminating oil, raw cotton, crude petroleum, sardines, well-drilling machinery, fruits and borax.\textsuperscript{80}

The regional overproduction of oil that characterized the Southern California petroleum industry in the early 1920s and the dire need to develop and export market became the basis for subsequent federal appropriations for the improvement of Los Angeles Harbor. As described by Fogelson, “by 1932 the federal government had dredged the outer harbor to 35 feet, widened the main channel to 1,000 feet, enlarged the turning basin to 1,600 feet, extended the 11,000 foot breakwater another 12,500 feet, and at a cost of about $12.5 million transformed San Pedro Bay into one of the United States’s principal harbors.”\textsuperscript{81} With the emergent export economy, the regional oil industry in Southern California could no longer be considered self-contained. In 1929, the Port of Los Angeles peaked at over 29 million tons of commercial activity.\textsuperscript{82} Even when total commercial activity was declining in the 1930s, the export of regional surpluses of oil remained an essential means of managing energy abundance in Southern California.

The networked and integrated qualities of Los Angeles Harbor are emphasized in Figure 4.6, a map published in the 1926-1927 Annual Report of the Board of Harbor Commissioners. This map underscores the foundational importance of transportation networks as material linkages that integrate the vast region between Los Angeles and the industrial district of San Pedro and Wilmington. Although the pipelines that serviced the harbor are not visible, this map does provide insight into spatial fix of oil-based energy that shaped the urban and industrial expansion of Los Angeles in the first three decades of the twentieth century. In particular, this

\textsuperscript{79} “Commerce of Los Angles Harbor on way to billion,” Los Angeles Times (1 January 1928), E1.
\textsuperscript{80} Ibid.
\textsuperscript{81} Fogelson, Fragmented Metropolis, 118.
\textsuperscript{82} Ibid., 119.
map shows how the oil fields surrounding Long Beach, Wilmington and San Pedro were connected to each of the major railroads (the Southern Pacific, the Santa Fe and the Union Pacific) that spanned the region to converge on Los Angeles Harbor. Located strategically along major boulevards and railroad junctions, this map also emphasizes the enormous refining and storage capacity that reinforced the importance of the harbor as a major regional node in Southern California for the production and transshipment of oil-based energy.

Figure 4.6. The Los Angeles energy outlet, 1927 (Source: Board of Harbor Commissioners, Annual Report: Fiscal Year Ending June 30, 1927. Los Angeles, 1927, p. 91)

Conclusion

In the first decades of the twentieth century, Los Angeles emerged as the leading exporter of oil and oil-based products on the Pacific Coast. This was a spectacular accomplishment for a city without a natural deep-water harbor. Involving extensive environmental transformation and massive investments of public and private capital, the development of San Pedro Bay into a modern, municipally-controlled port-industrial complex with deep-water access was critical to
the emergence of an oil-based energy system in Southern California in the first decades of the twentieth century. Los Angeles Harbor, in the words of Clarence Maston, was “founded on purpose.”

In addition to influencing the political and physical expansion of the city through municipal incorporation, Los Angeles Harbor functioned as spatial fix that facilitated the transportation and storage of oil produced in Southern California. “Los Angeles is the only southern harbor directly connected with the oil fields, with adequate storage for fuel supplies,” proclaimed the Harbor Commission in 1916. The refineries, pipelines and loading stations that made Los Angeles Harbor the leading port on the Pacific Coast in the first decades of the twentieth century represented enormous investments in fixed-capital.

When the prospect of overproduction became an issue in the early-1920s, the harbor also functioned as a critical outlet in efforts to manage regional abundance through increasing export activity. By tracing the municipal functions of Los Angeles Harbor as a leading oil port in the first decades of the twentieth century, this chapter contributes insight into how fossil fuels have shaped the production of one of the key urban and industrial regions in North America.

In Chapters Three and Four, this dissertation has emphasized the role of fixed capital investment, transportation networks and built landscapes in shaping the emergence of oil-based energy in Southern California and Los Angeles between 1890 and 1930. In the next two chapters, I shift to a more direct focus on the role of the state as a mediating influence of oil-based development. With diverging objectives and an overall lack of coordination, the influence of government between the municipal, state and national levels needs to be emphasized as a major source of inertia that sustains oil-based capitalism. Whereas Chapter Five looks at the role of municipal government in facilitating the emergence of Los Angeles as the first oil-based city in

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83 Maston, Building a World Gateway, 11.
84 Los Angeles Board of Harbor Commissioners, Advantages and Availability of Los Angeles Harbor, 17.
North America, Chapter Six places Southern California in the context of federal efforts to conserve fossil fuel energy in the first three decades of the twentieth century.
CHAPTER FIVE

Embracing energy: Los Angeles and the municipal regulation of oil-based capitalism in Southern California

In the context of North American urban history, the discovery of a massive oil field beneath the streets of Los Angeles in the early 1890s was an unprecedented event that required the immediate attention of municipal government. “While slaughtering houses, tanneries, and other nuisance industries could be relocated away from valuable property and concentrated populations,” explains Sarah S. Elkind, “oil deposits could not.”1 Within the broad scope of the municipal police power, the oil industry could have been considered a nuisance that was fundamentally incompatible with existing land-uses. Yet, this is not how Los Angeles City Council proceeded in addressing the question of oil development within municipal limits.

This chapter examines the role of municipal government in facilitating the emergence of Los Angeles as the first oil-based city in North America. Faced with the problem of valuable oil beneath the streets of Los Angeles, the elected members of municipal government assumed the responsibility of developing a regulatory structure that made oil drilling possible in the context of preexisting land-uses. By focusing on the process of municipal governance during a formative period in the development of Los Angeles as the first oil-based city in North America, the aim of this chapter is to emphasize the coordinating influence of local politics and “territorial alliances” in shaping the regional development of oil-based energy systems. Black gold became a necessary evil in Los Angeles, and municipal government assumed a critical function in the process of

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maintaining a structured coherence between localized oil production and rapid urban development.

This chapter is comprised of six sections. In the first section, I describe how the discovery of Los Angeles City Oil Field in the early-1890s became an immediate problem of municipal governance, particularly in matters regarding seemingly exclusive land-uses. Then, the second section of this chapter elaborates on the messiness of oil-based urban and industrial development, and how the existence of oil beneath the streets of Los Angeles became a major source of the many “nuisances” reported to City Council in the late-nineteenth and early-twentieth centuries.

In the third section, I examine the role of City Council in crafting a system of municipal regulation capable of managing the complexities of oil-based urban and industrial development. To be sure, the role of municipal government in directing Los Angeles along a path of oil-based development extended beyond regulatory functions. In the fourth section, I argue that urban expansion of Los Angeles in the first three decades of the twentieth century provided a captive market for oil produced in Southern California. Sprinkled onto city streets, oil literally became part of the built landscape in Los Angeles.

After outlining the role of Los Angeles municipal government as a regulator of oil production and consumer of oil-based products, the final two sections of this chapter emphasize the long-term implications of oil-based municipal development. In particular, the fifth section examines how Los Angeles City Council was able to apply a working system of municipal regulation to manage the development of the Venice Oil Field after 1929. Part of Los Angeles, Venice became committed to a path of oil-based urban and industrial development. In the final section, I extend the scope of analysis beyond municipal boundaries to consider how the uneven distribution of crude oil deposits across the vast Los Angeles Basin became a major ecological factor that contributed to fractured metropolitan development in Southern California.
Petitions and ordinances from the records of Los Angeles City Council provide insight into how elected officials, private citizens and oil companies devised solutions to problems associated with oil production and oil-based capitalist development. In other words, these records capture a wide array of conflicting interests regarding the issue of oil development within city limits.

**Los Angeles strikes oil**

As I argued in Chapter Three of this dissertation, the opening of a Southern Pacific Railroad line between San Francisco and Los Angeles in 1876 stimulated a new era of urban and industrial development in Southern California. “During these early years,” wrote Edna Monch Parker in 1937, “the railway practically dictated the location of the centers of population.”² After 1885, the arrival of the Atchison, Topeka and Santa Fe line into the city triggered a rate war between the two railroads, further enhancing the business prospects of the Los Angeles region.³ Even with the stimulating influence of the railroads, however, a regional scarcity of coal remained a formidable bottleneck to expanded urban and industrial development in Southern California. The oil that was being developed on the outskirts of Los Angeles in the latter decades of the nineteenth century was being marketed almost exclusively as asphalt.⁴ Regional deposits of oil had yet to become the solution to the problem of cheap fuel that was limiting the scale and scope of urban and industrial development in Southern California. Although it was becoming increasingly expensive to import, coal was still king.

⁴ American Petroleum Institute, *California’s Oil* (API, Department of Information, 1948), 16.
According to published accounts, Edward L. Doheny first became interested in the oil business one spring day in 1892 after noticing a decrepit wagon lumbering past his Los Angeles hotel that was hauling chunks of a greasy, brownish substance that the locals were calling “brea.” Doheny, then a struggling silver miner, learned from the wagon driver that the dark gunk was being extracted from a surface pit near Westlake Park, and, when mixed with soil, could be used as a combustible fuel. At the time, local ice factories were using “brea” instead of coal, which was the main energy source in the city. With coal retailing for $20 a ton in Southern California, Doheny reasoned that larger manufacturing enterprises might eventually make the conversion to cheaper, more local, sources of crude energy.⁵

Along with business partner Charles A. Canfield, Doheny is credited with hand-drilling the first free-flowing commercial oil well within the city limits of Los Angeles. This oil was struck in April of 1893.⁶ Before then, the Ventura-Newhall district was the focus of the burgeoning oil industry in Southern California. Although oil wells had been sunk in various portions of the city since the 1860s, the 225-foot deep well dug by Doheny and Canfield at the corner of Patton and State streets signaled the beginnings of “an important epoch in the history of the city of Los Angeles.”⁷ “It meant cheap fuel,” explained Lionel V. Redpath in a promotional bulletin published in 1900, “the lack of which had always been a material hindrance to the growth of the city.”⁸ News of the Doheny-Canfield well spread quickly, and within the next three years dozens of start-up companies had sunk approximately 300 wells within the immediate vicinity of Patton and State streets, which soon become known as the “Second-street Park Oil

⁶ Davis, Dark Side of Fortune, 26; APA, California’s Oil, 17; W.W. Orcutt, Early Days in the California Fields (Taft, California: The Midway Driller Publishing Company, 1926), 13; Lionel V. Redpath, Petroleum in California: A Concise and Reliable History of the Oil Industry of the State (Los Angeles: Published by Lionel V. Redpath, 1900).
⁷ Redpath, Petroleum in California, 39.
⁸ Ibid.
The oil boom in downtown Los Angeles had begun and was proceeding at a frenzied (and wasteful) pace.

In June of 1894, the *Los Angeles Times* published an article questioning the possibility of an oil-belt within city limits. In a brief span of a few months, reported the newspaper, between twenty-five and thirty wells were sunk in a little district just north of Second-street Park, “a low-lying and uninviting piece of land where nobody would care to build a house for a residence, and where lots were difficult to sell at $100 apiece until the present oil excitement commenced.”

Some of these wells were producing as much as a dozen barrels of oil a day, which found a ready market at $1.75 to $2 per barrel. According to experts, when used for fuel purposes, the oil being produced from this district at $2 per barrel was equivalent to a ton of the best quality coal, which was being sold locally at $20 per ton. The results were promising: the city of Los Angeles was sitting atop a massive oil-belt that extended deep into the vast hinterlands of Southern California. According to the *Times*, the existence of oil beneath the city presented a “good opening for some of the capital that is lying idle in Los Angeles today.”

Predictably, the opportunity to be in the business of solving the problem of cheap fuel for the city was seized in an aggressive and wasteful way by prospectors, real estate promoters and owners of small town-lots. By 1895, Los Angeles was the leading oil field in California, accounting for more than half of the total output for the state. According to one observer, “wells were as thick as the holes in a pepper box – a well to a lot, and there were several hundred

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10 “We have an oil belt?,” *Los Angeles Times* (15 June 1894), 4.
11 Ibid.
lots."¹³ In the first state-funded survey of this oil field, mining geologist W.L. Watts estimated that approximately 300 wells were being operated in downtown Los Angeles as of March 1896.¹⁴

As shown in Figure 5.1, a photograph from 1901, the forest of oil derricks that covered a large (and predominantly residential) section of Los Angeles was a visual manifestation of the relationship between private property, on the one hand, and the material qualities of oil as a flowing, subterranean resource, on the other hand. With each narrow town-lot capable of supporting a derrick, prospectors were in a competitive rush to deplete the common pool of oil. Located a few blocks from Second Street, Court Street cut through dense portion of LA oil field.¹⁵

Figure 5.1. Oil wells on Court Street, 1901 (Source: University of Southern California Libraries. File: CHS-851).

¹³ API, California’s Oil, 23.
¹⁴ Watts, Oil and Gas Yielding Formations of Los Angeles, Ventura, and Santa Barbara Counties, 8.
¹⁵ Crowder, “Los Angeles City oil field,” 68-78
Even though the geographic extent of the downtown field had yet to be determined, oil companies of all shapes and sizes were eager to take part in the action, aggressively buying up town lots, erecting derricks and sinking wells. Whereas Mrs. Ferguson at 5 Phillips Block maintained a single well at a depth of 1500 feet that produced 1,500 barrels of oil in 1895, Union Oil maintained seven wells that produced 8,152 barrels oil in 1895. That year, the leading producers in the dense thicket of oil operations that became Los Angeles City Field were the Loma and Parker-Morril Oil Companies, each maintaining eleven wells that produced 40,000 barrels of oil, respectively. At the turn of the twentieth century, the oil-producing region of Los Angeles City Field extended more than three miles in length, ranging from one to two city blocks in width. The peak year of production for Los Angeles City Field was in 1901, when 1,150 active wells pumped over 1.8 million barrels of oil. Over 200 separate companies were active in that year, the largest being the Union Oil of California, L.A. Terminal & Transportation and the Westlake Oil Company.

Beginning with the Doheny-Canfield well, the commercial development of Los Angeles City Field was the first instance of a major oil boom within the limits of a rapidly growing North American city. From that point forward, the “messiness” of the oil industry was no longer a remote concern for the city of Los Angeles. This was a unique situation in the history of North American urban development, where the extractive operations of energy production usually took place in remote locations out of the way of cities. As noted by Jones, “the high energy density of fossil fuel deposits justified investing in infrastructure to transport energy long distances, thereby

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16 Ibid., 12-13.
separating sites of energy production and consumption.”¹⁹ In most historical contexts, this statement provides an accurate account of the geography of fossil fuel-based energy systems as they developed across North America in the late-nineteenth and early-twentieth centuries.

In the case of Los Angeles, however, the solution to the problem of cheap fuel happened to be in an oil-belt that extended beneath the downtown streets of the city. Illustrated in Figure 5.2, this massive subterranean oil deposit had no regard for surface property lines and existing (predominantly residential) land-uses. As indicated by the close proximity of oil wells, existing residential land-uses were quickly sacrificed in a competitive rush to extract black gold from beneath the town lots of Los Angeles. Faced with an array of conflicting interests regarding land-use, a series of important decisions made by municipal government put Los Angeles on a trajectory of oil-based urban development.²⁰

²⁰ Crowder, “Los Angeles City oil field,” 69-70; Redpath, Petroleum in California, 37-42
The oil nuisance

In Los Angeles, the story of oil in the first three decades of the twentieth century needs to be understood in the context of the structure of municipal government in the latter decades of the nineteenth century. Upon becoming an American town in 1850, Los Angeles was governed under state law by a seven-member body called the Common Council. Since capital was at a minimum in the early years of incorporation (and citizens were strongly opposed to taxation), the primary responsibility of the municipality was to establish long-term contracts with private companies to provide basic services to accommodate urban expansion in the latter decades of the
nineteenth century. The Common Council had the authority to oversee service, set rates, enfranchise competitors, revoke privileges and extend leases. In Los Angeles, contracts were negotiated with private companies to provide water, gas, electricity and street railways. The companies that provided the growing city with these vital services were able to ensure favorable contracts by becoming directly involved in municipal politics.21

By the time that City Council was established in 1889, the influence that private capital had over the municipal government of Los Angeles was sustained by a ward-based system of election. The division of the city into nine wards was conductive to the thriving of a political machine where ultimate power resided in the nine-member City Council rather than the mayor. “Before every municipal election,” explains Fogelson, the leaders of the political machine “met with the party faithful in each district to select candidates for the council and representatives to the conventions that chose contenders for the city-wide offices.”22 For the political machine that dominated Los Angeles in the latter decades of the nineteenth century, managing elections on a localized, ward-by-ward basis was much more effective (and easier) than being accountable to voters on a city-wide basis. Bolstered by the ward-based system of municipal election, the machine remained in power because it was able to effectively satisfy the basic needs of major business interests in Los Angeles – including the needs of the emerging petroleum industry.23

Oil may have been particularly messy, but it was not the first or only energy-related nuisance that plagued North American cities and fledgling municipal governments in the nineteenth and early-twentieth centuries. Before the development of fossil-fuel energy sources and oil in particular, horse-drawn wagons and carriages provided the main source of motive

22 Ibid., 208.
power in North American cities.\textsuperscript{24} These were the days when horsepower actually meant horsepower. At the turn of the twentieth century, observes environmental historian James C. Williams, “the 8,065 horses in Los Angeles amounted to one horse for every thirteen people, exceeding the national average by 87 percent for communities of its size and foreshadowing the city’s future as a harbinger of individualized transportation.”\textsuperscript{25} However, the unfortunate environmental drawback to this form of energy was that horses left excrement throughout the city and eventually dropped dead, sometimes unexpectedly.

The burning of coal in urban areas, particularly along the Northeastern Atlantic seaboard, the oldest industrial region in the United States, was even less pleasant from the perspective of city-dwellers. Black soot from chimneys floated in the air, drifted in the wind, and seemed to stick to everything. Compared to horses, coal proved to be a particularly dirty form of energy.\textsuperscript{26} Coal was dirty, but the concentrated energy it offered was a necessary element of the second industrial revolution in North America.\textsuperscript{27}

Beginning in the mid-1890s, the series of efforts to commercially develop Los Angeles City Field transformed the oil problem from one of cheap fuel to a serious urban nuisance. The downtown streets of Los Angeles quickly became awash with oil, property was damaged and engines from derricks produced a loud noise that seemed to blast day and night.\textsuperscript{28} Faced with this unprecedented situation, the earliest efforts of municipal government focused on managing conflicting political economic interests and legal rights associated with the development of oil in

\textsuperscript{24} Clay McShane and Joel A. Tarr, \textit{The Horse in the City: Living Machines in the Nineteenth Century} (Baltimore: Johns Hopkins University Press, 2007).
\textsuperscript{25} Williams, \textit{Energy and the Making of Modern California}, 29.
\textsuperscript{28} Nancy Quam-Wickham, “Cities sacrificed at the altar of oil: popular position to oil development in 1920s Los Angeles,” \textit{Environmental History} 3 (2) (1998): 189-209.
downtown Los Angeles. Signed petitions submitted to City Council during this period reveal the extent to which concerned residents and property owners protested against oil operations in downtown Los Angeles.

Figure 5.3, a photograph from 1910, provides a perspective on the immediate environmental implications of town-lot drilling in Los Angeles. Due to a chronic lack of adequate storage facilities, which was a reflection of the privatized nature of town-lot drilling, oil was often collected in earthen sump holes where it quickly evaporated into open air. Sump holes filled with oil like the one in this photograph were a common source of nuisance reported to Los Angeles City Council at the turn of the twentieth century.29

Figure 5.3. Cluster of oil wells in Los Angeles, showing paved road to the left, 1910 (Source: University of Southern California Libraries. File: CHS-31000).

In his fictional account of the early-twentieth century oil industry, Upton Sinclair captures in extraordinary detail the “messiness” of drilling operations in Southern California. Although the construction of oil derricks in the early years had immediate stimulating effects on the local lumber trade, the process of construction often resulted in the destruction of city roads and private properties. Dense forests of oil derricks in city lots were unsightly to begin with, but drilling also required a constant flow of water to lubricate and prevent over-heating of the drill-stem. “Drilling was always a dirty business,” describes Sinclair, “you swam in pale grey mud until the well came in, and after that you slid in oil.”

Water was an essential ingredient of oil drilling, and proper drainage was rarely ever achieved. In addition, the engines that turned the drill-stems were a constant source of noise and smog. Oil was being produced in downtown Los Angeles and neighborhood residents were not happy.

Understandably, the earliest protests to Los Angeles City Council against the developing oil industry within city limits largely concerned the destruction of residential property values. Existing neighborhoods were being trampled and oil seemed to be everywhere. In October of 1894, City Council received a petition from concerned property owners and residents in the immediate vicinity of the Second-street Oil District asking for an ordinance restricting the hours of drilling to fifteen hours a day. “To hear the noise of a half dozen engines working all together day and night is not only unjust but it is [also] inhuman,” reads the petition, which then goes on to argue that “the plea of the oilmen that it is impossible to drill without stopping has no foundation…”

As taxpayers and voting citizens, the petitioners appealed to the basic rights of private property in an effort to convince that residents and property owners in downtown Los Angeles of the need for control.

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31 Quam-Wickham, “Cities sacrificed at the altar of oil,” 189-209.
Angeles were entitled to “some relief” from the nastiness of the oil industry. These were complaints that the elected members of City Council had to take seriously.\textsuperscript{33}

Particularly in the early years of the oil industry, property damage in downtown Los Angeles was often caused by poor drainage and overtaxed sewerage infrastructures. The narrow town lots of the city were not platted to accommodate oil drilling. In March of 1896, City Council received a complaint from a distressed citizen calling attention to the “damage to crop and property” caused by “a large deposit of oil…during the last rain storm, owing to the sewer box being too small to carry the water from Figueora Street.”\textsuperscript{34} Proper drainage was rarely, if ever, achieved in the Los Angeles Oil Field in the final decade of the nineteenth century. It was becoming obvious that some form of municipal regulation was needed to manage conflicting interests related to the development of oil within city limits.

Safety concerns were also raised. On 22 April 1895, City Council received a petition from citizens protesting against the proposal of Union Oil to build and manage storage tanks on land contiguous to the Los Angeles River.\textsuperscript{35} Modern urban society is dependent upon the efficient and economical provision of fossil fuel energy, which is, in turn, predicated on the purposeful development of transportation and storage infrastructures.\textsuperscript{36} Yet, particularly in the early years of the Southern California petroleum industry, the rivet-bound pipes and tanks that comprised these networks and infrastructures were highly susceptible to leakage and constant threat of fire. Oil-drenched landscapes and city-streets may have been a constant nuisance in the latter decades of the nineteenth century, but fire was considered to be the gravest of all threats,

\begin{itemize}
\item \textsuperscript{33} Ibid.
\item \textsuperscript{34} Los Angeles City Archives, \textit{Petitions}. Vol. 157, No. 214 (9 March 1896).
\item \textsuperscript{35} Los Angeles City Archives, \textit{Records}. Vol. 43 (22 April 1895), 76.
\item \textsuperscript{36} Debeir et al., \textit{In the Servitude of Power}, 1-14.
\end{itemize}
particularly in populated areas. In the words of Upton Sinclair, fires were the “terror of the industry.”³⁷

Some form of land-use planning was urgently needed, as indicated by the concern that some citizens expressed towards the operation of oil refineries near established residential districts in Los Angeles. “We the undersigned residents and property owners of Los Angeles hereby…request your honorable body to have the oil refinery, situated at the corner of Second Street and Beaudry Avenue, removed from that neighborhood,” reads a petition received by City Council in September of 1895, which went on to explain how “the fumes and gasses arising from this nuisance are unbearable and at night our sleeping-rooms are foul with these odors, well-nigh producing suffocation.”³⁸ Even in the early years of the Los Angeles oil field, the chemical vapors associated with refinery operations were becoming identified as a serious threat to public health.

Refineries were nasty, but some citizens also acknowledged the importance of the burgeoning oil industry to the economic prosperity of Los Angeles. In December of 1895, City Council received a petition from property owners and residents from the immediate vicinity of the refinery operated by the Los Angeles Oil Burning and Supply Company, which was located at the eastern terminal of the Southern Pacific Railroad near the Los Angeles River.³⁹ This was the same refinery that citizens protested against in September of that year.⁴⁰ According to the petition, the “refinery has been a means of encouraging home industry, and has been the occasion for the employment of numbers of men…thus sustaining families and causing the building of many homes.”⁴¹ As indicated by this support, oil was becoming recognized as the convenient

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³⁷ Sinclair, Oil!, 161.
³⁸ Los Angeles City Archives, Petitions. Vol. 146, No. 959 (16 September 1895).
³⁹ Los Angeles City Archives, Petitions. Vol. 148, No. 1306 (December 1895).
⁴⁰ Los Angeles City Archives, Records. Vol. 44 (30 September 1895), 379.
⁴¹ Los Angeles City Archives, Petitions. Vol. 148, No. 1306 (December 1895).
solution to cheap fuel that the city desperately needed in the latter decades of the nineteenth century.

To be sure, the records of Los Angeles City Council are riddled with petitions that describe the nuisance associated with oil refining, particularly in the vicinity of residential dwellings. As the issue was being debated in Council, Mayor Frederick Eaton issued a strong statement in 1899 declaring the refineries within city limits an indispensible element of the local economy. “I am assured by the oil refineries of the city that they are perfectly willing to comply with any requirements that will prevent the discharge of gases into the open air,” explains the statement from Mayor Eaton to City Council. In other words, effective regulation rather than exclusion was the answer to the refinery problem in Los Angeles. Most known for his role as a mastermind supporter in the development of the Los Angeles Aqueduct, Mayor Eaton was a major figure in the late-nineteenth and early-twentieth century expansion of Los Angeles into a modern industrial metropolis.

The municipal regulation of oil production in downtown Los Angeles

Politics are the means through which long-term investments into energy systems are coordinated. Beginning in the 1890s, a series of decisions made by City Council put Los Angeles on a trajectory of oil-based urban and industrial development. “The development of the oil industry in this city has given rise to many perplexing problems,” reported the Los Angeles Times in March of 1898, “there has been an unceasing conflict of interest between the oil men and property-owners whose property has been depreciated by the invasion of the unsightly derricks with their attendant nuisances.”

42 Los Angeles City Archives, Records. Vol. 57 (23 October 1899), 28.
43 “Visit the oil fields,” Los Angeles Times (4 April 1898), 12.
In Los Angeles, the municipal code had to be both systematic and dynamic in managing conflicting interests associated with oil production within city limits. As indicated by the compromises made, the elected officials of City Council developed a strategy that made an attempt to balance the rights of oilmen to conduct their business with the rights of property owners, residents and concerned citizens. When it came to crafting, amending and enforcing city ordinances, the “wide divergence of opinion” that initially divided Council regarding the burgeoning oil industry had to be narrowed considerably for the sake of providing cheap fuel needed for rapid urban and industrial growth. The result was a municipal regulatory structure capable of managing the complexities, dynamics and contradictions of oil-based development.

The first set of laws related to oil passed by Los Angeles City Council in 1894 focused on the minimization of oil-related nuisances within city limits. Out of concern for safety and public wellbeing, one ordinance (no. 2421) was passed regulating the erection, operation and use of oil boilers and engines outside of the general fire limits of the city. Boilers and engines used for “drilling, pumping or operating a well” were a particular focus of this ordinance, which also covered the use of oil as fuel in other industries. Anybody wishing to operate an oil-burning engine or boiler outside of the general fire limits of the city of Los Angeles had to apply for a special permit issued by the Board of Fire Commissioners.45

The municipal government in Los Angeles also made less-direct efforts to minimize the threat of fire that was systemic to oil-based urban and industrial development in Southern California. In November of 1894, City Council passed an ordinance (no. 2467) “prohibiting the depositing or placing of oil, petroleum, and kindred substances upon the public streets, alleys or places…in such a manner as will permit the same running into streets…and other public

44 Ibid.
45 Los Angeles Archives, City Ordinance No. 2421 (1894).
Oil had become an urban nuisance and city government had to respond accordingly in an effort to manage conflicting land-use interests.

Another early effort to minimize oil-related nuisances in the final decade of the nineteenth century involved the regulation of cables and wires above city streets that were necessary to the drilling of oil in downtown Los Angeles. The Board of Public Works issued individual permits to operators, and the burden of enforcement fell upon the existing Office of the Street Superintendent. Since the earliest wells in the city were brought in before this particular ordinance was passed in 1894, the oilmen responsible for the development of Los Angeles City Field were immediately resentful of this form of municipal regulation. In October of 1894, City Council received a petition from E.L. Doheny and others “protesting against the action of the Street Superintendent in ordering the owners of oil wells to remove their pipelines…necessary for pumping.”

Local oilmen also opposed early efforts to impose a municipal tax on oil production. In July of 1894, Council passed the first ordinance imposing a licensing fee of $1 per month on all producing wells within city limits. As of April 1898, over 500 active wells were generating over $500 per month in municipal revenue. “The industry has grown to such proportion that its defenders insist upon a modification of some of the existing ordinances,” reported the Los Angeles Times that month. In particular, oilmen protested against the operating license, which they considered to be “burdensome and unjust taxation.” For oil producers active in the Los Angeles City Field, municipal government seemed to be interfering with their right to conduct business.

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46 Los Angeles Archives, City Ordinance No. 2467 (November 1894).
47 Los Angeles City Archives, Records. Vol. 41 (22 October 1894), 397.
48 “Visit the oil fields,” Los Angeles Times (4 April 1898), 12.
49 Ibid.
Even so, by the turn of the twentieth century, Los Angeles City Council had made considerable progress in establishing a working foundation for the municipal regulation of oil production, the first such example in urban North America. Laws were in place to minimize oil-related nuisances on private and public lands, and a municipal tax had been imposed on active, producing wells within city limits. According to the *Los Angeles Times*, the Deputy City Attorney was convinced that the oil-related ordinances passed in the late-1890s covered as much legal ground as could be covered without excessive use of police power.\(^{50}\)

Municipal legislation could only be effective, however, if properly enforced. Beginning in 1897, Los Angeles became the first municipal government in North America to have a full-time oil inspector on the payroll.\(^{51}\) As prescribed by city ordinance, “the Oil Inspector must have a general practical knowledge of machinery, and of the drilling and operating of oil wells, and shall be familiar with the most approved methods and appliances used in connection with engines and boilers.”\(^{52}\) The Oil Inspector was expected to have specialized knowledge of the industry. In addition to the responsibility of collecting license fees, the Office of the Oil Inspector had the authority to enforce existing provisions regulating oil production within city limits. “The Oil Inspector and Assistant Oil Inspector shall have the same power and authority as regularly appointed police officers of the City of Los Angeles,” reads the ordinance.\(^{53}\) The enforcement of oil regulations required frequent visits to Los Angeles City Field, where nuisances where investigated on site.

In May of 1903, City Council passed an ordinance (no. 8331) that “prohibited the erection and maintenance of oil refineries…outside of a certain district in the City of Los

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\(^{50}\) “Oil legislation,” *Los Angeles Times* (27 February 1897), 9.
\(^{51}\) Kolnick, *Order Before Zoning*, 123.
\(^{52}\) Los Angeles City Archives, Ordinance No. 8303 (May 1903).
\(^{53}\) Ibid.
This area in question was an existing industrial district located on the southeast section of the city that extended along the west bank of the Los Angeles River. Although oil extraction was a necessary evil in the streets and town-lots of Los Angeles, City Council was able to exercise a higher degree of control over the industrial geographies of oil refining. In this case, the regulation of all refining activities to a particular section of the city was justified, according to the ordinance, “for the immediate preservation of the public peace, health and safety.” Violators of the regulation, if convicted, were guilty of a misdemeanor and subject to a fine of between $100 and $500 as well as the possibility of imprisonment for a period of between thirty and one hundred days.

To be sure, the ordinance that restricted the operation of oil refineries to an industrial district along the Los Angeles River was rigidly enforced by City Council. On 23 March 1904, a petition was filed by the Union Consolidated Refining Company requesting permission to operate a plant that was not located within the district proscribed in ordinance no. 8331. “That said oil refining plant has been erected and in operation for a period of over five years,” reads the petition, which goes on to argue that “the undersigned would suffer great hardship and irreparable loss if…not permitted to operate its said plant.” Despite the magnitude of this fixed capital investment, City Council eventually denied this petition for special privileges to operate an oil refinery outside of the established industrial district. The rules needed to be followed for the system to be effective. Geographies of extraction were fixed, but geographies of refining were not. Land-use regulations were a particularly important part of a municipal system that was developed to mediate conflicts arising from the messiness of oil production in a bustling urban environment.

54 Los Angeles City Archives, Ordinance No. 8331 (May 1903).
55 Ibid.
56 Ibid.
57 Los Angeles City Archives, Petitions. Box A-11 (24 March 1904).
As oil operations within city limits continued to evolve, abandoned wells and sump-holes that were dug in the ground to store oil became major nuisances that the Oil Inspector had to deal with. The physical expansion of city limits also became a concern to the Oil Inspector, which gained responsibility of the harbor district when it became part of Los Angeles in 1909. For a two-person operation, the frequent need to conduct on-site inspections became a time-consuming responsibility.

The efforts of City Council in regulating oil development were effective in part because municipal ordinance could be amended on a case-by-case basis. In the first decades of the twentieth century, City Council approved countless amendments to the ‘Residential District’ zoning to allow for oil development in unexpected places, such as in the Harbor District in 1909 and in Venice in 1929. Efforts to rationalize and make the regulation of oil more effective were also ongoing. In other words, regulation was effective because it could be adjusted according to the shifting geographical dynamics of the regional oil industry and its expanding urban milieu.

The municipal consumption of oil

In the first decades of the twentieth century, the role of municipal government in making Los Angeles the first oil-based city in North America extended beyond regulatory functions. During the formative decades between 1890 and 1930, the municipality of Los Angeles also became an important consumer of oil-based commodities produced in Southern California. In particular, an important element of the built landscape of Los Angeles was established when City Council made the decision to begin sprinkling city streets with “road oil.” In 1904, a Special Committee was established to investigate the possibility of sprinkling city streets with oil as opposed to continuing to use water to minimize dust and produce a hardened surface.
In June of that year, the Special Committee on Oiling Streets reported to City Council that it had cost approximately one hundred and twenty-five thousand dollars to sprinkle city streets over the past year, or nearly four hundred dollars per mile. Water was not only expensive because it had to be transported a considerable distance from the ocean, but it also did not produce long-lasting results. “While oiling the streets will be more expensive in the start,” reads the report of the Special Committee on Oiling Streets, “it has been demonstrated beyond doubt that if properly done and maintained it will be cheaper in the end.”\(^5\)6 Oil was considered to be more economical than water because it did not evaporate when sprinkled on city streets. For the elected members of City Council, the ability to save money and stimulate a local industry was an attractive proposition.

In order to secure favorable rates for road oil, the Supply Committee assumed responsibility for administering a competitive bidding process between private companies. In August of 1904, the Supply Committee considered bids from nine oil companies, ranging from forty to eighty cents per barrel. All companies were offering heavy-grade oil pumped from the local fields, delivered in barrels either hot or cold. According to early estimates by the Supply Committee made in 1904, approximately one thousand barrels of oil per year would be needed to maintain the streets of Los Angeles.\(^5\)9

In the first decades of the twentieth century, the physical expansion of the city resulted in a captive market for road oil with a heavy asphalt base. Contracts were negotiated with companies annually, but City Council also had the authority to authorize immediate purchases in an ongoing effort to keep up with urban growth. After the annexation of the harbor district in 1909, the Supply Committee solicited bids for six hundred barrels of oil to sprinkle on roads in

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\(^5\)6 Los Angeles City Archives, *Records*. Vol. 69 (20 June 1904), 265.
In the summer of 1916, the Supply Committee solicited bids to provide the city with road oil for one year, but also approved the purchase of ten thousand barrels of road oil for immediate use. For private companies competing in the local field in the early days of the industry, contracts to provide the city with road oil were considered to be lucrative.

In addition to administering bids for road oil, the Supply Committee was also responsible for negotiating contracts for all oil products consumed by the municipal structure of Los Angeles. Purchased according to specifications determined by the City Engineer, these products ranged from fuel oil used to power the boilers at City Hall to gasoline needed by the Fire Department. Even the garbage incinerator at City Hall needed fuel. Many of these supply contracts were awarded to Union Oil, a vertically-integrated, Los Angeles-based company able to provide an array of refined petroleum products at the most competitive prices and at the precise specifications of the City Engineer. In July of 1916, for example, the Supply Committee accepted bids from Union Oil to provide the city with benzene, engine distillate and kerosene. In addition to using heavy oil to improve and expand the urban environment, the City of Los Angeles emerged in the first decades of the twentieth century as a major consumer of refined petroleum commodities produced in Southern California.

Venice strikes oil

Founded in 1905 by land developer and tobacco millionaire Abbot Kinney, “Venice of America” was one of many beachfront communities that dotted the coastline of Southern California at the turn of the twentieth century. Tourism was, after all, considered a major engine of regional economic development at this time. With an extensive canal system and distinctive European

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architecture, Venice was modeled in the image of its Italian counterpart. Located only 14 miles west of Los Angeles, transportation service was provided by the “Red Cars” of the Pacific Electric Railway. With a mile-long beach lined with “amusement piers” and a boardwalk, Venice soon gained a reputation among Southern Californians as the “Coney Island of the Pacific.” Even with its many attractions as a beachside tourist resort, however, popular enthusiasm for Venice of America soon faded.

In the first two decades of the twentieth century, the need to provide basic services and infrastructure to accommodate a growing population eventually forced the residents of Venice to concede to annexation with the city of Los Angeles. When annexed to Los Angeles in 1925, the municipal structure of Venice was unable to generate the revenues necessary to provide basic services such as water and sewerage disposal. Once capable of attracting upwards of 150,000 tourists in a single weekend, the beachfront community of Venice was in serious decline. Perhaps the most glaring sign of this decline was the fate of Kinney’s precious system of canals, which never circulated water properly and eventually became stagnant and slimy. “Filled in, they were paved as ordinary streets in 1927,” describes historian Kevin Starr, “when Venice was developing as an ordinary Los Angeles suburb.”

Now part of Los Angeles, things changed suddenly in Venice when oil was discovered beneath the peninsula south of Washington Street in December of 1929. Within the short span of a few months, the “Coney Island of the Pacific” was quickly transformed into an industrial landscape where oil derricks seemed to tower from every small town lot. Indeed, the discovery of

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65 Ibid.
66 Ibid.
oil in Venice set off a boom that in many ways reflected the rapid and wasteful exploitation of the Los Angeles City Field in the 1890s.68

Faced with a flood of applications to drill for oil in Venice, Los Angeles City Council assumed a direct role in opening the new field for immediate exploitation by implementing a permit system for town-lot drilling. “Whereas many applications for permits to drill and explore for oil in the Venice district, are being filed,” reads a resolution presented by Councilman Julies C. Barthel to Los Angeles City Council on 6 February 1930, “it appears that citizens and taxpayers are desirous of obtaining the right to drill and explore for oil.”69 After all, any legislation that denied the right to drill for oil in Venice would have been conceived as a direct attack on the basic rights of private property as well as an undue restriction on the rights of citizens and taxpayers to conduct their own business affairs.70 Accordingly, Councilman Barthel appealed to City Council to “adopt a policy which will result in the granting of any and all requests for permits in said area where, in the opinion of the Council, the possibility of producing oil is present.”71 As was the case in Los Angeles in the 1890s, municipal structure was being applied to facilitate rapid resource exhaustion.

On 24 February 1930, the City Attorney submitted a report that affirmed the authority of Los Angeles City Council to charge a fee for permits issued for oil wells drilled within municipal limits, including Venice. The only stipulation was that all fees charged had to be done on a per-well basis, rather than according to productivity. In addition, this report also affirmed the regulatory power of municipal government to “reasonably limit the number of wells that may be drilled within a certain block or tract, provided that the limitations as to the number of wells that

69 Los Angeles City Archives, Records. Vol. 214 (6 February 1930), 141.
71 Los Angeles City Archives, Records. Vol. 214 (6 February 1930), 141.
can be drilled within a certain area is based upon a reasonable exercise of the police power.”

In this case, the threat of fire in a residential district overcrowded with oil wells was provided as a sufficient justification for the reasonable exercise of the police power.

Subsequently, a municipal system of regulation was imposed in Venice whereby all landowners who were interested in setting up drilling operations on their small town lots had to apply to Los Angeles City Council for exemption from an existing land-use regulation known as the “Old Residential District.” For the most part, these permissions were readily granted to applicants who completed the required paperwork with the City Planning Commission and paid the applicable taxes. Landowners not interested in drilling also had the right to lease their properties to high bidding oil companies. As Elkind describes, “real estate that was once valuable because of its isolation from nuisances of industrial production and because of its proximity to the ocean was now surrounded by clattering drills, spilled oil, and the incessant roar of diesel pumps.” Within the short course of one year, the former beachfront town of Venice California was transformed into a muddy industrial mess.

Like the streetcars, beaches and tourism are another example of development that was constrained by the spatial fix of oil-based capitalism in Los Angeles. In the summer of 1930, wells were coming in at a rate of one per day. By the fall of that year, approximately 50 oil wells were producing in the Venice field. Figure 5.4, a photograph from September of 1930, shows how quickly and extensively the beaches of Venice were transformed into an unsightly industrial district that was dominated by the extraction of oil.

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73 Elkind, “Oil in the city,” 83
74 Ibid., 86.
75 Ibid., 82-86.
76 Ibid.
Issuing permits to drill for oil was the easy part, but keeping up with the effective enforcement of municipal regulations was an ongoing process that seemed to overwhelm the capacity of Los Angeles City Council. Indeed, a number of petitions submitted by Venice residents reveal a growing frustration towards a perceived lack of enforcement of existing municipal regulations. On 29 August 1930, a petition was received from C. L. G. Clark, a Venice resident protesting against the loud noise caused from drilling operations conducted past the hour of eleven in the evening, which was in direct violation of municipal code. According to Clark, the City of Los Angeles was guilty of “criminal negligence” for issuing permits to oil companies but not following up with proper enforcement: “pumping oil from these wells whilst we are
sleeping…is ruining the health of the many residents for almost a mile of the Venice residential section.”79 In addition to threatening to sue the City of Los Angeles for “nine hundred thousand dollars damages” for time lost “writing two novels,” the angry and animated Clark also recommended the removal of the local grammar school from the Venice Oil Field, as the “gaseous poison…are causes of insanity.”80 Clearly, not all citizens were satisfied with the direction that Los Angeles City Council was taking with regards to allowing the drilling of oil within municipal limits.

Even after the opening of the Venice Oil Field to intensive development, local residents and booster organizations continued to protest the damage caused to beachfront property.81 In August of 1930, City Council received separate petitions from the Culver City Chamber of Commerce, the Southwest Chamber of Commerce and the Los Angeles Kiwanis Club protesting the leasing of all public beaches for the purposes of drilling oil, particularly in the former City of Venice.82 Evidently, these booster organizations were united by a vision of regional economic development where the long-term gains associated with beachfront tourism significantly outweighed the short-term gains associated with the rapid depletion of a local oil field. Resulting in damaged infrastructure and landscapes peppered with sump holes, the environmental damage associated with oil drilling was not easily reversible.83

Even as the issue of drilling on public beaches was being considered by City Council, a number of petitions submitted in the fall of 1930 continued to emphasize the environmental damage that was being done to the waterfront. On 16 October 1930, the City Planning Committee reported on a communication from the Venice Branch of the Los Angeles Chamber

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79 Los Angeles City Archives, Petitions. Vol. 2459, Box A-458 (3 September 1930).
80 Ibid.
of Commerce, “requesting the Council to provide for the safety of lives and property and to prevent pollution of the publically owned beach and ocean water.” In particular, this communication recommended the passing of an ordinance mandating that all derricks, flow tanks and sumps for oil wells between the “speedway and the ocean” be supported by drilled pilings, so as to ensure a secure foundation. In addition, it was further recommended that the Board of Public Works authorize the construction of permanent bulkheads to protect public beaches from nearby operations. As was the case in the Los Angeles Field nearly three decades prior, the question was not to exclude oil development, but rather, how best to accommodate it. The question of long-term environmental impacts was not of immediate concern to Los Angeles City Council.

The oil boom was, after all, relatively short-lived. When production peaked in 1931, approximately 340 oil wells were scattered across the small town lots of the Venice producing district. At this time, Venice was the fourth most productive oil field in Southern California. By early 1932, however, production was declining sharply as the field became depleted. According to Elkind, the “Venice-Del Rey field was the last of the unrestrained town lot fields because property owners and business interests came to see other property rights and values as more important for Los Angeles’s long-term property.” The destruction caused to the beaches of Venice had shifted public opinion regarding the process of town-lot drilling. As was the case with the Los Angeles City Field at the turn of the twentieth century, town-lot drilling proved once again to be a formula the for rapid and wasteful exploitation of a vital energy resource.

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84 Los Angeles City Archives, Records. Vol. 221 (16 October 1930), 493.
85 Ibid.
86 Elkind, “Oil in the city,” 90.
87 Ibid., 86-90.
Fragmented metropolitan development

At the turn of the twentieth century, the municipal government of Los Angeles was dominated by the private enterprises that were contracted with the city to provide basic municipal services such as water, transportation and utilities. “Between 1865 and 1900,” writes Robert Fogelson, “the water, gas, and electric companies, the street railway lines were the most influential participants in Los Angeles politics.”⁸⁸ This situation changed considerably in the early years of the new century, when the rapid urban and industrial development of the city eventually exposed the limitations of municipal machine politics. For the voting public of Los Angeles, which was becoming an increasing reflection of a majority population comprised of American-born inhabitants, corrupt politics and poor services provided by private companies was a clear sign that a progressive municipal government was needed that was more accountable to tax-paying citizens.⁸⁹

Culminating in the 1909 election of a progressive administration headed by Mayor George Alexander, the local reform movement in Los Angeles was successful in reducing the influence that private capital had over municipal politics. This was accomplished through an ambitions strategy of gaining municipal control over all basic urban services that were provided by private companies. Water may have been a priority, but reformers were also ultimately successful after 1900 in gaining municipal control over the harbor and the electric power plants. Efforts to gain municipal control over the gas utilities, telephone and street railways were ultimately not successful.⁹⁰ As described in Chapter One, the failure to bring the street railways under municipal control had long-term implications on the horizontal urban expansion of Los Angeles.

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⁸⁸ Fogelson, The Fragmented Metropolis, 206.
⁸⁹ Ibid., 205-228.
⁹⁰ Ibid., 229-246.
Water has always been a problem of urban development in Los Angeles. Granted a franchise by the city in 1868, the Los Angeles Water Company was a private enterprise that exercised a direct influence over local municipal politics for the remaining decades of the nineteenth century. By 1900, however, existing systems of water supply in Los Angeles were proving incapable of supplying the massive demand created by rapid urban expansion. A new, more modern, system of water provision was needed to feed the growing city. In Los Angeles, the process of bringing water under municipal control resulted in the building of the Owens Valley Aqueduct, a process overseen by an independent Board of Public Works. When completed in 1913, the new system (representing a fixed capital investment costing 23 million dollars) was an unprecedented feat of civic engineering that provided the growing city of Los Angeles with a fresh supply of water that was carried from a source that was located more than 200 miles north of the city in the California Sierras.91

Between 1900 and 1930, an aggressive campaign of more than eighty annexations transformed the city of Los Angeles into a sprawling metropolis with a municipal territory that extended to more than four hundred and fifty square miles.92 The result was the largest municipal government in the United States. Historians of Los Angeles have argued that a surplus of water after the completion of the Owens Valley Aqueduct was a major factor that motivated these annexations. “In 1913, the year water arrived,” describes Kevin Starr, “Mayor [Henry] Rose appointed an Annexation Commission to oversee the expansion of Los Angeles through water.”93 Considerations of water may have been significant, but are only a partial explanation for the emergence of Los Angeles as the largest municipality in the United States. The uneven

91 Ibid., 97
92 Kolnick, Order Before Zoning, 52.
distribution of oil across the vast landscape of the Los Angeles Basin was another factor that shaped uneven geographies of urban and industrial development in Southern California.

In Los Angeles, the ability of municipal government to regulate and profit from the production of oil extended only to city limits. Beyond municipal control, the uneven geography of oil deposits across the Los Angeles Basin emerged as an important source of fragmented metropolitan development in the first decades of the twentieth century. In this regard, the findings of two papers by Fred W. Viehe that examine the influence of oil extraction on the suburbanization of Los Angeles are worth revisiting. 94 “Suburban dispersal occurred because of the dispersed location of the oil fields and refinery sites,” argues Viehe, “and metropolitan fragmentation developed because the suburbs pursued different economic functions.” 95 For a residential or industrial suburb, proximity to crude oil deposits usually translated into increased revenues and decreased taxes – provided that annexation by Los Angeles could be avoided.

For Los Angeles, the ability to annex surrounding territory became increasingly difficult in the first decades of the twentieth century as the value of oil to the North American economy became evermore apparent. Signal Hill, Montebello and Fullerton are all examples of oil-wealthy suburbs that incorporated to avoid annexation by Los Angeles. Before the discovery of oil on 20 June 1921, Signal Hill was little more than a small country town. Within a few months, however, Signal Hill had become the wealthiest community in the nation, with an estimated per capita annual income of $40,500. Under the guidance of oilmen, the residents of Signal Hill decided to incorporate in 1924 to avoid an aggressive annexation campaign by the City of Long Beach. Other suburbs with oil incorporated to avoid the messiness of the extractive industry. Almost immediately after the discovery of its namesake oil field in 1921, the suburb of Torrance

incorporated to protect its reputation as a “garden city” from the unsightliness of derricks, refineries and the chaos of wildcat drilling. The residential suburb of Hawthorne also incorporated to avoid the nuisances of the oil industry.96

To be sure, most residential suburbs that emerged in the Los Angeles Basin in the first three decades of the twentieth century did maintain close ties with the regional oil industry, often serving as bedroom communities for nearby industrial suburbs or as locations for corporate headquarters. For instance, the residential suburb of La Habra became economically and financially linked to the oil industry when it became home to the corporate headquarters of the Standard Oil Company of California. Other residential suburbs have origins as potential oil fields, Beverly Hills being a notable example. When the Amalgamated Oil Company purchased a ranch west of Los Angeles to search for oil but eventually found none, boosters transformed this unsuccessful business venture into what would become one of the most exclusive residential suburbs in Southern California. Indeed, even the perception of oil abundance in the greater region was a factor that contributed to the emergence of Los Angeles as a fragmented metropolis.97

Conclusion

Emphasizing the influence of municipal government, this chapter illustrates how a series of decisions made by City Council were formative in making Los Angeles the first oil-based city in North America. From the perspective of municipal government, particularly at the turn of the twentieth century, the complex process of managing oil extraction in an existing urban environment was predicated on the development of a municipal regulatory structure that balanced the rights of oilmen with the rights to tax-paying and voting citizens. In the first three

96 Ibid., 11-13.
97 Ibid., 8-10.
decades of the twentieth century, the struggles of Los Angeles City Council to manage the
development of oil within municipal limits should be regarded as a pioneering example of urban
governance.

To the elected municipal government of Los Angeles, the problem of oil extended
beyond regulatory functions to include other key aspects of the emerging fossil fuel energy
system. In the first decades of the twentieth century, the City of Los Angeles also became an
important consumer of oil and oil-related commodities produced in Southern California. In this
way, oil became embedded in the politics, economy and built environment of the Los Angeles
region, which in turn became a captive market for the regional petroleum industry. In
combination, the decisions made by Los Angeles City Council became a major source of inertia
that supported the path-dependent development of oil-based capitalism in Southern California.

The formative influence of the municipal regulatory system and enforcement capacity in
shaping the oil-based trajectory of Los Angeles in the first three decades of the twentieth century
was further illustrated by the fractured metropolitan development of the oil-producing region
beyond city limits. Having been annexed by Los Angeles in 1925, the former beachside
community of Venice was transformed into a site of extraction after oil was discovered there in
1929. As was the case in the Los Angeles Field, the Venice oil boom was a relatively short-lived
but nonetheless significant to the regional economy. In both instances, the municipal structure
was imposed to encourage rapid extraction with little regard for longer-term environmental
consequences. The spatial-fix of oil-based energy, once established by municipal structure and
local political economy, represents a long-term commitment that is not easily reversible.
CHAPTER SIX

Fueling the nation: competition, waste and the political ecology of oil conservation in Southern California

In 1904, the United States Navy made a strategic decision to convert its fleet of war vessels to oil-based energy. For industry observers, this highly publicized decision to covert from coal confirmed the superiority of oil as a modern fuel for transportation and internal combustion. “Whereas coal was primarily an industry and domestic fuel,” argues Martin V. Melosi, “oil was a military-naval fuel.”¹ Ten years later, the Secretary of the Navy reported that all American battleships and destroyers were burning oil.² The timing could not have been more perfect.

The advent of worldwide modern warfare in the first decades of the twentieth century made oil a primary issue of national security in the United States. According to Gerald Nash, the “fuel oil consumption of the United States Navy rose from 360,000 barrels in 1912 to almost 6 million barrels in 1919.”³ With a modern harbor and nation-leading petroleum industry, Los Angeles became a direct focus of federal efforts to conserve oil-based energy. To use the words of geographer Scott Kirsch, Los Angeles became “a field for strategic government intervention”⁴ in the first few decades of the twentieth century when the conservation of fossil fuel energy became a major focus of federal policy.

³ Ibid.
In this chapter, I argue that federal efforts to conserve vital energy resources were complicated by established processes of metropolitan development in Los Angeles, a region where oil provided fuel for energy, was used to generate electricity, and was used to produce gasoline for an increasingly automobile-dependent urban culture. At the federal level, efforts to establish a geographic solution to the energy needs of the nation and military were complicated by the spatial fix of oil-based capitalism in Los Angeles. Accordingly, the aim of this chapter is to emphasize how lack of coordination and differing priorities between governments at the municipal, state and federal levels, each corresponding to a particular geographic scale, needs to be understood as a major source of inertia that sustains oil-based capitalism. As a political ideal, the strategy of conservation made sense in theory but had uneven geographic implications across the United States.

Comprised of four sections, this chapter places the oil-based metropolitan development of Los Angeles in the context of federal efforts to conserve fossil fuel energy in the first three decades of the twentieth century. For context, the first section explains how the General Mining Act of 1872 provided the legal foundation for a competitive system of oil production governed by the rule of capture and characterized by excessive waste, chronic bouts of overproduction and a generalized atmosphere of market instability. In the context of North American energy history, legal systems and property regimes at different geographic scales need to be understood as a major source of inertia that sustains the oil-based capitalist mode of production.

In the second section, this chapter historicizes the idea of conservation as it emerged amid perceptions of scarcity, waste and overproduction in Southern California and elsewhere in the first decades of the twentieth century. As Nancy Quam-Wickham explains, “the crisis of
California’s oil industry animated the efforts of [federal] policymakers to control the industry.”

Based on the principles of applied science and the calculations of the United States Geological Survey, conservation emerged as a political idea that emphasized the efficient management of natural resources as a means of ensuring long-term sustainability and national prosperity. Whereas the minimization of waste across all natural resources sectors became a long-term objective of progressive legislators in the United States, eventually resulting in a significant shift in federal policy regarding extraction on public lands, the advent of modern warfare in the first decades of the twentieth century made oil conservation and immediate and primary concern of the federal government. 

In a case study of the United States Fuel Administration, the third section examines how federal efforts to conserve vital energy resources during World War I were complicated by established processes of oil-based metropolitan development in Los Angeles. The aim is to emphasize how lack of coordination and differing objectives between governments at the municipal, state and federal levels needs to be understood as a major source of inertia that has complicated and has ultimately prevented the implementation of effective national energy policies in North America. Without consensus and coordination, moving beyond oil in a way that is planned rather than forced will be no simple matter.

In the fourth and final section, this chapter examines how the passing of the Mineral Leasing Act of 1920 resulted in the return of competition, waste and chronic market instability as defining elements of oil-based capitalism, culminating with the onset of the Great Depression in

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1930. I focus on the Mineral Leasing Act to illustrate how the federal government was adjusting to, rather than dictating, the complex structure of oil-based capitalism in Southern California and elsewhere across the United States. As will be illustrated, the historical inertia of the nineteenth century property regime presented a formidable barrier that inhibited federal efforts to conserve fossil fuel energy in the first three decades of the twentieth century.

**Building a system of competition, waste and instability**

In the United States, the General Mining Act of 1872 formed the legal foundation for a capitalist system of oil production based on aggressive competition and minimal state intervention. Passed on 10 May 1872, this federal law codified an informal practice of acquiring and protecting private mining claims on public lands in the American West, such as during the California Gold Rush. The General Mining Act granted permission to all citizens over the age of eighteen to enter onto public lands for the purposes of prospecting for minerals such as gold, silver, copper and lead, as well as oil and other fossil fuels. Mining claims authorizing the transfer of public lands and subsurface mineral deposits to private ownership was awarded to prospectors on a first-come, first-served basis. This was the federal property regime that made possible the emergence of the Southern Pacific Company as the largest private owner of oil-bearing territory in Southern California, a situation that ultimately hindered federal efforts to conserve fuel in the first decades of the twentieth century.

Under this essentially open-access policy regime of the federal government for distributing exclusive private rights to resources, the only requirement for staking a claim was

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that mineral of “commercial quantities” be produced and that each individual claimant spend at least one hundred dollars per year on “improvements” to the site. Single prospectors and large mining companies had equal access to unpatented claims on public lands, awarded on a first-come-first-served basis. In the latter decades of the nineteenth century, the role of the federal government in relation to mineral policy in the United States was limited to the enforcement of laws that governed access to minerals on public lands. By passing the Oil Placer Act of 1897, Congress confirmed that all public lands “containing petroleum or other mineral oils and chiefly valuable therefore” were “free and open to occupation, exploration, and purchase” under the General Mining Law of 1872. Encouraging aggressive competition over access to mineral-bearing lands, the General Mining Act was enforced as part of a federal legal system designed to spur the rapid settlement and economic development of the American West.11

When it came to oil, the “rule of capture” added an additional layer of complication to an already-competitive rush among prospectors to develop and sometimes over-produce oil in order not to lose it to neighboring claims. According to energy historian Daniel Yergin, the rule of capture “…was most important in shaping the legal context of American oil production, and the very structure of the industry from the early days.”12 Beginning in the latter decades of the nineteenth century, federal courts in California and throughout the United States appealed to the rule of capture to settle disputes over mineral claims on public lands. Borrowing from English Common Law, the courts declared oil and other mineral resources to be analogous to a wild animal, reduced to property only when captured. “Yet unlike a wild animal,” argues Paul Sabin, “oil reserves were available to all neighbors simultaneously.”13 Since subterranean pools of oil

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13 Sabin, Crude Politics, 15.
flowed freely beneath and across surficial property lines, the fear of drainage of oil under one parcel of land via drilling on an adjacent parcel emerged as a strong motivation that encouraged rapid resource extraction in California. Across the American West in particular, the provisions of the General Mining Act combined with the rule of capture formed the basis of a competitive system of oil production driven by aggressive resource extraction based essentially on a “use it or lose it” approach. Specifically, the holders of these mineral rights had reason to fear that if they did not pump as much oil out of the ground as quickly as possible, they would lose their valuable resource to competitors despite holding exclusive claims to the land above.¹⁴

The history of oil production in the United States illustrates how excessive waste is an inevitable byproduct of a capitalist system based on aggressive competition, rapid resource extraction, minimal state intervention and the rule of capture. Beginning with Pennsylvania in the 1860s, inadequate storage facilities and inefficient transportation methods were contributing factors that resulted in the immense wasting and overproduction of oil in the latter decades of the nineteenth century. Early wooden barrels and pipelines were leaky, and oil evaporated quickly in open air. Unexpected floods and fires were constant sources of contingency that often resulted in extreme wastage. Oil wells sometimes flowed for days after a strike before they could be properly contained with adequate storage. The American system of oil production was leaky and wasteful from the beginning.¹⁵

Under the rule of capture, extraction became a struggle among competing producers to deplete common pools of subterranean reserves as quickly as possible. The result was chronic overproduction, rapid price fluctuations and generalized market instability across the oil-

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producing regions of the United States.\textsuperscript{16} Due to the rapid decline in price that resulted when oil glutted the market, overproduction was also economically wasteful. “When oil is so cheap as to be hardly worth saving,” observed economist John Ise in 1926, “there are many ways in which it is wasted.”\textsuperscript{17} When oilmen went out of business, they often left behind wells that were still capable of producing. Unmaintained and abandoned wells were highly susceptible to contamination from surface water, resulting in the further wastage of oil.\textsuperscript{18}

The dynamics of waste and market instability assumed extreme proportions in Southern California. The discovery of the Los Angeles City Field in 1892 stimulated an aggressive oil rush across the Southland. By 1903, production from the Sunset, Santa Maria, Kern River and Los Angeles fields resulted in a glut of oil reaching the market. According to Ise, “the rapid exploitation of all these fields raised the production of the state from a little over two and a half million barrels in 1899 to over 24 million barrels in 1903 – nearly 1,000 percent in four years.”\textsuperscript{19} The result was a steep decline in prices to as little as 10 cents per barrel. Due to a heavy gravity indicating a relatively high density of hydrocarbons, the oil produced in Southern California was mass-marketed as unrefined fuel to be burned as an alternative to coal, which was scarce to the region and was becoming increasingly costly to import in the latter decades of the nineteenth century. In 1910, it was estimated that approximately seventy-five percent of the oil produced in California was burned in crude form, while the remaining twenty-five percent went to the refineries.\textsuperscript{20}

The burning of unrefined oil as fuel in steam-powered engines was considered to be particularly wasteful because only a small portion of the crude energy was actually rendered

\textsuperscript{17} Ise, \textit{The United States Oil Policy}, 154.
\textsuperscript{19} Ise, \textit{The United States Oil Policy}, 89.
\textsuperscript{20} Ibid., 162.
useable. Energy was lost in many ways: friction, dissipation, carbon build-up, air leaks and improper operation were major factors that diminished efficiency.\textsuperscript{21} Despite inefficiencies related to technology, railroads and steam-tankers were major consumers of fuel oil produced in California at the turn of the twentieth century. Considerably cheaper than coal, oil became the solution to the problem of cheap fuel in Southern California.

Based on the generous provisions of the General Mining Act and reinforced by the rule of capture, the property regime established by the United States federal government in the second half of the nineteenth century represented a major barrier in efforts to develop a national policy to conserve fossil fuel energy in the first decades of the twentieth century. Until the passing of the Mineral Leasing Act in 1920, the oil-based economy of Southern California was established based on laws developed by the federal government to encourage rapid extraction and aggressive competition among producers. Extreme waste and chronic market instability were unavoidable byproducts of this system. Once established by laws and decades of fixed capital investment, the competitive dynamics of oil-based energy systems are not easily reversible: there is no such thing as a clean slate.\textsuperscript{22}

**Early efforts to conserve oil amid perceptions of resource scarcity**

The market instability, extreme wastefulness and systemic overproduction that characterized the American system of oil production at the turn of the twentieth century was cause for concern among the scientists and engineers of the United States Geological Survey (USGS). In 1908, the Petroleum Division of the USGS estimated that the United States had between 10 and 25 billion barrels of crude oil reserves. The director of the Petroleum Division of the Survey was David T. Day, a world-leading authority on petroleum geology. On 11 November 1908, Day, along with

\textsuperscript{21} Ibid., 156-7.

\textsuperscript{22} Sabin, *Crude Politics*, 15-19.
Ralph Arnold, one of California’s leading petroleum engineers, recommended to George Otis Smith, Director of the United States General Survey, “…that the withdrawal of public lands known to contain petroleum is an immediate necessity for the adequate supply of this material during the remainder of the century or even the next fifty years.” These strong recommendations of the USGS were forwarded to the Secretary of the Interior. Based on perceptions of impending scarcity, oil experts were beginning to consider ways of preventing the wasteful depletion and impending shortage of a valuable energy resource.

In September of 1909, President William Taft heeded the warnings of the USGS by issuing an executive order reserving three million acres of public oil lands in California and Wyoming for the national government. Whereas Navy men, geologists and others concerned with the wasteful and rapid depletion of the nation’s reserves applauded this strategy of withdrawal, oil producers across the American West were resentful of the newly-imposed federal regulations on public lands. In his satirical account of the petroleum industry in Southern California, Upton Sinclair captured this sentiment of private oilmen toward the lofty ambitions of the Taft administration to conserve oil: “When government does fool things, then people find a way to get round it, and businessmen that do it are no more to blame than any other kind of men. This is an oil age, and when you try to shut oil off from production, it’s just like you tried to dam Niagara Falls.”

Based on a regional ecology in which oil was abundant and coal was scarce, the complex political economy of oil in Southern California was not compatible with federal efforts to conserve fossil fuel energy sources. According to Nash, President Taft’s withdrawal order “was

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virtually ignored by the California operators for a decade after 1910."\textsuperscript{27} Since effective federal regulation was impossible due to the logistical and legal difficulties of enforcement (which required federal inspections), production proceeded apace on lands that were now being claimed for the United States Navy.\textsuperscript{28} The political economic and ecological system of oil production in Southern California was far too complex and unwieldy to be effectively managed by the federal government.

At the California state level, efforts to conserve oil reflected a more practical strategy that involved maximizing operational efficiencies and minimizing waste in the oil fields. The office of the State Oil and Gas Supervisor was established in 1915, and given the authority to inspect and supervise the drilling, operation, maintenance and abandonment of wells in order to prevent, as far as possible, the needless wasting of oil and gas. At the turn of the twentieth century, the contamination of underground reserves by water was the greatest source of oil waste in California.\textsuperscript{29} As the first appointed State Oil and Gas Supervisor, R.P. McLaughlin made regular inspections to drilling sites in order to oversee and enforce the proper casing of wells, preventing any possibility of water infiltration. As described by Sinclair, the “state inspector came and made his tests, to be sure you had got a complete ‘shut-off’; if you hadn’t, he would make you do it over again – some poor devils had to do it twenty or thirty times!”\textsuperscript{30} Record keeping in the form of drilling logs and production reports were also central to the task of the Oil and Gas Supervisor, who was charged with establishing a system of “best-practices” to minimize waste. Indeed, the centralized collection and management of information was considered an essential aspect of increasing operational efficiencies in oil production.

\textsuperscript{27} Nash, \textit{United States Oil Policy}, 17.
\textsuperscript{28} Ibid.
\textsuperscript{29} Ise, \textit{The United States Oil Policy}, 283.
\textsuperscript{30} Sinclair, \textit{Oil!}, 77.
In the *First Annual Report of the State Oil and Gas Supervisor for the Fiscal Year 1915-16*, R.P. McLaughlin made the grim diagnosis that “there is probably no large business so inefficiently conducted as is that involved in the production of oil in California.” Competition, waste and overproduction were systemic to the political economy of oil production in Southern California. Compared to the federal government, however, the State Oil and Gas Supervisor had both the authority and practical ability to exercise conservation measures in the early decades of the twentieth century. The next section of this chapter examines how the involvement of the United States in World War I changed everything.

**The United States Fuel Administration and the “Los Angeles Controversy”**

The decision of the United States to enter World War I in 1917 made oil conservation a primary and immediate concern of national defense. Almost overnight, impending shortage rather than systemic overproduction and waste became the primary concern of a federal government that no longer considered conservation a long-term process. The essential link between fossil fuels and the engines of modern warfare had made oil conservation an immediate and dire necessity.

In the United States, the legal foundation for a system of wartime mobilization based on the federal management of national energy resources was established in August of 1917 when Congress approved the Lever Act, officially titled “An Act to Provide Further for the National Security and Defense by Encouraging the Production, Conserving the Supply, and Controlling the Distribution of Food Products and Fuel.” Two agencies were created to implement the provisions of the Lever Act: the United States Food Administration and the Federal Fuel Administration. According to the Lever Act, “by reason of the existence of a state of war, it is

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essential to the national security and defense…to secure an adequate supply and equitable
distribution, and to facilitate the movement of…fuel oil and natural gas.”  

In the context of a perceived national energy shortage, the Fuel Administration was given broad plenary powers to ensure a steady supply of coal and oil for military and industrial operations for the duration of the war, when the Lever Act was designed to expire.

President Woodrow Wilson appointed Harry A. Garfield as the leader of the United States Fuel Administration. The son of assassinated President James A. Garfield, the man who became head of the Fuel Administration was an academic and lawyer who believed in a coordinated and informed approach to resource conservation. He staffed the Fuel Administration with those he viewed as “the best scientific and business brains in the country,” and tasked them with making “recommendations for fuel saving that can be effected everywhere – in the house, in the boiler rooms of the smaller and greater factories, in the locomotives and the steamboats.”

After all, the industrial life of the nation depended on fossil fuel, particularly in times of war. In an address made before the Academy of Political Science in New York on 17 December 1917, Garfield described the administrative structure of his Fuel Administration as an “American system,” with “the central power at Washington, the state representatives in each of the states, and local representatives in the counties and cities.” Due to the exceptional circumstances of war, Garfield acknowledged the necessity of having “to build the house and live in it at the same

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32 D.M. Folsom to G.M. Swindell, 12 January 1918. Records of the United States Fuel Administration, Record Group 67 (RG67); Federal Oil Director for the Pacific Coast, San Francisco, CA; General Correspondence, 1918; Box 4 of 6, Folder: “Publicity,” National Archives and Records Administration – Pacific Region (San Francisco).
35 Ibid., 53.
time.”

Under the provisions of the Lever Act, the urgency of war demanded that immediate action be taken by the federal government to enforce fuel conservation.

As the house was built, the obvious choice to head the United States Fuel Administration was Mark Requa, a well-known petroleum engineer from California. A protégé of Herbert Hoover, Requa understood the relationship between unregulated competition and excessive waste that characterized the American oil industry at the turn of the twentieth century. In 1916, he estimated that ten million barrels of oil were being wasted each year in California alone through seepage, evaporation and by burning. Described by Yergin as “America’s first energy czar,” Requa became responsible for forging “a new and unprecedented relationship between government and the oil industry.”

In order to reduce waste and improve operational efficiency in oil production, Requa believed in a “hands-off” approach to conservation based on the logic of voluntary cooperation between government, industry and within industry itself. In the words of historian Gerald D. Nash, Requa was a “passionate advocate of cooperation among businessmen, and of cooperation between them and the government.” Voluntary cooperation in oil production would reduce the need for direct government intervention, which “was regarded with much satisfaction by important spokesmen for the industry.” Producers were encouraged to work together in a combined effort to maintain prices. The process of maintaining prices was dependent on the minimization of physical as well as economic waste, the latter understood as surplus in excess of market demand and available storage capacity. The wastefulness of the system was obvious to businessmen and politicians who acknowledged that a change to the status quo was necessary in

36 Ibid., 54.
37 Ise, The United States Oil Policy, 141.
38 Yergin, The Prize, 162.
39 Nash, United States Oil Policy, 30.
40 Ibid.
order to effectively enforce conservation. The head of the United States Fuel Administration also expected cooperation and coordination between various levels of government.\textsuperscript{41} Immediate adjustments were required.

Oil was, after all, the dominant fuel of modern warfare and California was a leading oil-producing state.\textsuperscript{42} For the Fuel Administration, initiating the process of wartime mobilization required appropriating the productive capacities of fossil fuel-based energy systems across the United States. Although efforts to conserve energy varied greatly by state, the heavy oils produced in Southern California were of particular importance to the objectives of the Fuel Administration.\textsuperscript{43} In his 1927 novel, Upton Sinclair describes how oil from Southern California “was driving the trucks that were carrying munitions up to the front; it was moving the biggest and fastest cargo-ships, and the swift destroyers that were protecting them; it was lubricating the machinery in the factories, and more and more was being called for.”\textsuperscript{44} And unlike the British, American forces had a domestic supply of oil-based energy to draw from.

In addition to fueling the machines of war overseas, oil from Southern California was viewed as essential to maintaining industrial production and transportation along the Pacific Coast. A national shortage of available coal supplies during the relatively cold winter of 1917 made the need to conserve energy for the domestic war effort seem even more urgent to the leaders of the Federal Fuel Administration. The nation appeared to be in the midst of an energy crisis at the worst possible time. Immediate action was required to conserve fuel and prevent complete industrial paralysis on the Pacific Coast.\textsuperscript{45}

\begin{footnotes}
\footnote{41 Yergin, The Prize, 162; Clark, Energy and the Federal Government, 81-109; Ise, United States Oil Policy, 29-38.}
\footnote{42 Yergin, The Prize, 66, 151-189.}
\footnote{43 Clark, Energy and the Federal Government, 93-106.}
\footnote{44 Sinclair, Oil!, 105.}
\footnote{45 Clark, Energy and the Federal Government, 50-2.}
\end{footnotes}
The broad strategy of the Federal Fuel Administration in California and elsewhere was to develop, maintain and administer a cooperative system of oil production and distribution based on priorities and permits. On the Pacific Coast, all companies with a yearly output of more than 100,000 barrels of fuel oil were required to secure licenses from the Fuel Administration.\textsuperscript{46} The detailed information collected from producers by regional Fuel Administrators was essential to the task of “assuring an adequate supply and equitable distribution of fuel oil, for purposes vital to the national security and defense and to the successful prosecution of war.”\textsuperscript{47} Listed in order of importance, the priority classifications of the United States Fuel Administration for the delivery of fuel oil were as follows:

1. Railroads and bunker fuel.
2. Export deliveries or shipments for the United States Army or Navy.
3. Export shipments for the navies and other war purposes of the Allies.
4. Hospitals where oil is now being used as fuel.
5. Public utilities and domestic consumers now using fuel oil (including gas oil).
6. Shipyards engaged in government work.
8. Arsenals.
9. Plants engaged in manufacture, production and storage of food products.
10. Army and Navy cantonments where oil is now being used as fuel.
11. Industrial consumers engaged in the manufacture of munitions and other articles under Government orders.
12. All other classes.\textsuperscript{48}

Maintaining the operational integrity of established transportation networks on the Pacific Coast was clearly essential to the strategy of wartime mobilization implemented by the United States Fuel Administration.\textsuperscript{49}

\textsuperscript{46} Nash, \textit{United States Oil Policy,} 29.
\textsuperscript{47} United States Fuel Administration, \textit{Rules and Regulations Governing Licensees Engaged in the Business of Distributing Fuel Oil}, Washington D.C., approved 9 March 1918. RG67; Federal Oil Director for the Pacific Coast, San Francisco, CA; General Correspondence, 1918; Box 3 of 6, Folder: “Pacific Coast War Service Committee,” NARA – Pacific Region (San Francisco).
\textsuperscript{48} D.M. Folsom to Albert E. Schwabacher, 6 May 1918. RG67. Federal Oil Director for the Pacific Coast, San Francisco, CA; Fuel Oil Usage Correspondence, 1918; Box 1 of 1, Folder: “California – Federal Fuel Administrator,” NARA – Pacific Region (San Francisco).
\textsuperscript{49} Ibid.
Letters of opposition sent to the Fuel Administration illustrate how this system of priority classification was by no means foolproof. On 6 March 1918, for example, National Fuel Administrator Garfield received a letter from the Los Angeles Crematory and Columbarium Association calling “attention to the fact that the nature and character of the service which crematories perform makes it obvious that they are in fact public servants and public utilities and it seems that they should be classed as such.”\(^{50}\) Exceptions were sometimes necessary.

In addition to administering a system of priority classification, the Fuel Administration also encouraged increased production for the duration of the war. “It is of paramount importance that there should be no interruption in the production of oil,” explained Requa in February 1918.\(^{51}\) Oil companies were expected to voluntarily cooperate in a patriotic effort to maintain prices. “I am expecting that the oil industry will to a great degree govern itself,” emphasized Requa to oil producers, “and that it will recognize the necessity of maintaining fair and reasonable prices and cooperating to the fullest extent in supplying most efficiently the products of petroleum needed to meet the requirements of our own Army and Navy, and of the Allies.”\(^{52}\) The emphasis was on efficiency, which would only be achieved through voluntarily cooperation. Voluntary cooperation, if possible, would reduce the need for direct federal intervention. This would be a lasting lesson for the California oil producers.\(^{53}\)

In Southern California, Federal Fuel Administrators developed a plan to maximize overall production that included proposals to open the naval reserves to drilling and the reopening of abandoned wells in Los Angeles. In a letter to the Federal Oil Director for the

\(^{50}\) Los Angeles Crematory Association to Harry Garfield, 6 March 1918. RG67; Federal Oil Director for the Pacific Coast, San Francisco, CA; General Correspondence, 1918; Box 2 of 6, Folder: “Los Angeles,” NARA – Pacific Region (San Francisco).

\(^{51}\) Mark Requa to the Oil Producers of the United States, 11 February 1918. RG67; Federal Oil Director for the Pacific Coast, San Francisco, CA; General Correspondence, 1918; Box 4 of 6, Folder: “Publicity,” NARA – Pacific Region (San Francisco).

\(^{52}\) Ibid.

\(^{53}\) Yergin, The Prize, 162; Clark, Energy and the Federal Government, 81-109; Ise, United States Oil Policy, 29-38.
Pacific Coast, directors from the Chamber of Mines and Oil in Los Angeles made the recommendation that “it would pay to reopen many of the old wells which were abandoned during the period when low prices prevailed for crude petroleum.” In addition, the use of oil-based products to construct and improve roads throughout California had to be approved by the United States Highways Council. Even asphalt needed to be conserved. Deteriorating roads, however, were least among the concerns shared by Los Angeles motorists.

Due to the wartime importance of aviation naphtha, the United States Fuel Administration also implemented strategies to conserve gasoline. In Los Angeles, amendments made to specifications for the sale of gasoline resulted in the marketing of an inferior product, much to the dismay of the many motorists who complained about automobile engine problems.

By imposing standards that conformed to United States Navy specifications, the Federal Fuel Director for the Pacific Coast was actually lowering the quality of gasoline that could be sold to private motorists. The highest quality distillates were being reserved for the production of aviation fuel. “The only question in this matter is between the personal convenience of the individual consumer and the requirements of the Allies for aviation gasoline,” explained Folsom in a letter to a concerned Los Angeles citizen in the fall of 1918, and “in this regard I believe that the Allied requirements should come first.” Evidently, the domestic and overseas war effort was to become the singular focus of the production and distribution of fuel oil in Southern California. Regular flows of oil were being disrupted and private consumption was not high on

54 Chamber of Mines and Oil to D.M. Folsom, 10 October 1918. RG67; Federal Oil Director for the Pacific Coast, San Francisco, CA; General Correspondence, 1918; Box 2 of 6, Folder: “Los Angeles City Oil Wells,” NARA – Pacific Region (San Francisco).
55 Dr. J.A. McGarry to D.M. Folsom, 9 October 1918, and D.M. Folsom to J.A. McGarry, 11 October 1918. RG67; Federal Oil Director for the Pacific Coast, San Francisco, CA; General Correspondence, 1918; Box 2 of 6, Folder: “Los Angeles,” NARA – Pacific Region (San Francisco).
56 Folsom to McGarry, 11 October 1918.
the priority list. Under the Fuel Administration, the freedoms and convenience of the automobile had to be sacrificed in a patriotic act of conservation.\textsuperscript{57}

In addition to changes made to quality specifications, the United States Fuel Administration also imposed limitations on the hours that gasoline could be sold in service stations across Southern California. Beginning 1 October 1918, private consumers in Los Angeles could only purchase gasoline between the hours of six in the morning and six in the evening. “The recent ruling confining the sale of gasoline between the hours of 6 A.M. and 6 P.M. has naturally caused considerable comment,” explained Standish L. Mitchell, Secretary of the Automobile Club of Southern California, in a letter to the Federal Oil Director of the Pacific Coast.\textsuperscript{58} Although this restriction was explained as a strategy to conserve manpower, there was a lingering concern among motorists in Southern California that the “gasless Sundays” that were impacting regions east of the Mississippi would soon extend to the Pacific Coast, where dependence on private automobiles was highest in United States.\textsuperscript{59}

When President Wilson made the appeal in the summer of 1918, “gasless Sundays” were a response to a shortage of gasoline stocks at ports along the Atlantic Coast, where vital energy sources were continuously being shipped overseas to aid the Allied war effort.\textsuperscript{60} On the Pacific Coast, by contrast, there were no signs of an oil shortage that could immediately justify the imposition of conservation measures as drastic as “gasless Sundays.” Even when the Fuel Administration was enforcing restrictions on the hours that gasoline could be sold in Los Angeles, California refineries continued to produce 24,000,000 gallons of gasoline each month.

\textsuperscript{57} Clarke, \textit{Energy and the Federal Government}, 103-104.
\textsuperscript{58} Standish L. Mitchell to D.M. Folsom, 1 October 1918. RG67; Federal Oil Director for the Pacific Coast, San Francisco, CA; General Correspondence, 1918; Box 2 of 6, Folder: “Los Angeles Controversy,” NARA – Pacific Region (San Francisco).
\textsuperscript{59} D.M. Folsom to Standish L. Mitchell, 5 October 1918 and D.M. Folsom to Frederick Wagner, 11 October 1918. RG67; Federal Oil Director for the Pacific Coast, San Francisco, CA; General Correspondence, 1918; Box 2 of 6, Folder: “Los Angeles Controversy,” NARA – Pacific Region (San Francisco).
\textsuperscript{60} Yergin, \textit{The Prize}, 163 and 178.
In October of 1918, the Federal Fuel Director for the Pacific Coast confirmed that a thirty-to-forty-day supply of gasoline was being kept in storage in refineries and sales stations across California.\(^61\) By that month, the stocks of gasoline available for overseas shipment reached a level that was deemed sufficient for overseas demand, resulting in the decision to make 13 October the “last gasless Sunday until further notice.”\(^62\) Surplus production from the fields of Southern California was being used to feed the reserve stocks in the Northeast.

In terms of strategies to conserve fuel oil, “lightless nights” was one of the first regulations imposed by the United States Fuel Administration that had immediate implications on energy consumption in the largest cities. Fuel oil was, after all, a primary ingredient in the steam-generation of electricity that was becoming critical in urban areas in the first decades of the twentieth century. In order to conserve fuel for the overseas war-effort, the Federal Fuel Commission issued an order on 9 November 1917 that restricted the use of all unnecessary lighting in public streets and private homes across the nation. “Display and advertising lighting which is affected by the Federal Fuel Administrator’s order for ‘lightless nights’ is concentrated largely in cities” explained Folsom in a letter to Albert E. Schwabacher, Federal Fuel Administrator for California.\(^63\) On 14 December 1917, “lightless nights” were restricted to Thursdays and Sundays until temporarily being suspended on 22 April 1918. Then, on 18 July of that year, the scope of “lightless evenings” was widened in a new order prohibiting the use of light produced by coal, gas, oil, or other fuel for domestic illumination or for the external ornamentation of buildings on Mondays, Tuesdays, Wednesdays, and Thursdays of each week. Whereas “gasless Sundays” were an appeal for voluntary cooperation, “lightless nights” were a

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\(^61\) Folsom to Wagner, 11 October 1918.


\(^63\) D.M. Folsom to A.E. Schwabacher, 14 January 1918. RG67; Federal Oil Director for the Pacific Coast, San Francisco, CA; General Correspondence, 1918; Box 6 of 6, Folder: “Petroleum Committee,” NARA – Pacific Region (San Francisco).
federal regulation that was “rigidly administered” in Southern California. Enforced by the Bureau of Conservation, violators of the “lightless evenings” regulation were levied fines of $251.64

In Southern California, representatives for the United States Fuel Administration faced the uphill battle of having to contend with established processes of oil-based urban and industrial development. To be sure, local resistance was inevitable amid federal efforts to conserve fossil fuels in a region completely dependent on oil-based energy. When the United States entered World War I in 1917, the Public Service Commission of the City of Los Angeles was in the midst of a long-term plan to develop a municipally-owned and operated hydroelectricity system. Municipal ownership of utilities was important to voters in Los Angeles, who authorized bonds in the amount of $10 million for the development of hydroelectric energy as a substitute for steam-generated electricity.65

By the fall of 1917, two municipally-owned power generation plants were completed in Los Angeles, with the remaining funds of the bond earmarked to build a distribution system. At this time, two private utility corporations were providing energy consumers in Los Angeles with electricity. The Southern California Edison Company, which generated electricity using a combination of thermal and hydro, served consumers throughout the southern portion of the state. By contrast, the Los Angeles Gas and Electric Company only served residents in the city with steam-generated electricity. In order to make immediate use of the hydroelectricity being generated at the two municipal power plants, the Public Service Commission in Los Angeles entered into a temporary operating agreement with the Southern California Edison Company in


65 Frederick T. Woodman to Harry A. Garfield, telegram, 1 February 1918. RG67; Federal Oil Director for the Pacific Coast, San Francisco, CA; General Correspondence, 1918; Box 2 of 6, Folder: “Los Angeles Controversy,” NARA – Pacific Region (San Francisco).
order to gain access to an existing distribution system. This agreement was made in the fall of 1917, just before the United States entered World War I. Even when supplying Southern California Edison with cheap power, allowing the corporation to cease steam-generation, the municipal power plants continued to generate a large surplus of hydroelectricity.\textsuperscript{66}

The wartime power situation in Los Angeles was of immediate concern to the United States Fuel Administration. The problem with steam-generated electricity was that the process consumed enormous amounts of fossil fuels. Whereas the operating agreement with the Public Service Commission allowed the Southern California Edison Company to cease steam-generation, the Los Angeles Gas and Electric Company continued to consume large amounts of fuel oil and natural gas. This situation was deemed excessively wasteful by Federal Fuel Administrators on the Pacific Coast, supported by a study of the California Railroad Commission concluding that surplus energy from municipal power plants would eliminate the need for the Los Angeles Gas and Electric Company to continue to consume vital fuel oil resources.\textsuperscript{67}

The controversy began on 7 January 1918, when A.E. Schwabacher, Fuel Administrator for California, sent a letter to Victor H. Rosetti, Chairman of the Los Angeles Fuel Committee, asking him to represent the federal government in a meeting before the Public Service Commission. “Tell them that if hydro-electric energy is utilized that would otherwise go to waste, a patriotic constructive measure of conservation would be accomplished,” reads the directive. According to Schwabacher, the use of municipal funds to duplicate existing

\textsuperscript{66} Board of Public Service Commissioners to the City Council of Los Angeles, 17 January 1918. RG67; Federal Oil Director for the Pacific Coast, San Francisco, CA; General Correspondence, 1918; Box 2 of 6, Folder: “Los Angeles Controversy,” NARA – Pacific Region (San Francisco).

\textsuperscript{67} Railroad Commission of the State of California, “In the matter of the conservation of fuel in connection with the operation of public utilities, Case No. 1178,” 28 January 1918. RG67; Federal Oil Director for the Pacific Coast, San Francisco, CA; General Correspondence, 1918; Box 2 of 6, Folder: “Los Angeles Controversy,” NARA – Pacific Region (San Francisco).
distribution systems as part of a long-term strategy to develop hydroelectricity was counterproductive to the logic of immediate wartime mobilization.68

Under orders from Schwabacher, Rosetti was tasked with strongly recommending to the Public Service Commission “that all available funds to be used for duplication of present electric distributing systems be used instead for hydro electric development which is so badly needed to conserve present use of fuel oil in generating power.” According to Schwabacher, “any action in this regard taken by [the] commission will be a patriotic one in accordance with the Fuel Administrations plans for conservation.” In contrast to the long-term objectives of the Public Service Commission, the Fuel Administrator of California wanted to see the remaining voter-approved bonds for the development of a hydroelectric system invested in additional generating capacity. In addition, Schwabacher suggested that the distribution system of the Los Angeles Gas and Electric Company be used to distribute the surplus energy accumulated by municipal power plants.69

Predictably, the requests made by the Federal Fuel Administration regarding the wartime power situation in Los Angeles were not well received by the Public Service Commission. For public officials invested in the long-term process of developing a municipally-owned hydroelectricity generation system, the Fuel Administration appeared by be exercising federal authority beyond the legal provisions of the Lever Act. In a letter sent to City Council on 17 January 1918, the Board of Public Service Commissioners emphasized the need for “a formal, public declaration of what is unquestionably the policy of the City, namely, that the City of Los Angeles is only willing but desirous of assisting the National Government in the saving of fuel

68 A.E. Schwabacher to Victor Rosetti, 7 January 1918. RG67; Federal Oil Director for the Pacific Coast, San Francisco, CA; General Correspondence, 1918; Box 2 of 6, Folder: “Los Angeles Controversy,” NARA – Pacific Region (San Francisco).
69 Schwabacher to Rosetti, 7 January 1918.
through the most effective use possible under the Charter of the City’s Hydro-electric plants.\textsuperscript{70} When bonds to develop a hydroelectric system were approved in 1917, a City Charter was passed prohibiting the wholesale of surplus energy generated by municipal power plants. Voters in Los Angeles did not want private companies making a profit from surplus energy generated with municipal tax dollars. Under the condition that no profit could be made from the surplus electricity generated from municipal power plants, the Los Angeles Electric and Gas Company had no reason to cooperate with the short-term plans of the Federal Fuel Administration.

Local newspapers exacerbated this conflict by bringing attention to the possibility that the Fuel Administration would eventually use the plenary powers of the Lever Act to force the Public Service Commission into an operating agreement with the Los Angeles Gas and Electric Company. If the surplus electricity from the municipal power plants could not be sold, there was always the possibility under the Lever Act that the Public Service Commission would be compelled by the federal government to give it away for free. The Public Services Commission of Los Angeles was willing to help conserve energy, but not on terms suggested by the Federal Fuel Administrator of California. On 23 January 1918, City Council passed a resolution requesting Mayor F.T. Woodman to submit a telegram to President Woodrow Wilson and Fuel Administrator Garfield explaining how the “city is prohibited by its organic law from selling electric energy for resale.”\textsuperscript{71} Evidently, the ethos of voluntary cooperation as part of a national wartime strategy to conserve fossil fuel had limitations in a regional capitalist economy dependent on cheap and abundant oil-based energy.

Faced with local resistance, the Fuel Administration responded to Los Angeles City Council and the Public Services Commission with a strong warning of impending federal action.

\textsuperscript{70} Board of Public Service Commissioners to the City Council of Los Angeles, 17 January 1918.
\textsuperscript{71} City Council of Los Angeles to F.T. Woodman, 23 January 1918. RG67; Federal Oil Director for the Pacific Coast, San Francisco, CA; General Correspondence, 1918; Box 2 of 6, Folder: “Los Angeles Controversy,” NARA – Pacific Region (San Francisco).
intervention. In a letter to Mayor Woodman, D.M. Folsom acknowledged “there may be some question of the legal right of the Fuel Administration to order any city to expend its funds for any purpose for which it is unwilling, even if such expenditure would result in conservation of fuel.” After all, in the early months of 1918 the energy markets of the Pacific Coast had yet to indicate a shortage of fuel oil.72 “There can be no question, however,” warned Folsom, “of the right and power of the Fuel Administration under the Lever Act to order and enforce the closing of some of the steam plants now supplying the City of Los Angeles with power if the present potential shortage becomes acute.”73 The message was clear: direct federal intervention would prevail where the strategy of voluntary cooperation failed. The only issue was that nobody knew how long the war would last.

The lingering threat of direct intervention was eliminated with end of World War I on 11 November 1918, which resulted in the expiration of the Lever Act. Ultimately, the level of efficiency envisioned by the United States Fuel Administration was never achieved. Even when oil from Southern California was desperately needed to support the domestic and overseas war effort, fuel oil remained the primary source of energy that was used by private utility companies in Los Angeles to generate electricity.74 The complexities of the Los Angeles energy system were simply not reducible to federal directives regarding the urgent need to conserve fuel oil.

The few historians who have documented the United States Fuel Administration have emphasized the overall effectiveness of this system of wartime mobilization. “Many oilmen hoped that the advantages of wartime cooperation could be maintained,” argues Gerald D. Nash, “for the problems of price stabilization and conservation were bound to reoccur in the immediate

72 D.M. Folsom to F.T. Woodman, n.d. RG67; Federal Oil Director for the Pacific Coast, San Francisco, CA; General Correspondence, 1918; Box 2 of 6, Folder: “Los Angeles Controversy,” NARA – Pacific Region (San Francisco).
73 Ibid.
74 Sabin, Crude Politics, 115-130,
postwar period.” Producers and distributors no longer had the security of government contracts and priority schedules, resulting in a reversion to market uncertainty and aggressive competition. According to Paul Sabin, “California’s unsettled oil market increased the urgency for oil operators to establish a favorable new legal framework for oil development on public lands.” Without the strong guidance of the Fuel Administration and the exceptional powers of the Lever Act, the role of the federal government in the sphere of energy conservation in Southern California and elsewhere across the oil-producing regions of the United States returned to a state of flux. Without direct federal oversight, the systemic overproduction, excessive waste and chronic market instability that characterized energy production at the turn of the twentieth century returned in the immediate postwar period, especially after the discovery of massive oil fields in the early 1920s.

The Mineral Leasing Act of 1920

Although brief relative to other allied nations, especially the British, American involvement in World War I affirmed the need to conserve fossil fuel energy resources over the long-term. After all, the Allies had “floated to victory upon a wave of oil.” However, many observers realized that federal efforts to conserve fossil fuel would have a disproportionate impact on the oil-based energy economy in Southern California, which was established under the open-access provisions of the General Mining Act. Predictably, news of an impending federal leasing law to govern access to natural resources on the public domain was not well received among the vested political and economic interests of oil production in Southern California. “There is no community in the United States more interested than is Los Angeles in the defeat of the measure

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75 Nash, United States Oil Policy, 48.
76 Sabin, Crude Politics, 31.
77 Clark, Energy and the Federal Government, 106-109; Nash, United States Oil Policy, 48;
now pending before Congress for the leasing of oil, gas, phosphate, potash and coal lands and water-power sites” reported the *Los Angeles Times* in 1916. Oil, explained the *Times* article, was the cheap fuel of rapid urban and industrial development in the Los Angeles Basin:

> The factories, furnaces and forges of this city are supplied with motive power by fuel oil, by natural gas and by electrical energy largely generated by the use of fuel oil. The locomotives on our steam railroads are run with fuel oil...The thousands of automobiles which course through our streets are run with gasoline made from petroleum and the cooking for half a million people is done with a mixture of natural gas with gas made from petroleum."  

In other words, the industrial economy of Los Angeles was completely dependent on oil, and the business community realized that any federal efforts to conserve fossil fuels through the implementation of a new leasing system was bound to have adverse impacts. “All of the oil lands and all the mineral lands in this country have, for seventy-five years, been free to citizens of the United States to acquire by discovery, location and development,” observed the *Times*, which argued that the “pending bill proposes to change the system under which the Pacific States have achieved marvelous growth and prosperity.” In defense of the status quo in Southern California, the Miners and Homesteaders Protective League of Los Angeles was established to oppose the proposed changes to federal mineral laws.

In the United States, the passing of the Mineral Leasing Act of 1920 formalized the transition of the federal government from “open-access” provider of oil-lands to active participant in oil-based capitalism. As landlord and proprietor, the federal government now had the full authority to collect royalties for all minerals and fossil fuels extracted by private companies on the public domain. Despite the evolving role of the federal government, industry competition remained the driving force of oil-production in Southern California. Under the new

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80 Ibid.
federal property regime, leases were granted according to a system of competitive bidding among oil producers.\textsuperscript{81}

Administered by the Bureau of Land Management, an agency of the United States Department of the Interior, the Mineral Leasing Act prescribed several functions to the federal government regarding the development of energy resources on federal lands. First, the Act gave the government power to manage the exploitation of leasable minerals on public lands. Second, the act enabled the government the authority to collect compensation from lessees in exchange for the right to extract minerals on public lands. With the Mineral Leasing Act of 1920, oil-bearing lands in the United States were no longer given away on a strictly first-come, first served basis. With the imposition of a leasing system and royalty schedule, the legal foundations for a new level of federal regulatory authority had been established.\textsuperscript{82}

The Mineral Leasing Act also changed the knowledge economy of oil in the United States by establishing important distinctions between “proven” and “unproven” oil lands. For unproven lands, prospectors were granted exclusive two year permits covering 2,560 acres based on the conditions that drilling started within six months and wells reach an aggregate depth of 2,000 feet within two years. If oil was found, the prospector was entitled to a twenty-year lease for one quarter of the land at a royalty of five percent and an annual rental of one dollar per acre. In terms of proven oil lands, the Secretary of the Interior was responsible for administering a competitive bidding process whereby tracts no larger than 640 acres were leased for twenty years at minimum royalty of 12.5 percent and an annual rental of no less than one dollar per acre.\textsuperscript{83}

Despite being considered a victory for producers in Southern California, however, the Mineral Leasing Act of 1920 was in effect a compromise measure that afforded the government

\textsuperscript{81} Sabin, \textit{Crude Politics}, 41-49.
\textsuperscript{82} Hays, 89-90; Nash, \textit{United States Oil Policy}, 17 and 244; Ise, \textit{United States Oil Policy}, 342-355.
\textsuperscript{83} Miller, “The historical development of oil and gas laws in the United States,” 517.
new administrative authorities for conserving oil and minimizing structural waste. By maintaining ownership of the public domain, the federal government was now in a position through the Act to enforce conservation and minimize waste by prohibiting the drilling of wells within 200 feet of the exterior boundary of a leased area. In addition, the Mineral Leasing Act of 1920 also gave the Secretary of the Interior considerable discretionary power to determine the future allocation (and rate of allocation) of oil-bearing public lands. Terms were negotiated on a lease-by-lease basis, and the Department of the Interior had the ability to tailor contracts in accordance to existing market conditions.\textsuperscript{84}

Despite affirming and formalizing the role of the federal government as landlord and proprietor of the oil-bearing public domain, the Mineral Leasing Act failed to address the competitive foundation of oil production in Southern California. The federal government was, after all, back in the business of promoting economic development, albeit in a different way. In 1920, the appointment of Albert B. Fall to the position of Interior Secretary resulted in the relaxation of federal regulations for oil and gas leasing, representing an enormous victory for oil producers in Southern California and a blow to previous conservation efforts initiated by the Roosevelt, Taft and Wilson Administrations. In a move that represented a significant reversal in federal policy, Secretary Fall used the pretext of drainage to justify opening the naval reserves to immediate production under the increasingly relaxed provisions of the Mineral Leasing Act. Time was a significant factor, since ongoing production across alternative sections of the field not owned by the federal government was slowly depleting the common pool of oil. In what was supposed to be a competitive bidding process, the relatively prompt leasing of naval reserves in Southern California and Wyoming to known business associates of Albert Fall immediately aroused suspicion among rival oil companies. Subsequent investigations determined that

\textsuperscript{84} Ibid.
Secretary Fall received money from the recipients of these lucrative government contracts, Edward Doheny in California and Henry Sinclair in Wyoming.\(^{85}\)

Known among historians as the Teapot Dome Scandal, the resulting controversy cast a dark shadow of corruption over the new role of the federal government as administrator of the oil-bearing public domain. The scandal disgraced the Department of the Interior, resulted in the removal of Albert Fall from office and tarnished the public reputation of Edward Doheny, the billionaire oilman who along with Charles Canfield discovered the Los Angeles City Field.\(^{86}\)

In effect, the Mineral Leasing Act of 1920 confirmed the status of the federal government as a vested interest in oil-based capitalism. Once again, federal policy emphasized the rapid exploitation of public oil-lands. Beginning in the early 1920s, the discovery of major oil fields surrounding Los Angeles resulted in a new spree of overproduction and volatile market conditions. In particular, discoveries at Huntington Beach, Long Beach and Santa Fe Springs resulted in a glut of oil that eliminated any lingering concerns of energy scarcity in Southern California. As described by Ise in his 1926 book *The United States Oil Policy*, the “feverish exploitation of the three great California fields, with the resulting addition of several hundred thousand barrels per day to the country, was disastrous.”\(^{87}\) Even with the passing of the Mineral Leasing Act in 1920, the United States federal government remained incapable of managing the complex political ecologies of oil-production in Southern California and elsewhere across the rapidly industrializing Sunbelt.

\(^{85}\) Yergin, *The Prize*, 194-198.


\(^{87}\) Ise, *The United States Oil Policy*, 107.
Conclusion

Beginning in the second half of the nineteenth century, oil-based capitalism emerged in Southern California in the context of a federal property regime that emphasized competition and was characterized by extreme waste and chronic bouts of overproduction. As a leading producer of oil-based energy, Southern California became a direct focus of federal efforts to conserve vital fossil fuel resources, especially after the outbreak of World War I.

With the aim of emphasizing the complications of geographic scale, this chapter examines how federal efforts to conserve fossil fuel resources during World War I were disrupted by established processes of oil-based metropolitan development in Southern California. As illustrated by the example of the United States Fuel Administration, the oil-dependent energy system of Los Angeles was not compatible with federal conservation efforts. Indeed, the Fuel Administration provides an important historical example for illustrating the limitations of federal intervention into established energy systems – even during exceptional periods of wartime mobilization.

From this perspective, the passing of the Mineral Leasing Act of 1920 can be interpreted as a federal response to the increasingly complex dynamics of oil-based capitalism in particular regional contexts across the United States. Under the new property regime, the federal government had the authority to allocate leases to the highest bidders and to collect royalties for all oil extracted from the public domain. Conservation was the theory and ideal, but systemic competition remained the reality of oil-based capitalism in Southern California.

CONCLUSION

Los Angeles, Southern California and the oil-based foundations of North American capitalism

The “American Century” is a term that is often used to describe the material prosperity and rise to global dominance that the United States achieved in the twentieth century.¹ Without question, oil was the quintessential fossil fuel of the American Century: not only by powering engines of modern warfare, but also by providing a cheap and abundant source of energy for expanded urban and industrial development. The past tense is intended here to emphasize the increasingly precarious status of oil-based capitalism in the post-1973 era, when it became strikingly clear that the resource abundance that sustained early phases of urban and industrial expansion in North America no longer exists.²

Beginning with coal in the middle of the nineteenth century, the development of fossil fuel energy was a major stimulating influence behind the rise of a modern, urban-industrial society in North America. The origins of oil-based capitalism can be traced to the turn of the twentieth century when California was the largest oil-producing economy in the United States and Los Angeles was the nation’s fastest growing metropolitan region. Interwoven in the production of urban and industrial space, oil remains the primary energy that sustains the capitalist mode of production in North America.³

³ James C. Williams, Energy and the Making of Modern California (Akron: University of Akron Press, 1997), 143-167; Scott L. Bottles, Los Angeles and the Automobile: The Making of the Modern City (Berkeley and Los Angeles:
My aim in this dissertation is to emphasize the interrelated and codependent historical geographies of oil as a form of energy and Los Angeles as a modern urban landscape. In a region where coal was scarce, the emergence of oil-based energy in Los Angeles was predicated on a series of long-term investments into spatial fixes to facilitate efficient and economic flows of liquefied fossil fuel energy. Unevenly distributed in crude form across the vast Southern California landscape, oil-based energy provided the cheap fuel for the rapid urban and industrial expansion of Los Angeles in the first three decades of the twentieth century. By the onset of the Great Depression, the widespread adoption of the automobile in Los Angeles and other cities in North America had solidified the status of oil as the dominant form of transportation energy in modern urban society.

In this dissertation, I examine how the emergence and establishment of oil-based energy in Southern California was stimulated and sustained by a culmination of successive and overlapping spatial fixes: from the early lines of the Southern Pacific Railroad, to the pipelines of Union Oil, and the vast regional network of roads and interchanges that integrated the first example of oil-based metropolitan development in North America. In the context of North American historical geography, Los Angeles can be regarded as the first city where oil-based energy assumed a formative influence over the production and ongoing reproduction of urban and industrial space.

Oil is more than a passive input that fuels the capitalist mode of production. In this historical geography of Los Angeles, I develop a dialectical understanding of oil-based energy as a commodity that is reflective of particular historical and geographical relationships between

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urban-industrial society and the biosphere that sustains it. In Chapters One and Two, I argue that the concept of the spatial fix – understood here as long-term, fixed-capital investments into landscapes to facilitate expanded capital circulation – is important for gaining insight into how the dominance of oil-based energy has been sustained and made increasingly resilient through the production of urban and industrial space. The culmination of decades and even centuries of fixed capital investment in particular regional contexts across North America, the strong historical and geographical inertia of oil-based capitalism has made the transition to an alternative source an increasingly daunting task.\(^5\)

In a case study of the Southern Pacific Company in Chapter Three, I argue that investments made by the railroads formed the basis for an emerging energy system in Los Angeles. Based on lands provided by the federal government in the latter decades of the nineteenth century, the railroads were the first form of mass-transportation in Southern California, fundamentally altering the scale and scope of industrial capitalism. Beginning in the 1890s, the development of oil-burning converters by Pacific Coast railroad companies unlocked the potential to extract energy from high-gravity California oil.

In the first two decades of the twentieth century, the enormous demands of the Southern Pacific and Santa Fe railroads stimulated the emergence of a mass-market for fuel oil produced in California. For railroad companies on the Pacific Coast, fuel oil was considered a particularly cheap and convenient source of energy because it did not require refining in order to be burned in the firebox of steam-powered locomotives.\(^6\) By 1930, railroads were part of a more extensive spatial fix of energy in the Los Angeles region that also included pipelines, storage facilities, oil


refineries and an improved harbor district. In the case of Los Angeles Harbor, the focus of
Chapter Four, the magnitude of fixed capital investment that went into the development of a
landscape to facilitate efficient and economical flows of oil was unprecedented. In addition to
functioning as a key node of energy production for the Los Angeles region, the harbor also
provided a critical outlet where surplus oil could be profitably exported via steamship to distant
shores of North America and even the globe. As an integrated region, the spatial fixes of oil-
based energy that emerged in Southern California in the first three decades of the twentieth
century operated at multiple geographic scales.

To be sure, the spatial fixes of oil-based capitalism that emerged in Los Angeles between
1890 and 1930 extended beyond transportation networks, infrastructure and industrial
landscapes. Transportation, storage and refining were essential to fossil fueled industrialization,
but these elements were part of a larger, more complex assemblage that implicated the
production of urban space writ large. Powered by cheap and abundant flows of fossil energy, Los
Angeles emerged in the first decades of the twentieth century as the fastest growing metropolitan
region in the United States and was the first metropolis in the nation wherein the production of
urban space was fundamentally constituted by a combination of fossil-fueled industrialization
and the internal combustion engine. “Since the period of its most spectacular growth coincided
with the rise of the automobile age,” observed Carey McWilliams in his classic account of
Southern California, “Los Angeles has always been a city on wheels, an automobile city.”
Timing of development was critical: whereas the electric streetcars formed the initial basis of

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7 Carey McWilliams, *Southern California: An Island on the Land* (Layton, Utah: Gibbs Smith, Publisher, 1973
[1946]), 236.
decentralized urban expansion, Los Angeles really was the first city in North America to reflect the widespread adoption of the automobile in the first three decades of the twentieth century.\footnote{Martin Wachs, “The evolution of transportation policy in Los Angeles: images of past policies and future prospects” in Allen J. Scott and Edward W. Soja, eds., The City: Los Angeles and Urban Theory at the end of the twentieth century (Berkeley and Los Angeles: University of California Press, 1996), 106-159; Bottles, Los Angeles and the Automobile, 175-210.}

Urban historians agree that the 1920s were a formative decade in the transportation history of Los Angeles.\footnote{Becky M. Nicolaides, My Blue Heaven: Life and Politics in the Working-Class Suburbs of Los Angeles (Chicago and London: The University of Chicago Press, 2002), 71-78; Williams, Energy and the Making of Modern California, 143-167; Bottles, Los Angeles and the Automobile, 1-21; Foster, “The Model-T, the hard sell, and Los Angeles’s urban growth,” 459-484; Sam Bass Warner, Jr., The Urban Wilderness: A History of the American City (New York: Harper and Row, 1973), 132-149.} In particular, the decision of a voting public to endorse the long-term visions of the Major Traffic Street Plan (1924) rather than the Comprehensive Rapid Transit Plan (1925) had direct implications on the emerging geographies (and established trajectories) of fixed-capital investment in Los Angeles. The opportunity to reinvest in transit facilities was forsaken for an opportunity to build a more comprehensive system of roads. In Los Angeles, the fate of the electric railroads remains an important example of a form of urban development that was constrained by a regional commitment to oil-based energy.\footnote{Ibid.}

This dissertation also emphasizes how the oil-based energy system that emerged in the Los Angeles region in the first three decades of the twentieth century had different political implications at different geographic scales. In Chapter Five, I examine how a series of decisions made by City Council beginning in the 1890s were significant in establishing a trajectory of oil-based urban and industrial development in Los Angeles. In Chapter Six, I investigate how the decision of the United States to enter World War I in 1917 made the conservation of oil an urgent matter of national security for federal policymakers. This was a significant transition away from the federal policies of the nineteenth century, when land and mineral rights were given away in an effort to quickly settle the American West. Although federal efforts to conserve
fossil fuel energy were resisted in Los Angeles, the passing of the Mineral Leasing Act of 1920 confirmed the status of oil as a fuel of national importance in the United States.\textsuperscript{11}

When understood in the context of successive and overlapping spatial fixes, the oil-based energy system that emerged in Southern California between 1890 and 1930 was never fully capable of managing the complexities and contradictions of fossil fueled capitalism. In the early years of the industry, leaky wooden barrels, inadequate storage and a lack of mass-transportation resulted in the extreme wasting of oil. Based on the rule of capture, extractive operations in Southern California became a competitive race to get oil out of the ground as quickly as possible with little regard for market conditions, available storage capacity or even the natural environment. Despite solving the problem of cheap fuel for the region, the oil-based energy system that emerged in Southern California between 1890 and 1930 was extremely wasteful and damaging to the environment. Over one hundred years later, the Lakeview Gusher remains the largest accidental oil spill in history.\textsuperscript{12}

This dissertation argues that oil dependence remains a problem of historical and geographical inertia that weighs heavily on the ability of human society and the powers that govern to make significant changes to how energy is produced and consumed. “While there is no energy determinism,” argue Debeir et al., “there is a powerful energy determination at work in all societies.”\textsuperscript{13} By the onset of the Great Depression, the foundation of a spatial fix based on internal combustion was firmly established in Los Angeles. One indication of this was the explosive increase in automobile registrations in Los Angeles County in the first three decades of the twentieth century. Between 1919 and 1929, for example, the number of automobile

\textsuperscript{12} “California’s legendary oil spill” \textit{Los Angeles Times} (14 July 2010).
registrations in the county increased from 141,000 to 777,000, “a rate of growth that far exceeded population growth,” explains Martin Wachs, “so that on the eve of the Great Depression in 1929 there was already one car for every three people in Los Angeles.”¹⁴ Ten years later, the 1939 expressway plan for Los Angeles (which included 612 miles of expressway) added a further layer of inertia to the established trajectory of automobile-based urban development.¹⁵

For good reason, urban historians have identified Los Angeles as a pioneering example of decentralized metropolitan development that increasingly became generalized across the United States in the two decades following the Second World War. The universalizing tendencies of capital accumulation remain, after all, a major source of tension and internal contradiction that chip away at the foundations of established spatial fixes.¹⁶ “When the 1959 Highway Act was passed, it made available an enormous amount of federal gasoline tax revenue for the construction of the Inter-state system,” explains Wachs, “and the availability of nine federal dollars for each state dollar spent was simply irresistible.”¹⁷ Based on the private automobile as a primary mode of transportation and supported by generous federal subsidies, the widespread suburbanization of the United States in the second half of the twentieth century has only added new landscapes and layers to the spatial fix of oil-based energy.¹⁸ Originating in Southern California at the turn of the twentieth century and gradually extending across the North American continent, the spatial fix of oil-based energy now operates at a global scale.

¹⁵ Ibid., 127.
Yet, the problem remains that oil is fundamentally a non-renewable source of energy that is derived from fossilized materials whose regeneration happens on a temporal horizon far longer than the rate at which they have been consumed.\(^1\) Moreover, the combustion of fossil fuels is now decisively implicated in a range of environmental problems, foremost among them planetary alteration of the climate. Throughout the twentieth century, the depletion and combustion of domestic reserves has made the political and ecological basis of fossil fueled capitalism in North America increasingly precarious.\(^2\)

Although geographies of crude extraction have changed over the span of decades, oil remains the primary fuel for transportation that sustains the circulation of advanced capital accumulation. The recent blackouts in California illustrate how energy systems are in a constant state of deterioration and require continuous reinvestment in order to remain efficient and economical. In North America, the generation of most electricity remains dependent on fuel oil. On the roads, rails and in the skies, oil-based energy continues to supply over 90 percent of the transportation needs in the United States.\(^3\) As of 2006, five of the largest corporations in the world were in the oil business (Exxon, Royal Dutch Shell, BP, Chevron and ConocoPhillips).\(^4\) Yet mounting energy insecurity, escalating geopolitical conflict over reserves, and recent disasters like Deepwater Horizon and Exxon Valdez continue to illustrate how fossil fueled capitalism remains an unstable and environmentally destructive mode of production.

Beyond the transportation sector and its implications on urban built form, innovations in the refining process have considerably expanded the range of commodities that can be yielded from a single barrel of crude oil, including the production of petrochemicals and plastics. Most

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\(^4\) Smil, *Oil*, 22.
people remain dependent on oil because oil is everywhere: in the roads, as fuel for automobiles, in every plastic-based commodity and as a primary ingredient in a seemingly endless list of food products and medicine. According to Black, reliance on a wide range of oil-based products has “helped define basic patterns of consumption in twentieth-century America.”\(^{23}\) By all measures, North America remains an energy-intensive society where oil remains internal and necessary to how everyday life is lived.

Originating as a spatial fix for industrial capitalism in the first decades of the twentieth century, the historical and geographical inertia of oil-based energy is deep and multilayered: it is not only embedded in urban and industrial landscapes, but also in politics, culture and an array of technologies and modern conveniences that sustain human life in advanced capitalist economies. In a modern, mechanized world, lifestyles have become organized around the consumption of extraordinary quantities of fossil fuel energy.\(^{24}\)

In North America, the relatively recent history of approximately 150 years of fossil fuel-based capitalism indicates that the transition to a more sustainable form of energy will be no simple matter. Since the turn of the twentieth century, oil-based energy has maintained an astonishing structural resilience and ability to adapt to new political economic conditions. To use the words of Debeir et al., “the inertia of energy systems is therefore ultimately related to the multiplicity of factors and conditions that must be assembled for a breakdown of the established energy system – known today as an energy crisis.”\(^{25}\) As illustrated by the historical geography of oil-based energy in Los Angeles, investment into established fossil fuel sources has had direct implications on the production and reproduction of urban and industrial space in North America.

\(^{23}\) Ibid., 50.
\(^{25}\) Debeir et al., 13.
and has thus contributed to the strong-historical inertia that continues to sustain the capitalist mode of production – even at these advanced stages.

Focusing on the metropolitan development of Los Angeles in the first three decades of the twentieth century, this dissertation examines how the emergence of oil-based energy was sustained and made increasingly resilient through the ongoing production (and reproduction) of urban and industrial space. By emphasizing the historical and geographical conditions through which oil emerged as the dominant fuel for transportation and industry in North America, and how the metropolitan development of Los Angeles was implicated in this process, this research develops an integrated political, economic and ecological approach to understanding the regional dynamics of energy transition and establishment. In particular, this historical geography of Los Angeles contributes valuable insight into how fixed-capital investment into built environments to facilitate efficient flows of fossil fuel energy has become a formidable source of inertia that sustains the capitalist mode of production.
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