

Oil Spaces: The Global Petroleumscape in the Rotterdam/The Hague Area

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Abstract

Corporate and public actors have built the physical and financial flows of petroleum into the very landscape. This article identifies different layers of those flows— physical, represented, and everyday practices—that combine into a palimpsestic global petroleumscape. It posits that these layers historically became essential parts of modern society and of citizens' everyday lives. Resulting path dependencies and an energy culture help maintain the buildings and urban forms needed for physical and financial oil flows and celebrate oil as a heroic cultural agent, in a feedback loop that leads societies to consume more oil. Following a general analysis, the article uses the Rotterdam/The Hague area, part of the North West European petroleum hub, as a case study of this feedback loop. Only in appreciating the power and extent of oil can we engage with the complex emerging challenges of sustainable design, policy making, heritage, and future built environments beyond oil.

Keywords

petroleum, urban history, global flows of oil, Rotterdam, The Hague

The Global Petroleumscape: Spatial and Represented

Over the last 150 years, powerful corporate and governmental actors have developed a network of spaces around the physical and financial flows of petroleum and its refined products. Combining the forces of private land purchase, speculation, and construction with spatial planning, policy, and regulation, they have guided the development of urban and rural areas around the world. Extraction, refining, transformation, and consumption of petroleum have made an extensive impact on seas, landscapes, cities, and buildings. Oil drilling equipment, refineries, storage tanks, pipelines, dedicated road and rail infrastructure, and gas stations serve the physical flows of oil in industrial areas as well as in everyday life. Headquarters, research facilities, housing, cinemas, and leisure facilities are linked to the financial streams of oil. All stand as material witnesses to the invasiveness of petroleum, but some of them are much more subtly connected to petroleum flows—international schools that serve oil expatriates' children, for example, are less visible than refineries. In most instances, oil companies have not been planning agents per se, but they have often

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collaborated with public governments in charge of spatial planning; as a result, the flows and the interests related to petroleum and their representation have influenced public planning practice, directly and indirectly, in response to the changing urban environment.

The impact of these private and public petroleum actors on society has not stopped there. The imagery of petroleum—in corporate publicity, policy documents, art, architectural design, and toys—also shaped citizen imaginaries and behavior. Oil companies and governments have created a broad range of petroleum imaginaries that change over time and in line with local cultures. They have promoted (and sometimes invented) progressive aspects of oil, historically in brochures teaching women to drive and educating children about the dangers of the street, and more recently promoting green technologies. They have depicted oil facilities as a sign of national industrial strength, they have promoted fun and attractive petroleum-derived products and spatial practices in everyday life, and they have engaged with spaces the oil industry does not own or use, but that have become accessible through the use of petroleum products. Noncorporate representations of oil in art and architecture as well as film and literature have celebrated oil as a heroic partner in creating contemporary society and our identity.

Together the physical, represented, and everyday practices form what I call the *global palimpsestic petroleumscape*.¹ Each of these layers has similar functions and typologies (style, location, or architectural form), and these layers interconnect to form a single landscape. The concept of the petroleumscape starts with the insight that the diverse *spatial* emanations of oil—including refineries and storage sites, office buildings, and gas stations—are connected through their relation to this single commodity and its group of industrial players. Connecting the actual places where oil has a hold with the *representation* of these spaces and of the *practices* of petroleum products, our analysis points to a better understanding of the ways in which oil shapes behaviors and secures continuous production and expansion of its spaces, thus creating a feedback loop. The expansive growth of the petroleum industry has been possible only through the benefits of cheap energy – for travel and heating, and for easy-to-use building materials – to citizens of different classes, races, cultures, genders, and ages around the world who have embraced the new petroleum spaces, effectively including population groups that are in conflict in many other areas. Careful promotion of the benefits of petroleum products and constant promotion of new uses and imaginaries helped reinforce widespread citizen buy-in, creating an energy culture that reinforces the spatial presence of the industry and further increased consumption in everyday life.

Over time, the various petroleum actors, with the support of the general public, have established path dependencies (to use a concept developed in the political sciences) and created an energy culture with multiple feedback loops, both spatial and represented, that stabilize the system, that make oil a positive and fun factor of everyday life, and that effectively prevent companies and countries from making a transition from oil to other energy sources. The existence of expensive and extensive petroleum infrastructure has important staying power. To give just one example: refineries, through their role as nodes in the production, transformation, and distribution of petroleum, have served as important drivers of spatial change, over time attracting petrochemical industries, redirecting petroleum flows, and reinforcing local petroleum systems, and even translating former—often colonial—dependencies into corporate ones. Furthermore, oil imaginaries have served the promotion of lifestyles and everyday practices related to the consumption of petroleum products, creating a second feedback loop that reinforces the presence of the petroleum industry through the participation of citizens for whom oil is an everyday necessity.

This reading of the global petroleumscape is in line with Henri Lefebvre's understanding of space as socially produced and then appropriated by the powerful as a tool.² In "The Production of Space," he argues that space "in addition to being a means of production . . . is also a means of control, and hence of domination, of power."³ In the case of petroleum, this dynamic is particularly evident. The *spatial practices* (the life of inhabitants in a space) and *representations of*

space (the approaches of built environment professionals) intersect with the *spaces of representation* (the images and associations of the users)⁴; they are multiple (palimpsestic) layers of physical space and professional and public representation. While Lefebvre sets up a complex system, this article focuses on oil-related spatial practices of petroleum production, administration, retail, and consumption, and points to the representations of these petroleum spaces. A fuller analysis of our everyday culture, including everyday language and imagery, is still needed.

Focusing on petroleum in the built environment (without taking into account other domains where petroleum is extensively used, from packaging materials to clothing, cosmetics, and medicine), this article argues that petroleum products have become part of global everyday life and a value system encompassing urban and rural areas, and industrial and less-developed countries. We now depend on oil to maintain these lives and spend more money on it, and companies in turn develop more products, more roads, more cars, all requiring more oil. The goal is thus to understand how petroleum has been written into spatial practice and representations, and how these forms shape future design and heritage decisions.

This article first places the concept of palimpsestic global petroleumscape in broader debates on global histories of architecture, planning, and urban form. It then explores the concept of the petroleumscape itself, identifying its different actors (corporate, public, citizen) and their shifting engagement with the construction and use of petroleum structures, pointing briefly to some global examples. Building on this general investigation, the article then specifically focuses on the Dutch Randstad, particularly the Rotterdam/The Hague area, analyzing the layered, or palimpsestic, creation of the Dutch petroleumscape over the last 150 years at the hand of private and public actors. In conclusion, the article proposes that we need to recognize the importance of petroleum in the construction of the built environment and its imaginaries to change them.

The long life span of petroleum installations and the built environment creates path dependencies, making it particularly difficult for us to overcome oil dependency and promote new energy practices. To bring about new landscapes and imaginaries and to prepare for the redevelopment of former oil infrastructure, oil transportation, office districts, or gas stations, we need to first understand the extent of the spatial and represented petroleumscape and understand how corporate actors and cultural factors drive spatial development. In most instances, oil companies and stakeholders have driven spatial development through land purchases and private construction. The rapid growth of petroleum and petrochemical companies has made them players with financial and political clout and spatial impact far beyond any single nation-state. National governments relied on petroleum first for military reasons, collaborating with border-crossing private investors, and some then used the revenues for public investments to stabilize their own power throughout the decades. State-owned oil companies from Saudi Aramco to Norwegian Statoil and the Chinese National Petroleum Corporation (CNPC) used petroleum income to build national identities and local welfare. Petroleum actors in some instances have thus become planning actors per se, tying the flows and the interests related to petroleum and their representation into national policies. Recognizing these factors, we will be able to identify moments of decisive change toward new energy values expressed in post-oil landscapes and imaginaries.

Existing Research: Oil Modernities and the Importance of Space

The concept of the global petroleumscape brings architecture and the built environment into an already rich conversation. Arjun Appadurai suggested that the suffix *-scape* allows for an understanding of the “new global cultural economy as a complex, overlapping, disjunctive order that cannot any longer be understood in terms of existing centre-periphery models.”⁵ Michael Watts’s excellent analysis (referencing the work of Timothy Mitchell, Andrew Barry, and others), and his term *oil assemblage*, connects oil with its territory, identifying a technological zone, while stopping short of discussing the designs of actual buildings and representations of them.⁶ The impact

of oil on the history of the last century, and on our everyday lives, has been expertly discussed by a range of scholars.⁷ Going beyond historical, political, and economic research on oil, numerous scholars in the field of Energy Humanities emphasize the importance of studying the representation of oil; they explore energy and particularly oil to gain a better understanding of the emergence of modernity and today's society. Oil is central to modern life, and Ross Barrett and Daniel Worden correctly argue that oil needs to be read both as a business and as a culture, a set of aesthetic practices.⁸ Many of the leading scholars in the field of Energy Humanities have explored cultural histories and theories of oil, and several specialists have written on literature, arts, film, and oil.⁹ Energy Humanities scholars speak of "invisible oil"¹⁰ to grasp the larger patterns of the ubiquity of oil in our life. Oil's role in the creation of multiple modernities, a concept proposed by Shmuel Eisenstadt, merits further exploration both in time and through space.¹¹ Specifically, studying in the impact of oil on built form, we may gain insight into the diverse spaces and temporalities of modernity in globally linked spaces.

Architecture, urban form, and landscapes more generally are important as spatial realities and cultural instruments; their role as part of larger social, political, economic, and technological change has long been recognized.¹² Diverse groups of scholars concern themselves with different aspects of oil in the built environment: economic geographers might study oil flows and related structures, planning historians investigate urban structures, and cultural historians consider the lived reality of oil; historians of the built environment have recognized the effects of oil on a region in specific historic investigations or in a particular building type.¹³ While there is some literature on architecture related to oil, the multifaceted role of built form in the construction of oil culture in different parts of the world has yet to be explored. Architectural historians have also looked at architectural artifacts related to oil, but they mostly focus on buildings designed by architects ("high architecture") and occasionally some vernacular buildings, notably gas stations.¹⁴ Scholars in a broad range of fields have written extensively about the car's impact on the built environment and its relation to architecture and urban form as important cultural elements in modern life.¹⁵ Recently, research in urbanism is starting to engage with energy landscapes, that is, architectural and urban spaces shaped by specific energy uses, and the built environment as a physical entity and a cultural device.¹⁶

Building on this literature, we propose that the global spread of petroleum is a useful vehicle for comprehensively investigating global architectural and urban history, in different parts of the world, under different political and economic regimes, in different geographical, historical, social, and cultural contexts, and with different layers of urban and regional development and architectural typologies. This might also be a way to overcome European and American scholars' traditional focus on European/North American/Australian practices. Recent initiatives for writing a globally balanced and more heterogeneous history already tie together existing research on the local impact of oil or on particular oil buildings.¹⁷ Thinking of oil in terms of a petroleumscape means giving historians, for example, the opportunity to explore a variety of building types in the context of urban or regional scales and of corporate networks.¹⁸

Petroleum Actors and the Elements of the Global Petroleumscape

Private and public actors created the global petroleumscape in multiple steps. Starting with the extraction of petroleum, they have developed related spaces for transporting, refining, storing, administrating, and retail in hybrid, shifting, and uneven ways in line with local, geographical particularities, historical preferences, and technological possibilities (Figure 1).

The first layer of the *spatial* petroleumscape is the *industrial footprint* of oil: its storage, transformation, and transportation. The oil industry started as a corporate endeavor, and in some countries, such as the United States, it continues to be officially private (even as its decision

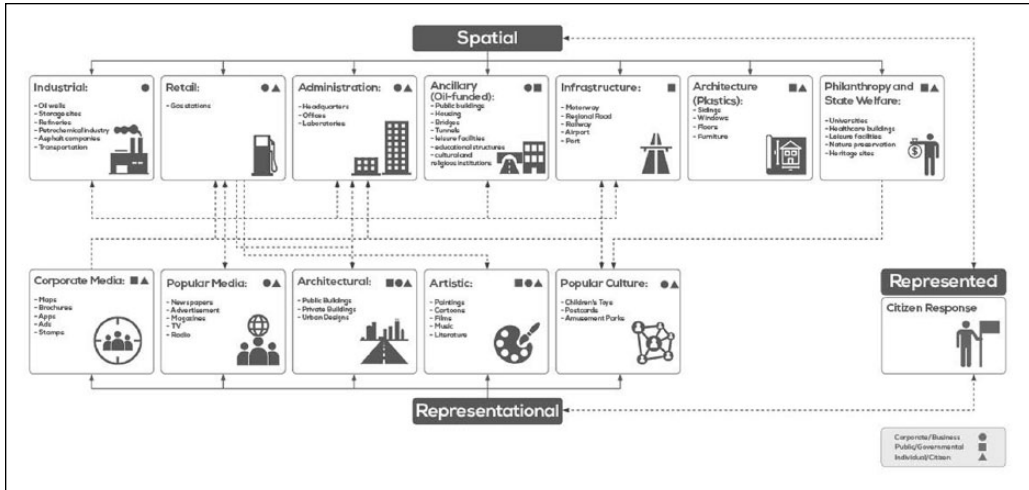


Figure 1. Shows the hybrid, multiple, shifting, and uneven ways in which many actors collaborate to create the global petroleumscape. Source: Carola Hein.

making is closely intertwined with public interest). Private companies have generally focused their engagement on functional and industrial spaces, some retail structures, and road and rail infrastructure. In the 1860s, the early years of the oil industry, entrepreneurs and numerous small companies discovered and developed extraction sites, building new infrastructure and functional settlements to extract oil. An infrastructure for extraction, transportation, refining, and resale, and also for administration and consumption, started to emerge around them.

Less than the ownership of petroleum sources, the control of the refining business and of infrastructure determined the shape of the petroleum industry. In the so-called Cleveland massacre of 1872, Standard Oil founder John D. Rockefeller purchased most of his local competitors, gaining control over railways and pipelines, as captured in the 1901 caricature of King Rockefeller with a crown of railways; it is a striking example of both infrastructure control and the role of private investment in the creation of urban patterns and built form. (Figure 2). Big companies, through their political lobbying, advertisement, and sheer size, have shaped entire landscapes in very different geographical areas in interconnected ways.

Some installations, such as refineries or headquarters, redirected the physical and financial flows of oil over more than a century, reinforcing the centrality of oil to local economies. The Schuylkill refinery in Philadelphia stands as an example: oil storage in the area started in 1866, and the refinery has been running since shortly thereafter (Figures 3 and 4). After a failed closure attempt in 2011, the local government supported the creation of Philadelphia Energy Solutions, which has effectively redirected petroleum flows from North Dakota to the center of the metropolis.¹⁹

With the emergence of car traffic in the twentieth century, the industry became a main player not only in transporting oil but also in paving the streets that would carry the oil. In fact, road construction used the heavy remnants of petroleum, bitumen, for which there was little use otherwise. Often, the oil industry collaborated with national governments to develop necessary infrastructure, as in the construction of King Fouad Way through the Egyptian desert from Cairo to Alexandria in 1939.

Another layer of the spatial layer of the petroleumscape is *the retail network* of petroleum products, notably benzene, a refined petroleum product that became the primary fuel for cars by the end of the nineteenth century. Lighting oil had not catalyzed a recognizable network of retail



Figure 2. Cartoon of John D. Rockefeller published in *Puck* v. 49, no. 1251, 1901.
Source: Library of Congress: LC-DIG-ppmsca-25503.

buildings to sell lamps, but benzene's fostering of car production led to a new architectural typology closely related to the new commodity's infrastructural needs: gas stations. As the range of cars expanded, gas stations spread throughout cities and rural areas. Compared with huge refineries, this layer of the petroleumscape is short-lived and much closer to the consumer (Figure 5). Gas stations are designed to be steps along a way, a secure companion on long trips as well as in the neighborhood. They are easy-to-build structures that can adapt to changing consumption patterns, for example, accommodating the sales of other products. As places of contact with the consumer, gas stations are ideally suited for brand marketing to adults and children through architecture, free toys, and other items. The rapid expansion in the number of gas stations in the 1920s was closely connected to national infrastructure construction in multiple ways, and this expansion supported the growth of the petroleum industry, facilitated petroleum transport, and promoted individual car-based transportation.

The landscapes of production and retail are complemented by *administrative and research facilities*, another layer of the spatial layer of the petroleumscape. Oil companies not only developed the port (and its key infrastructure) and set up a retail system, that is, they also inscribed their interests into a corporate landscape of headquarters and research facilities. The economic



Figure 3. The Atlantic Petroleum Storage Company on the Schuylkill River depicted as an idyllic location next to Appleyards in an advertisement from 1866. Source: Library Company of Philadelphia.



Figure 4. Aerial view from the sprawling Atlantic Refinery Company in 1926. Source: Library Company of Philadelphia.



Figure 5. The new architectural typology of gas station also attracted well-known architects such as Frank Lloyd Wright and Mies van der Rohe. Mies built the gas station on Nuns Island in 1969. Source: HB-32709-C, Chicago History Museum, Hedrich-Blessing Collection.

fates of physical and financial flows are closely intertwined, but their spatial location and their visibility are different. Oil administration buildings are often distinctive urban and architectural spaces; their design is often in tune with those of other large-scale office facilities and often they become local icons and heritage buildings. Companies locate them in prestigious locations and in proximity to relevant government ministries—in New York, for example, rather than Western Pennsylvania (Figure 6).

These centers were often also hubs for the oil industry's *ancillary spaces*, another spatial petroleumscape layer, holding all those buildings that are not part of the production process of oil: those that are associated with housing, leisure, or education of oil workers (elite or working class), and are either paid for in full or in part by a company, but are rarely identified in conjunction with the oil industry. In the absence of existing settlements, private corporations intervened in other areas of the built environment, such as housing or leisure structures, to serve the industry, increase its own attractiveness to its employees, or improve its reputation in the larger society. Because of its traditionally private focus, U.S. petroleum companies have preferred to shape cities and architecture through numerous philanthropies instead of by paying higher taxes: Standard Oil founder John D. Rockefeller and his descendants have sponsored art and health institutions, and also commissioned diverse buildings around the world.

Financial contributions and architectural gifts such as the Peking Union Medical College (founded in 1917) paralleled the expansion of the Standard Oil company, even while being carefully separated from the company's name (Figure 7).²⁰ But in many parts of the world, oil companies are more likely to be associated with national interests or to be part of a national government's portfolio, an important partner in developing infrastructure and promoting oil-based lifestyles. With the shift from lighting oil as a household good for individuals to petroleum-fueled cars, ships, and planes, governments at the turn of the twentieth century sought to ensure national access to petroleum sources, refining, and transportation. The construction of Abadan and other cities in Khuzestan province by the Anglo-Iranian Oil Company (which became British Petroleum [BP] in 1954) stands as an example²¹ (Figure 8).

A more recent addition to the spatial layer of the petroleumscape is the use of plastic materials in the building industry. In 1957, in a powerful collaboration of research, construction and



Figure 6. The Standard Oil headquarters on 26 Broadway was a well-known urban icon, shown here in a photograph by Underwood and Underwood of the drawings for the new building in 1923. Source: Library of Congress, Prints and Photographs Division, Washington, D.C. 20540, USA, <http://hdl.loc.gov/loc.pnp/pp.print>.



Figure 7. The Peking Union Medical College designed by Harry Hussey in 1921. Source: Bundesarchiv: Image 137-023959.

design, architects from the Massachusetts Institute of Technology (MIT), Monsanto Chemical Company, and Disneyland inaugurated a visionary plastic house of the future with new forms and technologies in Anaheim and marketed it to millions of visitors as part of a modern lifestyle: clean, functional, and fun (Figure 9). The dream of a mass-produced full plastic house was never realized, and the building was demolished ten years later, but petroleum companies and the building industry had found a new focus. Instead of following comprehensive architect-led

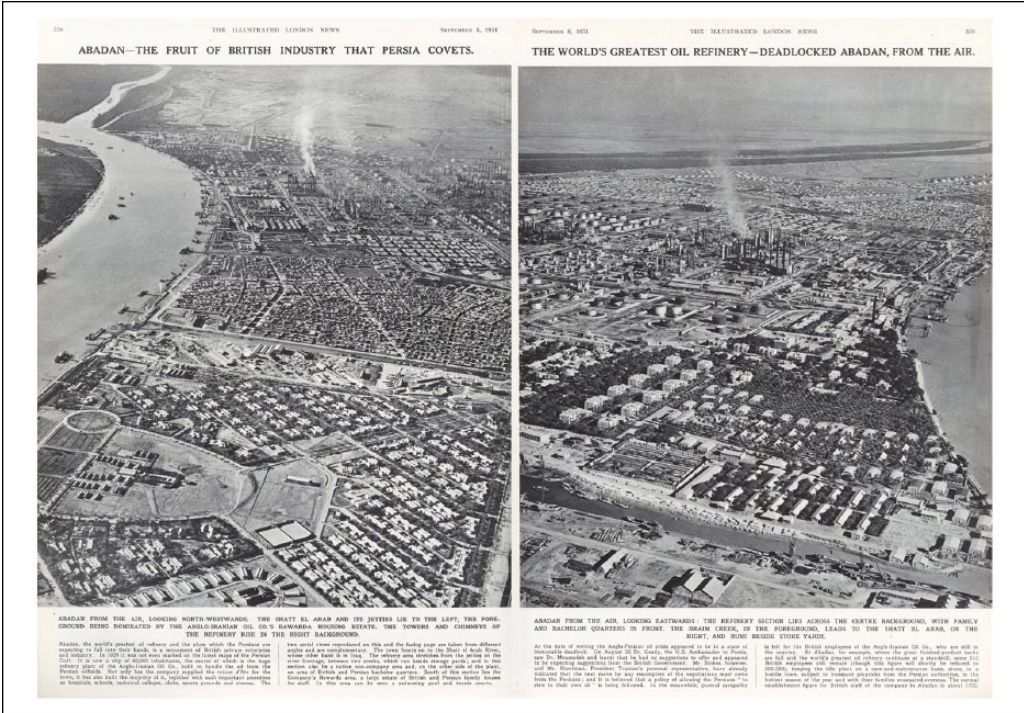


Figure 8. Aerial view of Abadan, a city built around a refinery in 1951, when the Iranian government nationalized the Anglo-Iranian Oil Company.
 Source: The *Illustrated London News*, London, September 8, 1951.

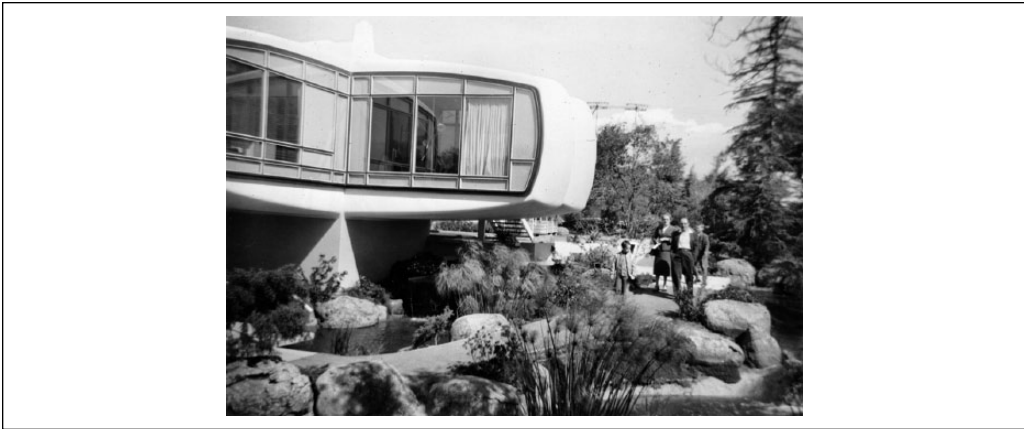


Figure 9. Some 20 million visitors saw the House of the Future, set in 1986, at Disneyland Anaheim, between 1957 and 1967.
 Source: Linda Peach Warner Collection. Acc#2014-57, Orange County Archives.

design, the petrochemical and building industries collectively developed new materials and building elements—from plastic bathroom units to electric cable insulation and corking, from insulation to plastic windows, from furniture to Lego toys and doll houses—that excited designers and users and have since become standard in buildings.

Private companies, with grand names such as Standard Oil, Royal Dutch Shell, and BP, started to create the spatial layer of the petroleumscape. Continuously adapting to, creating, and steering evolving societal demands, their enormous petrochemical industry caters to all realms of life and has become embedded in all types of spaces: urban and rural, built and natural. The rapid growth of petroleum and petrochemical companies has made them players with financial and political clout and spatial impact far beyond any single nation-state. National governments relied on petroleum first for military reasons, collaborating with border-crossing private investors, and some then used the revenues for public investments to stabilize their own power throughout the decades. State-owned oil companies from Saudi Aramco to Norwegian Statoil and the China National Petroleum Corporation (CNPC) used petroleum income to build national identities and local welfare. Citizens of a broad range of backgrounds have become part of and partners in the encompassing spatial petroleumscape.

Reinforcing this spatial layer of the petroleumscape, *representations in corporate media and public relations materials* map, depict, and represent the built environment selectively to promote oil companies and governmental agencies involved in the oil business. This representational layer of the petroleumscape often depicts industrial spaces as clean and colorful (not as dirty and black as reality); it associates company logos with spaces of leisure and culture created for their employees, or with natural or urban environments that become accessible for the customer through the use of petroleum products but that are devoid of the physical presence of oil.²² The representation of these petroleum-related spaces in corporate and private media, films, architecture, and design has shifted over time and space to promote petroleum usage and has further enhanced the impact of the physical layer of the petroleumscape.

From the beginning, corporate and public entities intimately associated with the construction of oil-related structures promoted those structures with extensive publicity. Various advertisement campaigns also promoted petroleum itself in its many forms, from lighting oil to car fuel. Ads for lighting oil by companies such as Saxoléine expressed the supposedly joyous experience of safe lighting oil in the late nineteenth century (Figure 10). Company publicity—films, booklets, and postcards—has addressed employees as well as the general public.

Companies have depicted their extensive investments. Films on Abadan such as *Critical D days in Persian Oil Issue* and the movie *Persian Story* document what the Anglo-Iranian Oil Company saw as the benefits of their investment in Iran.²³ In China, the government celebrated the discovery of oil in Daqing in the late 1950s as a model for the country's socialist industrialization (Figure 11). Oil industry images on stamps or money are often seen in countries where the oil industry is in public hands; the oil industry, part of the public sphere, also shapes public spaces and buildings. The spatialization and representation of oil as well as the creation of petroleum-related lifestyles are an inherent part of policy making and extend into school books and national narratives.

Perhaps the most intriguing advertisement and the most complex campaign have been the collaboration between Shell and Norman Bel Geddes that featured a modern city of highways and skyscrapers that inspired the City of the Future exhibition sponsored by General Motors at the New York World's fair of 1939 (Figure 12). The exhibit went on to influence planners in shaping real cities and citizens in imagining how to live in the second part of the twentieth century. At the same time, the petroleum industry, along with other private and public players, was lobbying for oil-friendly public policies like subsidies for highways and against public transit. Together with the heavily promoted desire for single-family home—and in U.S. federal mortgage deals for most veterans in the postwar period—these were a recipe for increased driving and suburban development packaged enticingly in advertisements (Figure 13). Celebrated in the public media in the United States, these transformations led to suburban development and associated lifestyles.

Companies (including government-owned firms) developed bulletins and newspapers for clients of all ages and education levels. Advertisements spoke to cultural and social changes and

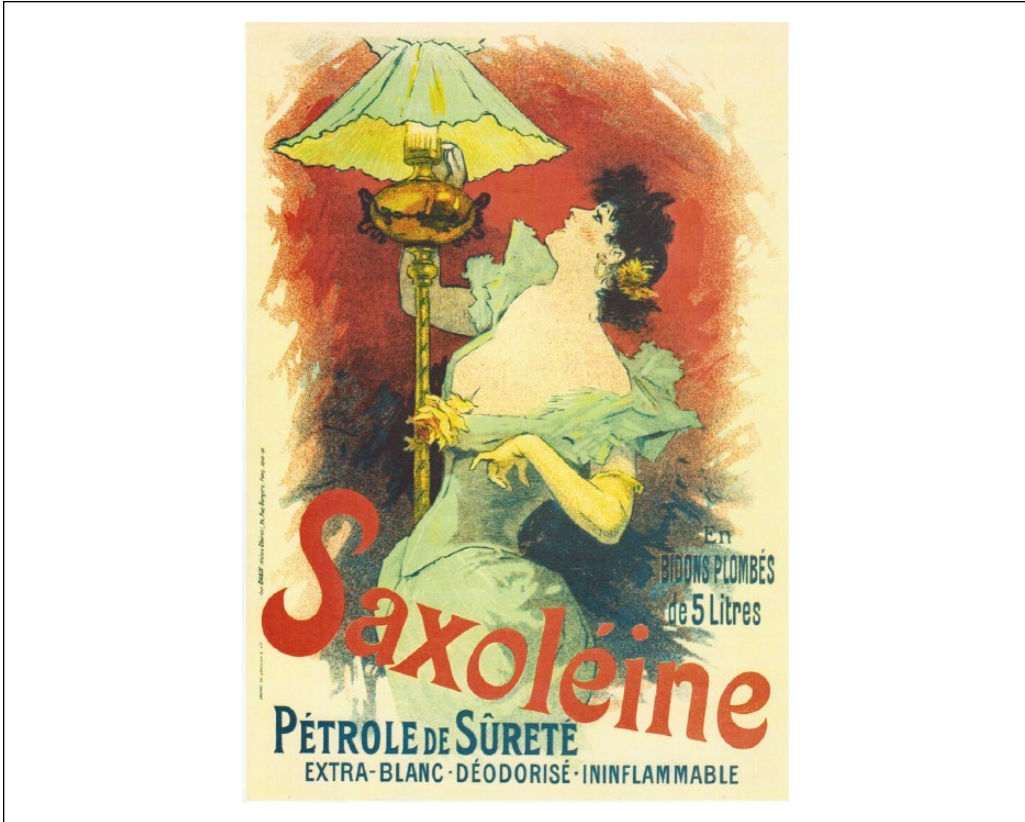


Figure 10. Poster for Saxoléine Security Petroleum by Jules Chéret in 1891.
Source: Carola Hein.



Figure 11. Chinese Stamps from 1974 showing the heroic people and their lifestyle in Daqing. The so-called “Iron Man” Wang Jinxi is the protagonist in the top left image (Designers: Yu Ren, Keming Pan).
Source: Carola Hein.



Figure 12. The 1939 New York World's Fair witnessed the power of the collaboration between design, oil, and car companies.
Source: *Life* magazine, July 5, 1937

susceptibilities, including issues of gender and environmental concerns. For example, petroleum companies started handing out free maps in the 1920s, encouraging new car owners to discover cities and landscapes (Figure 14). These maps tied the imagery of petroleum to culturally relevant landmarks and buildings that oil companies invest in: connecting retail with maps, depicting oil architecture on their front pages, promoting modernist gas stations, and pairing those images of gas stations with important national monuments, traditional villages, and features of the natural landscape (Figure 15). A particularly striking example of such representation of the oil industry, refineries, pipelines, or storage tanks in cultural documents is the Standard Oil photo project, for which the photographer Roy Stryker depicted the (positive) impact of Jersey Standard Oil on people and communities (Figure 16).²⁴ Representation of technology is contingent to historical moments when technology is seen as a major societal achievement (such as the postwar period in the United States). At other moments in time, the oil industry celebrates the spaces it helps discover, the lifestyles it facilitates, or the new cheaper building materials it provides.

Along with corporate interests, *independent artists* and architects separately acknowledged the changes in the built environment and in lifestyles for the longest time by celebrating them. Their artistic and architectural proposals further strengthened the feedback loop between the petroleum industry and consumers. As the industry was well established, independent artists depicted oil buildings, refineries, gas stations, and headquarters in paintings, photography, and films. They illustrated oil's growing presence in everyday practices and helped inscribe it further into people's imaginaries.²⁵ Pride in oil storage and handling characterizes early depictions, such

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**ALL THE GAS MILEAGE
YOUR CAR CAN DELIVER**

**You'll Climb Hills Faster—
Save on Gas, too!**

Step out with Mobilgas or Mobilgas Special and enjoy all the gasoline qualities you want most . . . *high volatility for quick starts, warm-ups — high-octane for smooth anti-knock power — all the gas mileage your car can deliver!*

Yes, you get top economy because you get top performance — maximum quantities of super-power ingredients in Mobilgas and Mobilgas Special at the Sign of the Flying Red Horse.

Mobilgas
SOCONY-VACUUM

SOCONY-VACUUM OIL COMPANY, INC., and Affiliates; MOBILGAS PETROLEUM COMPANY; GENERAL PETROLEUM CORPORATION

GET MORE VOLATILITY • POWER • MILEAGE

World's Foremost Catalytic Refining Program Makes the Difference!

THE HIGH-OCTANE GASOLINE!

Catalytic refining — result of 22 years of Flying Red Horse research and development — is petroleum's biggest contribution to the rapid advance in modern engine design. It builds into Mobilgas and Mobilgas Special — super-power performance — proved mileage economy — all the gas mileage your car can deliver!

Figure 13. Mobilgas publicity promoting driving and celebrating the technical qualities of SOCONY-VACUUM gasoline.

Source: Carola Hein.

as the painting of the French city of Dunkirk. This large anonymous painting from 1923 puts the port activity at center stage. Former fortifications have become large green zones separating the old city from its rural surroundings, ready to be populated with (industrial) activities: multiple oil storage tanks visible on both sides of the river give a first idea of development, a new industrial future after World War I. The painter shows the tanks lit by the sun, and the new structures are gleaming white in the front right of the image. That future would come almost immediately to Dunkirk with the development of large refineries and storage sites (Figure 17).

Several artists caught on to the changing and growing physical petroleumscape, as we can see in an American gas station as painted by Edward Hopper in 1940 and Edward Ruscha's series of gas stations from the 1960s. In an unexpected influence beyond the oil industry, architects used such paintings as inspiration for their new designs of nonpetroleum buildings starting in the 1960s. For example, visionary drawings by Archigram and the plug-in city by Peter Cooke in 1964 are reflections on refineries, with an example actually depicted in Archigram's publication. Actual buildings, such as the Centre Pompidou in Paris designed by Richard Rogers and Renzo Piano and finished in 1967, show the degree to which architecture accepted the aesthetics of refineries



Figure 14. Map of Pennsylvania promoting driving published by Standard Oil of Pennsylvania. Source: Carola Hein.



Figure 15. Shell advertisement: Temple of Diana, Asia Minor. 3rd of the “Seven wonders of the world,” 1939. Source: The New York Public Library, <https://digitalcollections.nysl.org/items/510d47e4-4d31-a3d9-e040-e00a18064a99>.



Figure 16. Roy Striker's celebration of oil's impact on people's lifestyles: Depicting female photographer Esther Bubley at Bayway Oil Refinery. Source: Library of Congress.



Figure 17. View of the City of Dunkirk around 1923. Source: Collection of the Port Museum of Dunkirk.

(Figure 18). This support from independent actors for the oil industry—even of its most polluting elements, such as refineries, as inspirations for the design of cultural institutions, such as Centre Pompidou—signals the encompassing cultural embrace of the physical layer of the petroleumscape and the formation of the representational layer of the petroleumscape.



Figure 18. The Centre Pompidou in Paris.

Source: Nikolai Karaneshev

Critical artistic commentary also existed but has only grown in presence in recent decades. A 1904 cartoon critically illustrated the extraordinary reach of corporations into political and economic institutions, with Standard Oil grabbing for the steel, copper, and shipping industries, as well as a state house, the U.S. Capitol, and the White House. By capturing the dangers of oil monopolies and their reach, and translating them into a caricature with well-known buildings, this image adds to the representational layer of the petroleumscape. Other critical voices have emerged in the 1970s, when the oil embargo shattered trust in cheap energy, technology, and its unlimited potential in the Western industrial countries. While artists in Europe and America started to critique the negative environmental impact of petroleum, the parallel oil boom in the Middle East reached a new group of people eager to believe in new lifestyles and imaginaries.

Scholars have not yet explored popular media as part of the representational layer of the petroleumscape. Just think of children's toys produced without direct collaboration of the oil companies: a puzzle featuring an oil refinery, a toy car with the Esso logo, a Lego car handed out at the Shell gas station, or plastic Barbie houses that might inspire their owners to choose plastic window frames, furniture, or floor coverings in the longer term (Figures 19 and 20). Such objects promote a recognition of oil buildings, logos, and colors from an early age, preparing children for an oil world. Indeed, as we trace the history of oil's impact on the built environment and representations of that impact, we observe that the oil flows affect society's physical spaces and ways of living, and we realize that the consumer is now effectively part of the system.

Building on these first attempts at defining the layers of the petroleumscape, let us now examine both spatial and represented layers of the petroleumscape as they developed over the last 150 years in a particular place: the Randstad in northwestern Europe. Understanding the growth of the Randstad in light of oil-industry-related structures, we can see how corporate and public actors as well as specific local historic and cultural factors drive spatial development.

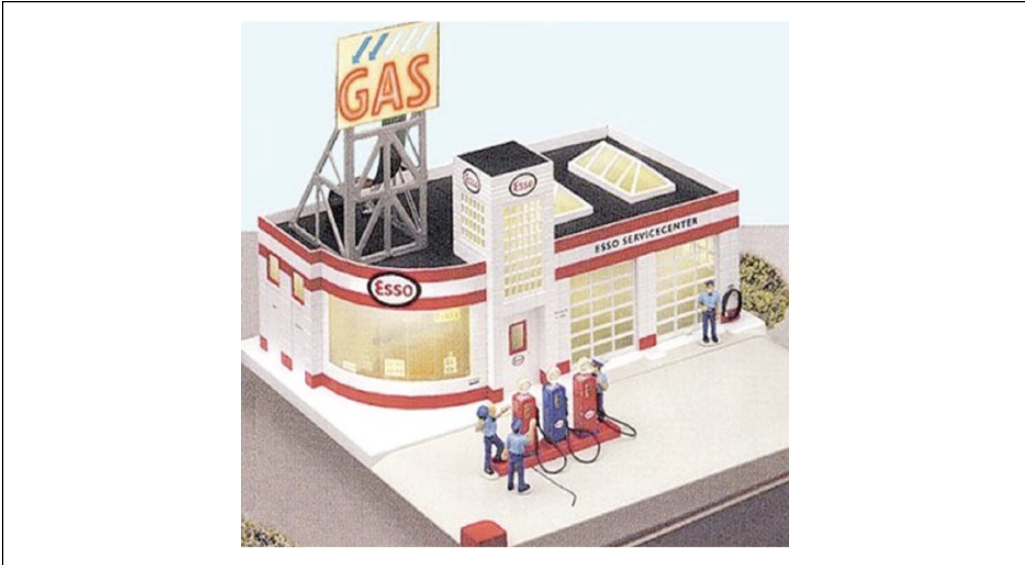


Figure 19. The Lego gas station as part of the representational petroleumscape, designed to include children at a young age in the oil-based transformation of the built environment.
Source: Carola Hein.

Tutti da Barbie
Oggi è una giornata importante, Ken torna da Hollywood dove ha appena terminato di girare un film. Alla festa verranno moltissimi amici, e che via vai sull'ascensore, ma la Casa di Barbie è così accogliente e spaziosa che tutti staranno comodissimi e si divertiranno un mondo. Vuoi aiutare Barbie a preparare il ricevimento e la camera degli ospiti?

Barbie[®]

La Casa di Barbie è in vendita dal tuo giocattolaio.

MATTEL
GIOCHI VIVI

Figure 20. Barbie toy house publicity, preparing children for the use of public building parts in their own houses.
Source: Carola Hein.

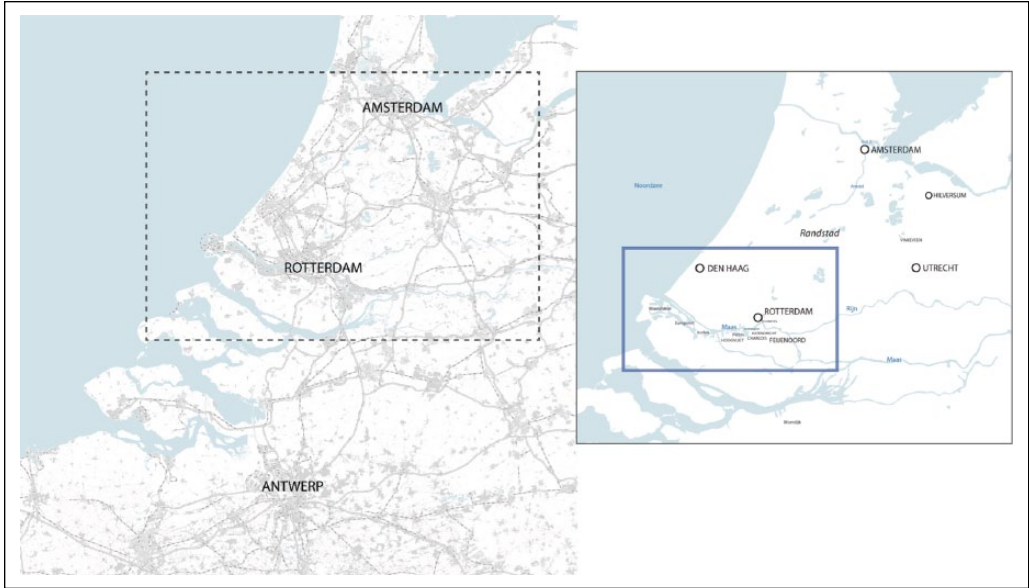


Figure 21. The Rotterdam/The Hague area in the Amsterdam-Rotterdam-Antwerp (ARA) region ARA area and the growth of the petroleumscape in four periods.
Source: Carola Hein and Arnoud de Waijer.

The Industrial Landscapes of Oil in the Randstad

When citizens and tourists think of cities in the Netherlands, few might think of petroleum. Instead, they will probably visualize historic centers with canals and windmills. But the Amsterdam–Rotterdam–Antwerp or ARA area is a major petroleum node: Amsterdam is a home for refined petroleum products; Rotterdam is a center for crude; and, crossing the Belgian border to the south, Antwerp is a petrochemical hub, the second largest in the world (after Houston) (Figure 21).²⁶ This is just one example of how deeply petroleum is written into our landscapes and how well it is hidden from ordinary life. Even spaces where bikes are prominent, such as the polycentric conurbation in the northwest of the Netherlands, have been shaped extensively by diverse petroleum actors, corporate, private, and even citizens.

To highlight how different layers of the petroleumscape have influenced each other, a series of analytical maps show the various phases in which the industrial, infrastructural, administrative, retail, and ancillary spaces (which comprise the spatial layer of the petroleumscape) have grown in the era of the car, specifically comparing 1910, 1940, 1970, and 2000 (Figures 22–25). These maps are based on rich source material, ranging from secondary sources to archival material and telephone book listings of gas stations, and in making the maps we focused on the big picture and broad trends rather than on each location and its historical development. The maps are an ongoing project and meant to provoke in-depth follow-up studies. In three phases, the next section follows the maps to explore the emergence of the Dutch petroleumscape through the lens of the Rotterdam/The Hague area, pointing to the intersection between public–private actors and to the spaces of oil becoming new actors themselves. Progressing in steps of thirty years—examining the end of the lighting oil period, the early years of car development up to World War II, the postwar period, and recent decades in which criticism of oil has started to gain ground—it shows how different layers of the petroleumscape have grown and supported each other, while public, private, and citizen actors used petroleum products and also promoted and depicted their use.

The growth of the port of Rotterdam and that of the city are intimately connected to that of global oil flows. As the series of maps shows, from the earliest locations in the city to the tip of

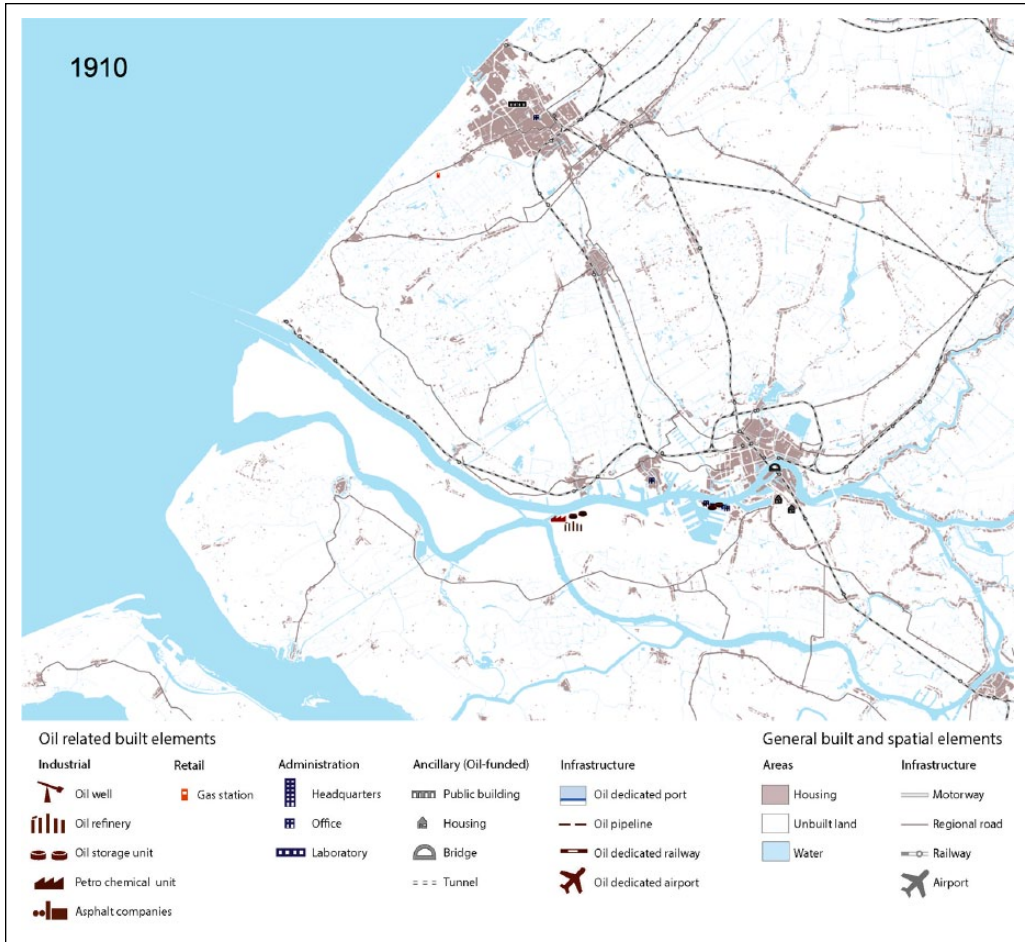


Figure 22. The petroleumscape in Rotterdam/The Hague in 1910.
Source: Carola Hein and Arnoud de Waaij.

the Maasvlakte extension of the 1970s, petroleum refining, storage, and transportation have occupied enormous spaces in the port (Figures 26–29). The growth of the petroleum port did not occur in a vacuum. It was closely linked to petroleum-fueled developments in other parts of the region, notably the construction of administrative and research buildings, retail, and infrastructure. It was also closely linked to representation of these developments.

Black Gold in the Dutch Randstad: Establishing Rotterdam as a Hub for Global Petroleum Flows: 1862-1910

The petroleumscape of the Dutch Randstad is anchored in the industrial spaces of the port cities, Amsterdam, Antwerp, and Rotterdam. While Antwerp was initially the biggest importer of petroleum from the United States, Rotterdam has emerged over the last 150 years as the main petroleum hub and stands here as example for the transformation of a port with multiple local players, into a global hub dominated by petroleum interests. The history of the Rotterdam port shows how private and local public players collaborated in the early years of the petroleum industry to establish the foundations of the ARA oil cluster as a node in global flows of petroleum. The analytical map of the city of Rotterdam illustrates how petroleum storage shifted from its initial location in

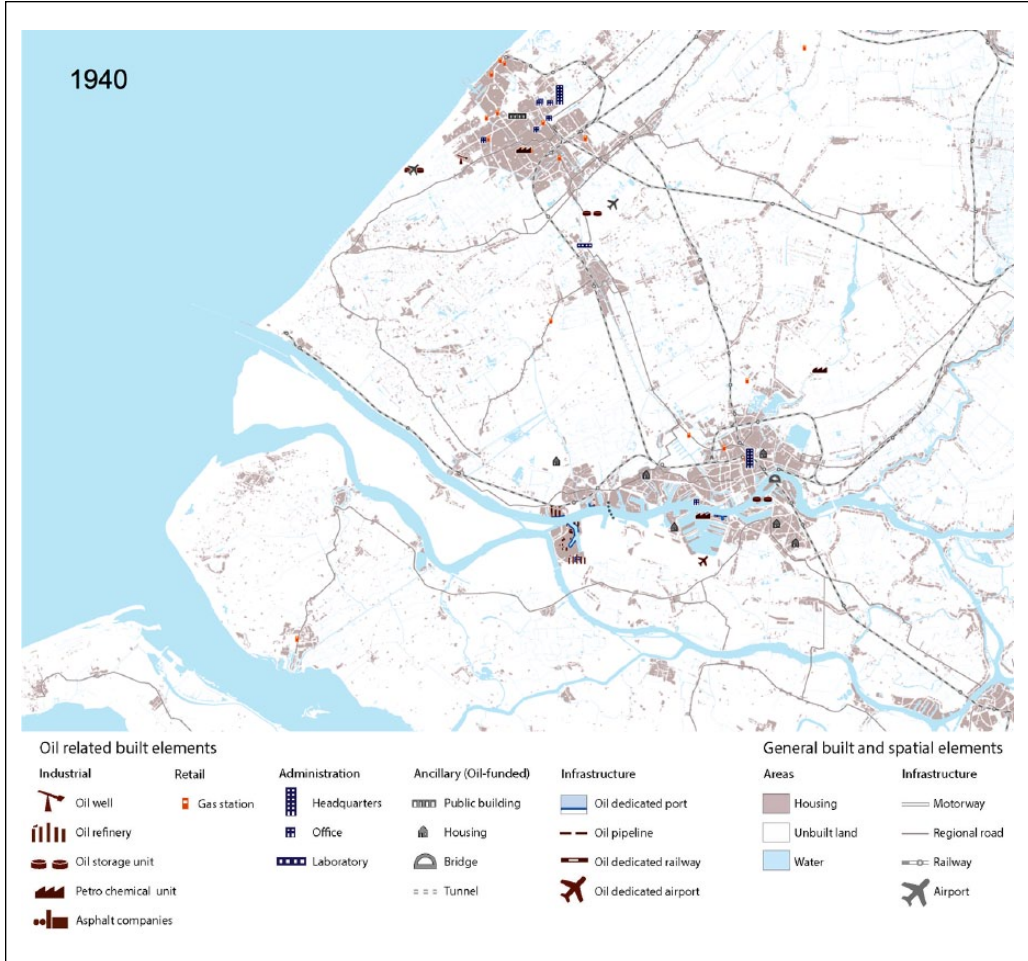


Figure 23. The petroleumscape in Rotterdam/The Hague in 1940.

Source: Carola Hein and Arnoud de Waijer.

the city toward the south side of the river and then westward, right as the city constructed new ports and otherwise expanded. The new ports were carefully situated in the plans for a new shipping lane, with improved access to the North Sea and new railway connections to the German hinterland.

The first barrels of oil arrived at Boompjes in 1862, and Pakhuismeesteren, a company that traditionally dealt in coffee, stored the new commodity in its warehouse, the East Indies House. Here and in other cities around the world, it rapidly became clear that the highly flammable and harmful substance needed special storage away from burnable structures and the drinking water supply of the city. The traders therefore moved petroleum storage temporarily to Buizengat outside the city, then to the Mallegat port (Figure 26).

Finding a place for petroleum storage was one goal; making sure that it could be transported to and from the port was another, and one that required collaboration among various partners. The construction of water, rail, and road infrastructure at the national scale and the extension of the city borders became key factors in the development of the Rotterdam port, and in turn they facilitated petroleum trade. The opening of the shipping canal, the Nieuwe Waterweg, connected Rotterdam directly to the North Sea in 1872. It improved the competitive position of the city as it facilitated access for the growing number of steamships that transported petroleum. The

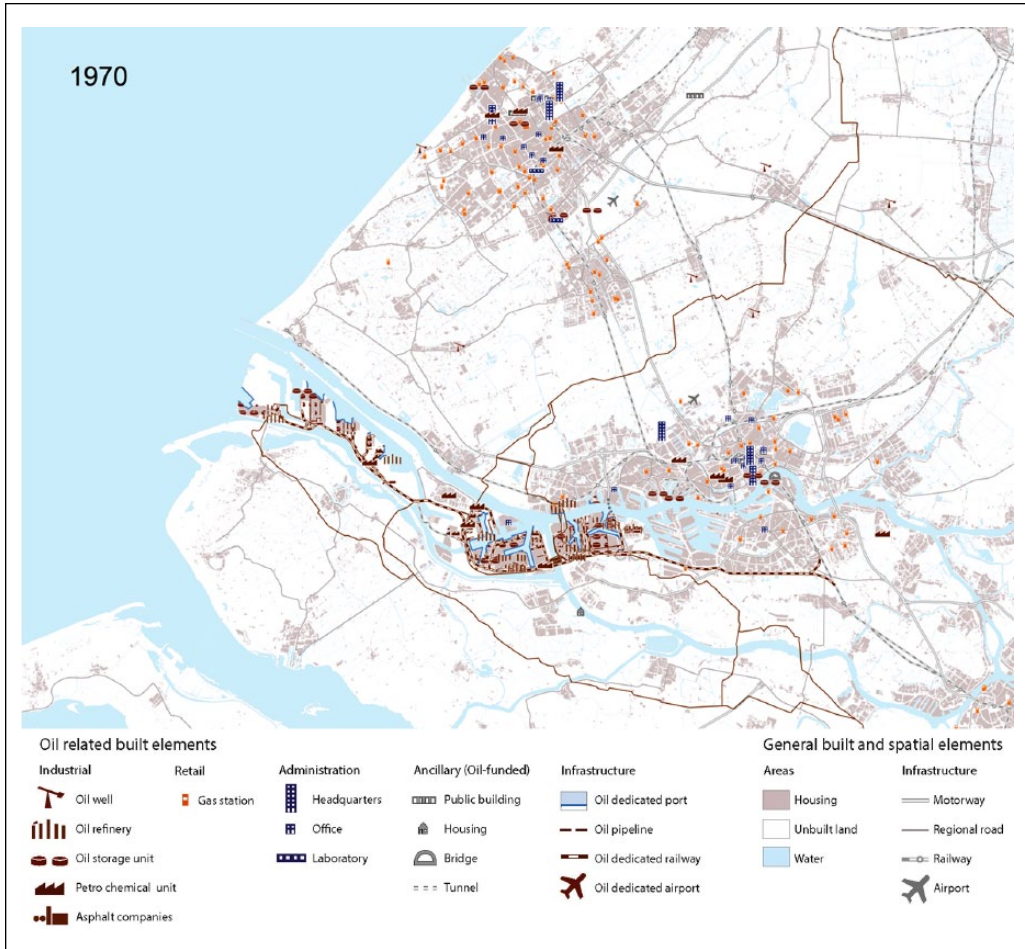


Figure 24. The petroleumscape in Rotterdam/The Hague in 1970.
Source: Carola Hein and Arnoud de Waijer.

construction of railway lines to the border, lines that would also come to serve the oil industry, was a second step. In 1877, the national railway crossed Feijenoord, near the Mallegat storage facility, and Pakhuismeesteren moved its facilities to Sluisjesdijk in the municipality of Charlois. The quick growth of the petroleum trade and the need for dedicated facilities flowed from a close collaboration between elite merchants and the municipality and solidified relationships between them. The economic elite, including the de Monchy family, the owner of Pakhuismeesteren, was closely associated with the city's political forces and drove Rotterdam's annexation of the neighboring municipality of Charlois in 1895, the first center for oil storing and trading, including facilities owned by Pakhuismeesteren.²⁷ The Willemsbrug over the Maas opened in 1878, providing a better link between city and port and also to Belgium and Antwerp.

The construction of new infrastructure and growth of the city created the foundation for Rotterdam's development as an oil node just as new global players in oil entered the European market. At the end of the nineteenth century, these players were interested in Rotterdam port as a turntable and transit point for oil on its way to the rapidly industrializing areas in Western Germany. Standard Oil and other international companies challenged the twenty-three-year monopoly of Pakhuismeesteren and started to compete for land allocation in the Rotterdam

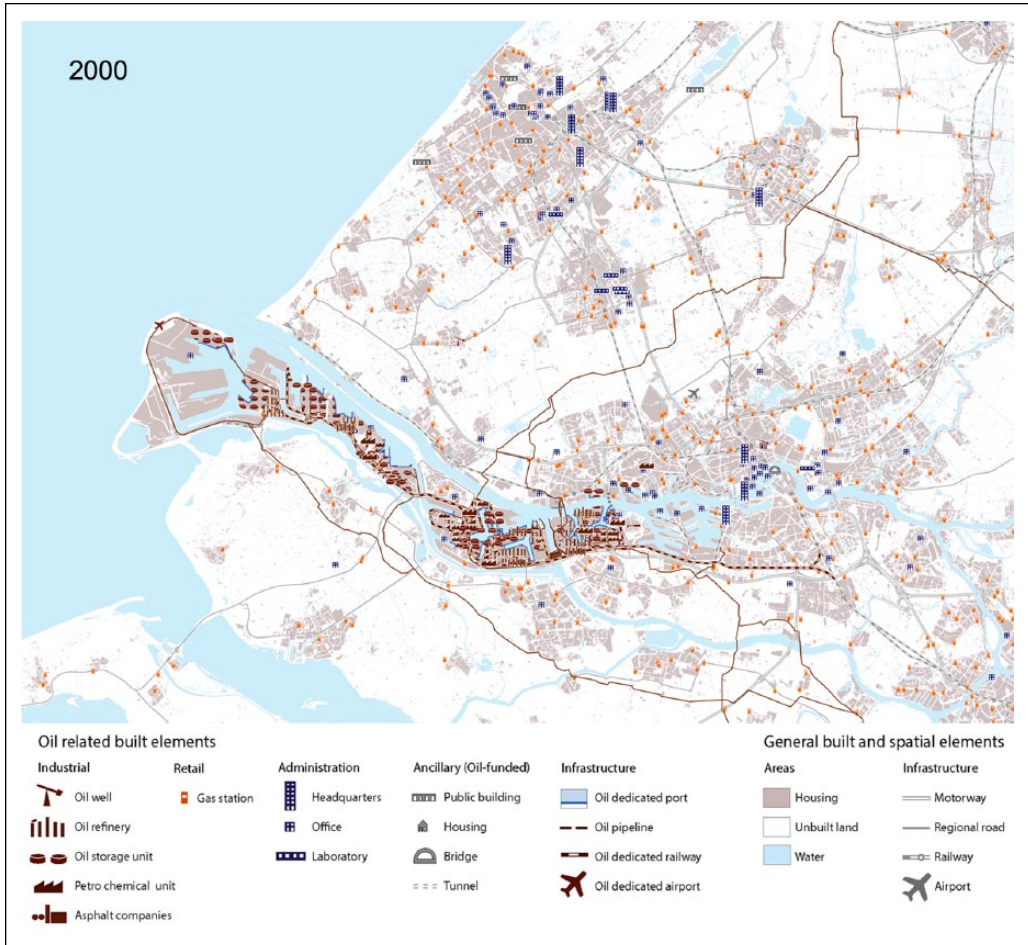


Figure 25. The petroleumscape in Rotterdam/The Hague in 2000.

Source: Carola Hein and Arnoud de Waijer.

petroleum port. By 1891, several major oil companies had settled in the port, and by 1901, the Koninklijke Olie—one of the predecessors of the Royal Dutch Shell—had built there as well. The city on the Maas had emerged as the main Dutch petroleum center, outpacing Amsterdam. The American companies' advances in shipping, transportation, and refinement, as well as the advent of major companies that gained control of the entire production and distribution chain, had extensively reshaped the port and the oil business. Their interests connected various parts of the world through their commodity flows, putting their imprint also on the Randstad.

If demand for lighting oil established Rotterdam as a major oil port, the rapidly growing new demand for benzene as a car fuel triggered its explosive growth. The petroleum site in Pernis, which had stored petroleum since 1887, became the heart of the new development. In 1902, the predecessors of Royal Dutch Shell built a gasoline refinery near Pernis, quickly picking up on the new oil age geared toward cars. In 1907, the company installed a trial distillation facility for petroleum from Borneo, and a trial facility for asphalt followed in 1918. The port expanded westward, and the Waalhaven, which had opened in 1906, would become the main petroleum hub (see Figure 30). To sustain development, oil corporations needed to provide housing for workers, who could not get to the locations easily. The petroleum companies' main interest was earning money, so they built housing, neighborhoods, or cities only when local authorities did not provide the necessary spaces.

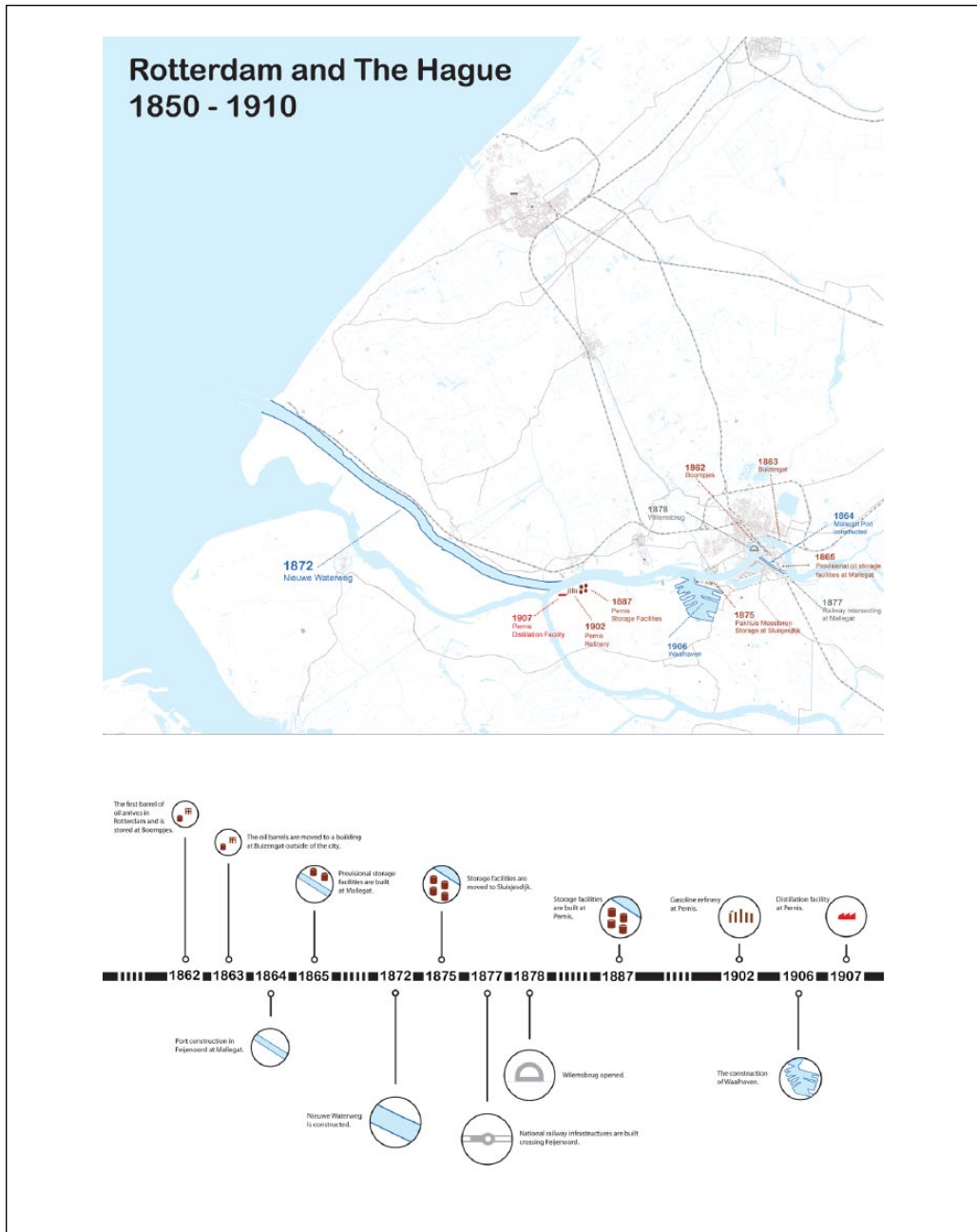


Figure 26. Analytical maps show how petroleum transformed the Rotterdam/The Hague area between 1850 and 1910.

Source: Carola Hein and Arnoud de Waijer.

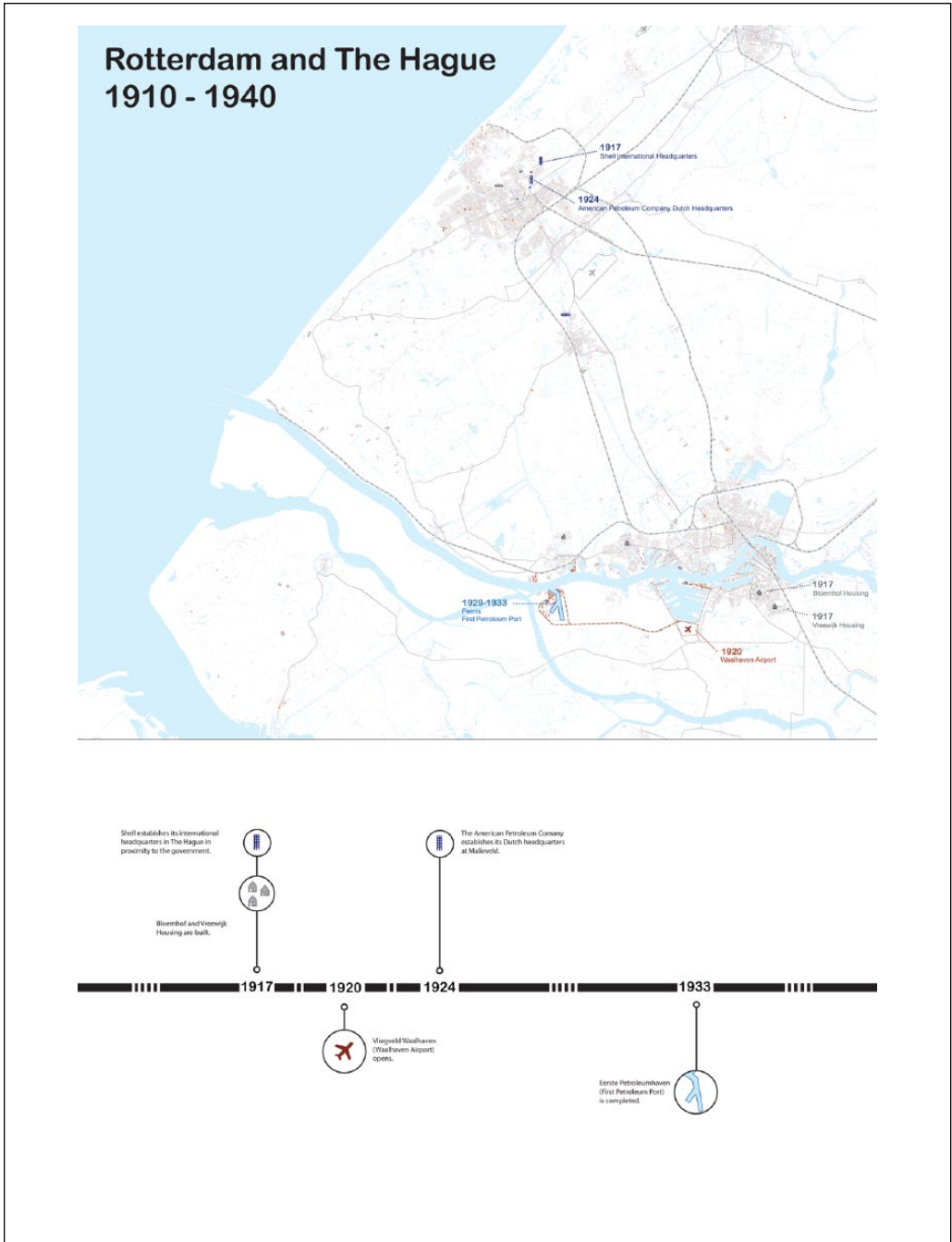


Figure 27. Analytical maps show how petroleum transformed the Rotterdam/The Hague area between 1910 and 1940.

Source: Carola Hein and Arnoud de Waijer.

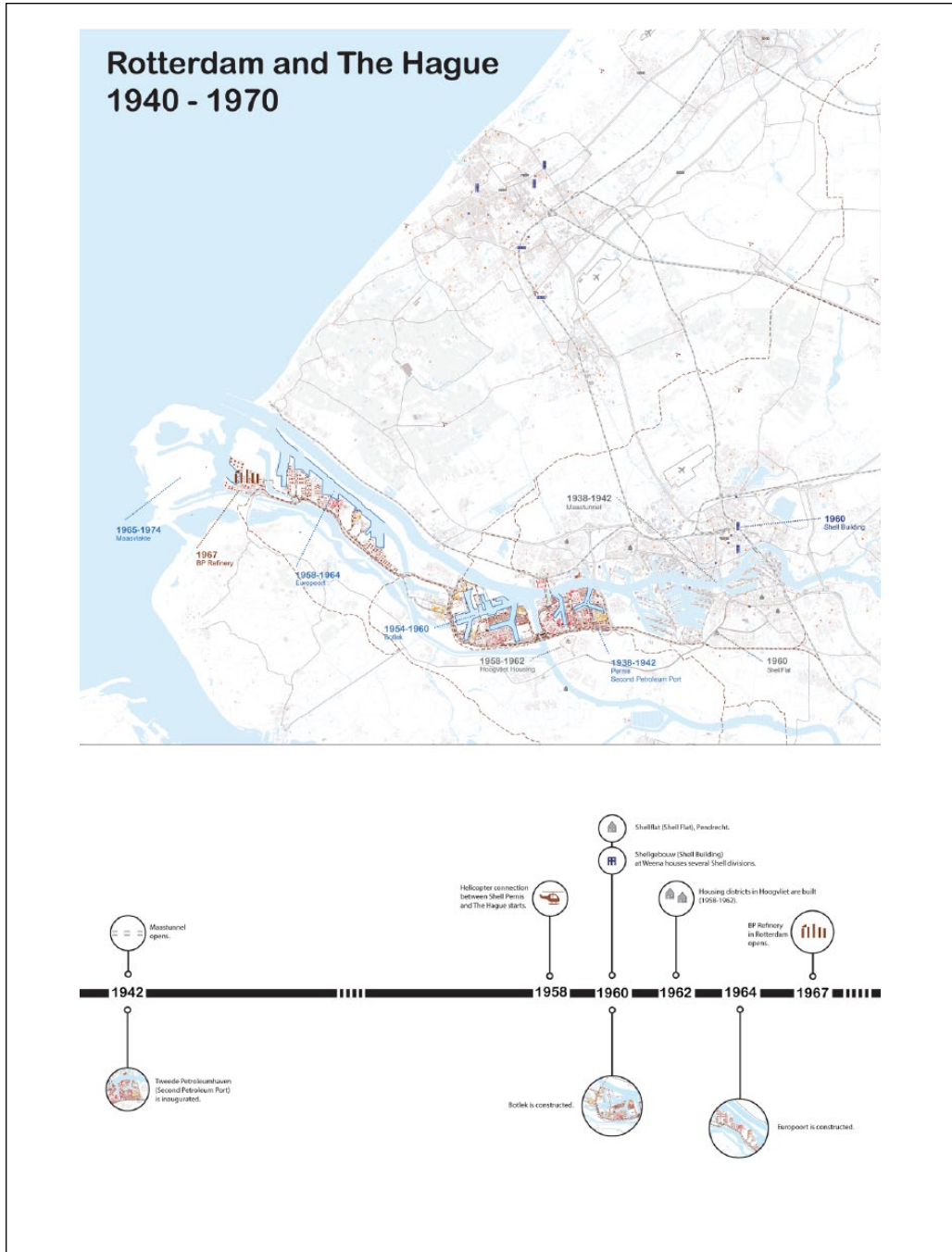


Figure 28. Analytical maps show how petroleum transformed the Rotterdam/The Hague area between 1940 and 1970.

Source: Carola Hein and Arnoud de Waijjer.

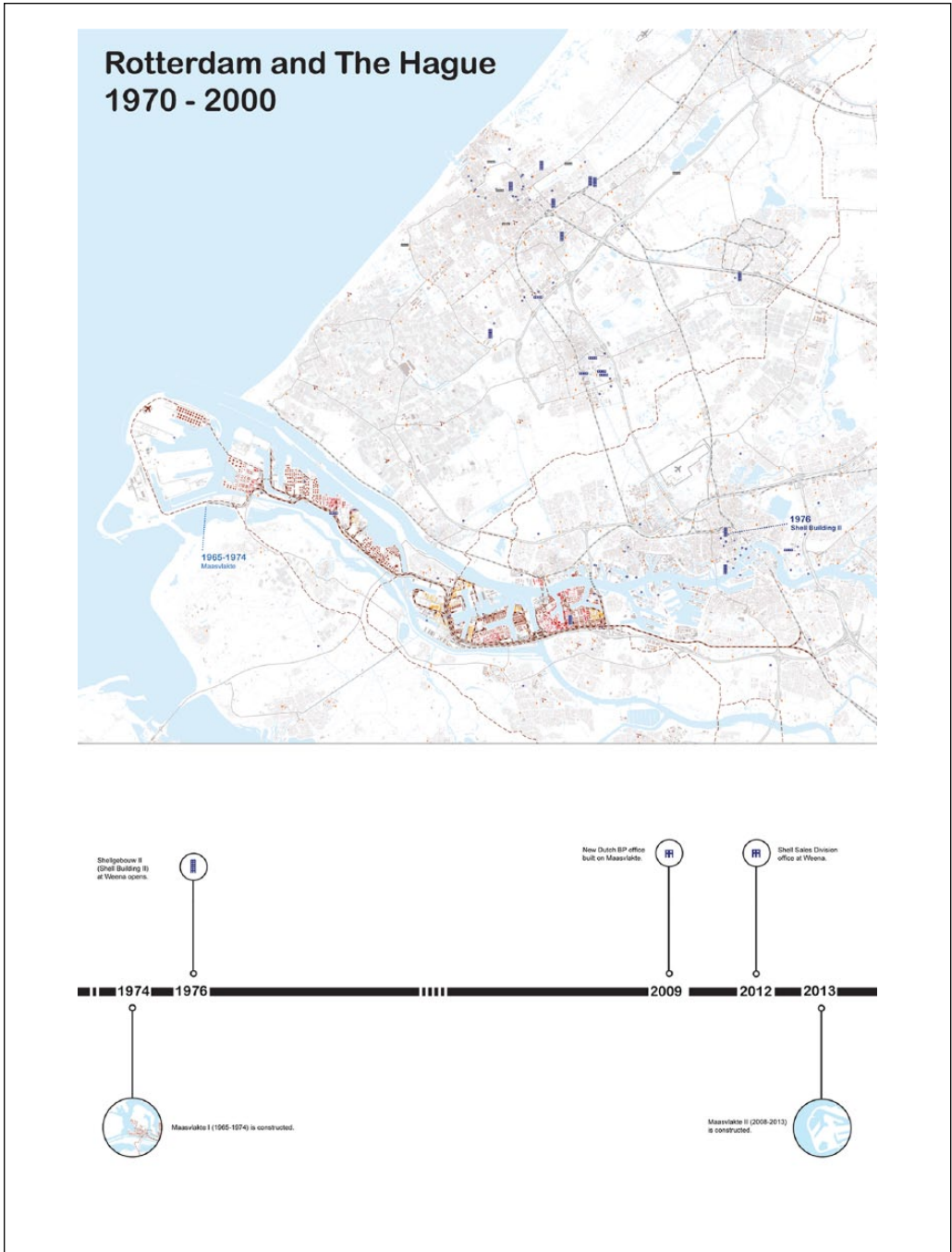


Figure 29. Analytical maps show how petroleum transformed the Rotterdam/The Hague area between 1970 and 2000.
Source: Carola Hein and Arnoud de Waajer.



Figure 30. The contemporary Rotterdam port with oil refineries and storage tanks.
Source: Carola Hein.



Figure 31. The former Exxon headquarter in The Hague nicknamed “The Red Elephant.”
Source: Roel Wijnants.

White-Collar Oil and the Gas Station: Including the Broad Public in Petroleum-Based Discovery of the Landscape: 1910-1940

Petroleum companies selected sites as needed for their own purposes; promoting business and influencing decision makers necessitated a location and buildings different from the ones dedicated to the industry, and retail needed yet other spaces. While the port and transportation infrastructure in Rotterdam were key to the spatial layer of the petroleumscape, proximity to the

national government and its relevant ministries in The Hague, the Dutch capital, drove the settlement patterns of the oil company headquarters (Figures 22 and 27). From there, they oversaw the industry's switch from lighting oil to engine fuel, which led to the creation of a retail landscape of gas stations with new forms and functions. In The Hague, they had close lines to national institutions, including those focused on spatial planning. The choice of The Hague as headquarter location, rather than one of the port cities, initiated the growth of a spatial cluster in which industrial and administrative interests collaborated.

When Royal Dutch merged with the British Shell Transport Company in 1907, the new company constructed headquarters for the *Bataafsche Petroleum Maatschappij* in The Hague (and in London). It finally chose to relocate near the Dutch House of Representatives and the Ministry of Colonies at *Carel van Bylandtlaan 30*.²⁸ The brothers M.A. and J. van Nieukerken, conservative architects (and, like their father, well known for work for the Dutch elite, both the aristocracy and leading merchants), designed the headquarters of Shell in The Hague (1915-1917). Erected on the land of the wealthy *Arendsdorp* family, the structure was big and visible with careful architectural detailing. Shell's competitor, the American Petroleum Company, later Esso, erected its headquarters close to Shell's, with a façade on the *Malieveld* close to the Central Station. Designed in 1919 by the Rotterdam architects *De Roos* and *Overeijnder* and named *Petrolea*, the building was finished in 1924. It features red bricks typical of the Amsterdam School, and a striking sculpture of an elephant designed by *Joop van Lunteren*, which led to the building's nickname: *The Red Elephant*²⁹ (Figure 31). Right next door, the company erected a gas station, a feature that other headquarters, notably Shell headquarters close by, also built.

World War I slowed down petroleum activities in the Netherlands, and the European development of the automobile was slower than in the United States. (In 1907, the first gas station had opened in St. Louis, and mass fabrication of Ford cars starting in 1913 led to a rapidly growing number of users.) But what started as an elite pastime rapidly spread to a larger population group, and the widespread popularity of the car took the petroleum industry to a new level. Oil companies started to develop an integrated distribution system for the new fuel, building a dense network of gas stations in and around the *Randstad*. Meanwhile, the *Nederlandsche Automobiël Club* (NAC), later *Koninklijke* (KNAC), and the *Algemeene Nederlandsche Wielrijders Bond* (ANWB), an association founded in 1883 for bicycle riders, became key players in developing the infrastructure and conditions for driving.³⁰

Unlike other countries, the Netherlands required oil companies to enforce aesthetic guidelines regarding the design of gas stations and thus the public face of oil. Starting in the 1920s, petroleum stations became the sign boards for oil companies. The Dutch opted for a functionalist approach and the architect *Sybold Van Ravesteyn*, architect of numerous buildings of the Dutch railway, was among the first architects to design for this new typology in 1935 when he created a (nonpermanent) pump island with a roof.³¹ This and other buildings celebrated the advent of oil in spectacular architectural ways and inscribed oil into the mindscapes of the general public (Figure 32). The rapid propagation of gas stations in the Netherlands, initially sited every 10 to 20 kilometers along major highways, drew opposition from the citizen organization *Bond Heemschut* in 1939. Its commission on "*De Weg en de Landschap*" (The road and the Landscape) specifically asked provincial leaders to intervene with oil companies to improve the aesthetics of gas stations. They ultimately succeeded: the oil companies decided to invite local architects to design them. As a result, uniquely designed gas stations heralded the main companies' names throughout the *Randstad* and beyond (many at its outskirts). Esso hired the modernist Dutch architect *W. M. Dudok* to produce a gas station prototype; he designed a V-shaped construction sheltering the pump island with a translucent façade underneath. Over one hundred of these stations were built, in three different sizes, but only two survive³² (Figure 33). Mapping of the *Randstad* has shown another important aspect of the Dutch petroleumscape: the location of early gas stations. While petroleum was prevalent in the port of Rotterdam, traditionally a



Figure 32. Sinfina gas station by the Dutch architect Sybold van Ravesteyn in Alphen aan den Rijn.
Source: Collectie Rijksdienst voor het Cultureel Erfgoed, objectnummer 900.838.



Figure 33. The gas station by the internationally recognized Dutch architect Willem Marinus Dudok was relocated from Vinkeveen to the Autotron in 2004.
Source: L. M. Tangel collection, Collectie Rijksdienst voor het Cultureel Erfgoed, objectnummer 521.689.

working-class city, the number of gas stations appears to be highest in the capital city, The Hague, suggesting that the number of car owners was higher in the vicinity of the decision-making places and in proximity to the high-income housing districts.

The multinational setup of companies such as Royal Dutch Shell required close contact between the different headquarters in the Netherlands and the United Kingdom and also had an impact on travel connections. In parallel with the infrastructure created for oil itself, newly emerging aerial connections facilitated the travel of decision makers among different sites and facilities. The Waalhaven Airport in the Rotterdam port next to the oil facilities opened in 1920 and allowed companies to bring in executives from abroad as the oil trade expanded and the first and second dedicated oil ports were inaugurated in Pernis in 1933 and 1942, carrying petroleum to the Shell refinery there.³³ Connection between Rotterdam and the harbor on the south side remained a problem until the construction of the Maastunnel between 1938 and 1942. It provided better access for (among others) the additional workforce required for activities related to the oil industry.

Beyond its headquarters in The Hague, the company had established research facilities in Amsterdam in 1914 and would go on to build a headquarters in Rotterdam during the postwar

reconstruction period. (Shell Laboratorium would hire the architect Arthur Staal to build several structures in Amsterdam-Noord, including the Shell Tower or Overhoeks toren, used by Shell from 1970 until 2009, now a landmark of the city and a national monument.³⁴) The administrative and research facilities were thus in prestigious locations in The Hague, Amsterdam, and Rotterdam. In contrast to the hidden sites of industry, several of the administrative and research buildings are urban icons and well known to locals. Ancillary housing structures for workers are rare as housing is mostly provided by existing cities. The spatial impact of the company is mostly visible in the real estate it owns, but a list of the sites Shell or other companies own does not tell the full story, as the private sector also provides extensive facilities. The petroleum buildings were a small part of the larger urban fabric, but the occupants of these buildings influenced national planning extensively.

Path Dependencies and Feedback Loops: Reasserting the Petroleum Hub of Rotterdam/The Hague after World War II and Promoting Oil-Based Urban Growth and Lifestyles: 1940-1970

Prewar development of oil infrastructures in the port and the capital city had a major impact on the postwar rebuilding of bombed-out Rotterdam, illustrating the importance of and path dependencies of oil. In May 1940, on the eve of the Rotterdam Blitz, The Hague was known as petroleum administration headquarters and Rotterdam was the third largest port of the world, after New York and London³⁵ (Figures 23 and 28). The port city's leading role in petroleum storage and refining made it a target in the Second World War. The German military bombed the storage tanks, and the Allies destroyed the remaining tanks to keep the German enemy from getting their hands on the oil.³⁶ Despite extensive destruction, taking advantage of its existing networks, the port rapidly returned to its leading position after World War II. And the existence of industrial oil structures in the port of Rotterdam was a major factor in establishing a continuity of oil transportation and transformation even as production centers shifted in the postwar era. In the early 1960s, with decolonization in Asia and Africa, most of the oil started coming from the Middle East; America lost its status as primary oil supplier, and oil companies (and their home countries) lost access to oil resources.³⁷ Growing petroleum demand in the postwar period brought new opportunities to Rotterdam, which positioned itself as a major import center, initiating new oil port construction in Botlek (1954-1960), Europoort (1958-1964), and Maasvlakte I (1965-1974).

The postwar growth of the port coincided with the expansion of cities of the Randstad, the development of the Dutch highway network in conjunction with the construction of new gas stations alongside them; the rapid growth of traffic; the increasing number of headquarters and research institutions in The Hague, and in neighboring Delft and Zoetermeer; and the construction of the Shell Tower on Weena in Rotterdam, part of the reconstruction effort (Figures 24 and 29). The First National Highway Plan (Rijkswegenplan, 1927), implemented in the 1960s, provided room for more traffic and did so largely outside the spatial planning system.³⁸

The demands of the oil industry continued to be key to planning and land allocation in the Rotterdam area; several studies document the overlapping interests of Shell and the Rotterdam Port Authority. But when a regional plan for West Brabant, established around 1969, earmarked space for a new Shell refinery in Moerdijk and for future expansion,³⁹ controversy ensued. The site was in clear conflict with national spatial planning policy. The Parliament decided that such "flexibility" should be curtailed by statutory planning decisions and passed a new binding national spatial planning procedure: the national planning key decision (planologische kernbeslissing). The port continued to grow, detaching from the city.⁴⁰ The new highways promoted driving and the spread of gas stations through the country. Regular citizens were inspired by the



Figure 34. Free road maps handed out by diverse petroleum companies at gas stations in the 1950s and 1960s.

Source: Carola Hein.

emerging petroleumscape, as we can see in photos of the so-called “berm tourism” (street side tourism). These photos show Dutch citizens riding in their cars for fun, enjoying a picnic on garden chairs alongside the newly built highways and their cars. The use of petroleum products by large parts of the Dutch people had become an inherent part of everyday lifestyles, strengthening the position of the industry and exemplifying the feedback loop from everyday practice to industrial and governmental desires.

By the 1950s, the consumer had become an important participant in the petroleumscape. Company publicity promoted the use of their products, highlighting freedom of travel and the beauty of historical landscapes. They produced and handed out many promotional documents—maps, brochures, and booklets—that focus on features of the Dutch landscape. Maps can be powerful tools to help users understand space (as shown in the analytical maps made of the Rotterdam port), but they can also create imagined new geographies, and corporations have used them for this purpose for decades.⁴¹ Since the 1930s, oil companies had used free maps to fuel the general public’s desire to explore the Dutch landscape (Shell, 1931; Texaco, 1935). Through the twentieth century, oil companies sold or freely distributed road maps that tied the company name to the experience of driving and visiting. The covers of these maps tie company colors and logos to traditional landscapes, to tourist destinations, to historical, scientific, or cultural explorations.⁴² They show icons of gas stations in a landscape dotted with oversized windmills and traditional Dutch houses with tulips, enticing the user to explore neighboring cities and regions (Figure 34). Tying the oil companies to traditional landscapes rather than the industrial ones that petroleum generates, covers like this also promote the car as a vehicle of freedom and discovery.

Similarly, many of the booklets that companies like Shell gave to company employees focus on traditional and local structures rather than petroleum-related buildings. Many of the maps, artworks, buildings, and toys related to the built environment that global companies produce and often hand out for free serve to establish and maintain the company as a household name, a good example of the feedback loop between spatial transformation and citizen acceptance. Royal



Figure 35. Araun Gordijn's depiction of a Purfina gas station by the Dutch architect Sybold van Ravesteyn.

Source: Araun Gordijn.

Dutch Shell has become a national icon in the Netherlands, similar to the Dutch airline KLM, and this status has further increased its power to transform physical and cultural landscapes through interventions at the governmental level.⁴³

The story told by oil companies about the benefits of an oil-fueled life inspired independent artists in the Netherlands, as they did worldwide. Despite the extensive presence of oil in the ARA, the representation of these facilities by independent artists does not reflect the actual spatial extent of each element. Only a few depict the physical expansion of industrial spaces, showing the Esso facilities in the Rotterdam port, featuring industrial structures, or even documenting the headquarters buildings in The Hague. These artists mostly picked up on isolated aspects of the petroleumscape, particularly the gas station. Paintings by Araun Gordijn depict gas stations such as Shell and Purfina as quaint everyday places (Figure 35). But architects have reacted to the new industrial landscapes of oil, including that of the Randstad, commenting on it in their buildings. They have notably adapted refinery aesthetics; see, for example, Jaap Bakema's Rotterdam public library with its refinery-like appearance (Figure 36).

The presence of the petroleum companies, like other global companies, generated another, ancillary layer of the petroleumscape in demands for housing, schooling, and leisure facilities for their employees. In the Netherlands, where public infrastructure serves the petroleum industry as well as the needs of its employees, private structures are more limited but nonetheless important. In contrast to places like Iran or Daqing where these ancillary structures serve workers who extract oil, here they are for administrative employees and their families. As a global company, Shell pays its professional staff well; the company employs many expatriates, who expect extensive educational facilities and other amenities for themselves and their families. These ancillary activities occupy a small portion of their host cities, but can change the functional and social organization of a city and drive up prices, for example, in the housing sector. Combined with the presence of employees of many other international institutions, the population of oil company employees also supports the large number of international schools in The Hague. These questions merit further exploration, largely beyond the purview of this piece. From a theoretical and analytical point of view, it is important to reflect on these types



Figure 36. The Rotterdam public library by Jaap Bakema, built from 1977 to 1983.
Source: Ollie Palmer.

of spatial effects of oil and their relation to the other layers of the petroleumscape. A change in oil production or oil use will also have a major impact on numerous other urban functions. Changes in the oil flows in the Rotterdam port will affect the housing and schooling situation in Den Haag, for example, a topic that planners will have to address as they face a future with changing connections to oil.

Company publications geared at the general public continued to construct a spatial meaning that is different from the one that they actually build: their focus remains on accessibility of natural, historical, and cultural spaces. The representational petroleumscape constructs space and identity as well as culture in and for spaces far beyond the ones that they actually occupy. For the general public, these publicities constructed a feedback loop that clearly tied the petroleum actors to freedom of driving and the joy of leisure.

Consolidating the Petroleumscape after the Energy Crisis: 1970-2000

The oil crises of the 1970s, when major industrial countries faced oil shortages, could have challenged the prominent role of petroleum actors in shaping the built environment. Car-free Sundays in the Netherlands allowed citizens to reclaim highways. The memory of the public was short, and few long-lasting changes occurred. But by that time, Rotterdam was firmly established as a leading oil port, serving consumers notably in the German hinterland.

Refineries continued to grow. The five refineries in the Rotterdam port have a combined distillation capacity of 58 million tonnes,⁴⁴ illustrating the growth of the industry, the refineries in the Rotterdam port now occupy some 2200 acres; refinery terminals spread over another 1000 acres, and tank storage stretches over some 650 more. But only dedicated mapping (Figures 25 and 29) makes this growth visible.⁴⁵ The production sector is huge in scale (with some 5,300 ha for industrial sites and 1,500 km of pipelines within the port) and its impact on planning decisions is high, but its visibility to the general public in their everyday life is low.⁴⁶ The pipeline network that links Rotterdam with Antwerp (where the big ships can no longer dock and where the petrochemical industry needs petroleum) and with Germany is largely out of sight.⁴⁷ The oil companies share other parts of the infrastructure, such as important rail and highway networks, with general users, who do not easily identify them as part of oil networks either. Recent headquarter buildings, such as the one for BP erected in the port area, feature a green roof and advertise a stated turn toward environmental friendliness.



Figure 37. The A'DAM Tower, formerly the Shell headquarters on the North Side of the IJ in Amsterdam in 2012.

Source: Mojito, https://commons.wikimedia.org/wiki/File:2012-06-02_EYE.jpg.

Oil infrastructure has become part of the area's collective imaginary. Heritage debates in the Netherlands document the ways in which spaces of oil have entered the wider public's imagination. Public and citizen attitudes about the companies, and about the history of oil in the Netherlands more largely, affect debates on the selection of monuments for the historic preservation register, which protects some buildings and structures as official parts of the country's iconic history. Historical oil landscapes, including remnants of industrial drilling such as the oil pump "Ja-knikker" in Schoonebeek, are already included in the register of monuments. Several gas stations from the 1930s are now protected, including the Auto-Palace by B. J. Meerman and J. Van Der Pijll in Nijmegen (1935): a modernist monument on a small mountain, with a circular canopy over a twelve-sided glass enclosed shop that includes a two-story housing and garage section and a 25-meter glass tower (closed in 1977). One of the Dudok gas stations was transported in 1995 from Vinkeveen to a museum in Rosmalen where it was restored, paying homage to the famous architect and his design as well as to an iconic building type of the petroleum century.⁴⁸ But turning such structures into an architect's office or including them in a museum disassociates them from the oil industry. Meanwhile, some headquarters, such as the Shell building in The Hague, are already listed monuments. Others are at least local icons: the Rotterdam Shell Tower, once described as the last erection of capitalism,⁴⁹ is no longer occupied by Shell, but the former headquarters' gas station at the foot of the building remains as a reminder of its former user. The Shell Tower in Amsterdam, the former toren Overhoeks, has been renovated into the A'DAM Tower and celebrated as a novel icon of touristic Amsterdam (Figure 37). As citizens and public decision makers decide which structures count as heritage, they also decide on a narrative of oil modernity, one that is not usually openly debated.

Today, with refinery closures looming in northwestern Europe, scholars of the Clingendael Institute expect that the refineries of the Rotterdam and Antwerp port will be among the last ones standing.⁵⁰ Changes in the refining business will affect ports, cities, and transportation infrastructure, and those entities will have to formulate planning strategies in response. Places where oil is still physically present will require more extensive cleanup and transformation investment than the headquarters and research buildings or the ancillary buildings that are part of the everyday usage. As refineries and storage areas around the world disappear, they will require extensive and specialized cleanup. The long-term environmental challenges and high costs of such a cleanup are evident in places such as Greenpoint in the United States, where some fifty refineries spilled

more than 64,000 m³ of oil and other contaminants into the ground. Designers might start to think of new strategies to combine cleanup of these sites with the new strategies for preservation, recuperation, and redefinition. Even cleaned up, the refineries will be difficult to integrate into their neighboring cities: they will remain valuable to the oil industry due to the extensive specialized networks that they are integrated in and that continue being used, and they are often located in specialized areas of the port that are difficult for ordinary people to access. As part of working ports, their street infrastructure cannot accommodate a large increase of non-port-related traffic. All of this poses problems for meaningful redevelopment. Moreover, any transformation in the oil sector will generate changes in land use, real estate, and social structure in Rotterdam and the ARA region, also requiring advance planning to mitigate their impact.

Conclusion: The Petroleumscape and the Time beyond Oil

This history shows that oil industry, in close collaboration with national governments, has materially not only shaped the port, but the entire Randstad, through headquarter buildings, retail, infrastructure, and ancillary buildings. This collaboration has facilitated everyday life for a large group of citizens, including travel, housing, and leisure. The gas station, as a new typology of retail, has become a hub for citizens of all classes as they fill up their tanks. In some places, the gas stations have even emerged as neighborhood centers, places to get food and other items when nothing else is open, often taking on a third function as restaurant or coffee shop. Throughout the last 150 years, the imaginary created by petroleum companies and nations has engaged the physical spaces of oil when it was opportune for them. These imaginaries have also (and in the Randstad in particular and countries in Europe and North America more often) focused on natural spaces, historical landscapes, and monuments, not on the areas physically connected to oil, therewith creating and reinforcing a feedback loop that supports the positive side of oil in everyday life and thus gets us to consume more oil.

In conclusion, the article proposes that we need to recognize the importance of the built environment and its representation—whether established through petroleum or not—in the construction of power systems. A single but world-encompassing industry has created path dependencies in multiple nations and locations, that is, the long life span of built things perpetuates oil dependency. This industry continues to shape our value systems, imaginaries, and decision making. All of this makes it particularly difficult for societies to overcome oil dependency and promote new energy practices. The first step in reimagining the future is truly seeing the extent of oil's effect on our everyday landscapes and understanding the ways in which collective mindscapes shape the physical environment.

Oil has taken hold of our built environment and corporate and public actors as well as independent artist and citizens who have celebrated it. We argue that citizens and politicians must gain an awareness of the enormous scale of oil's presence and its representation to support new energy values in line with a post-oil society and to create new imaginaries of that post-oil life. Engaging with my ongoing research on the ARA petroleumscape, a young illustrator, Jenna Arts, created two illustrations that characterize the Dutchness of oil, translating Vermeer's milkmaid into an oil maid, and adding a gas station into Vermeer's Little Street of Delft (Figures 38 and 39). These illustrations speak to the extent to which the consumer has become a complicit in the feedback loop of the petroleumscape, and they raise the question, "What would the post-oil equivalent of this maid or of this street look like?"

Research on the petroleumscape also serves to create a foundation for architectural intervention into the problem of ending oil dominance. Urban and architectural design professionals are well positioned to imagine life beyond oil—to imagine alternative energy practices, to transform existing cities, and to design meaningful new urban forms and practices. Dominic Boyer and Imre Szeman argued in a 2014 article, "The Rise of Energy Humanities: Breaking the Impasse,"



Figure 38. Reinterpreting the well-known milkmaid of the Dutch artist Vermeer into an oil mad, Jenna Arts tried to capture the Dutchness of the representational petroleumscape.
Source: Jenna Arts.



Figure 39. To dramatize the impact of oil on historical cities, Jenna Arts added gas stations to Vermeer's famous painting, "The Little Street" in Delft.
Source: Jenna Arts.

for example, that “today’s energy and environmental dilemmas are fundamentally problems of ethics, habits, values, institutions, belief, and power.”⁵¹ They also argue that the failure to imagine new solutions is partly due to a lack of understanding of how oil works in culture and to examine the difficulties we now face in overcoming oil dependency.⁵² Such researchers have pointed to the need for citizens to tell new narratives and to use art and the humanities as a resource for design and planning.⁵³ In the field of architecture and urban form, culture and new narratives accompany recent attempts by architects, planners, and politicians to redevelop the energy landscape underlying our current built environment. Designers, many of whom are eager to promote sustainable architecture, can build upon and go beyond the complex present of the layers of the petroleumscape, particularly if it has been clearly analyzed and presented by historians. How will new energy uses reframe the spatial and representational layers of the petroleumscape? We will have to clean and redevelop polluted areas, redevelop and reimagine former oil sites, preserve oil-age infrastructure (such as highways) as heritage for posterity or repurpose it, and rethink oil-specific architecture like gas stations and company headquarters. At the same time, new energies will require new sustainable spaces that may well form a landscape as ubiquitous, intimate, and ordinary as the petroleumscape.

Thus, knowledge of the impact of oil on the form and function of buildings and cities is of academic and historical interest; it is also relevant to the general public. Through outreach activities besides this article, we aim to create an awareness of visitors of the vastness and complexity of Rotterdam’s petroleumscape, and to inform the general public about the extensive role of oil in our built environment that goes far beyond refineries. Creating awareness of oil’s ubiquitous presence and its importance through time, and reflecting on and imagining new uses for oil-related structures, is one of the current research topics at Delft University of Technology and the goal of an exhibition, building on the author’s research, at Museum Rotterdam. Documenting the petroleumscape of Rotterdam and The Hague, *Oliedam: Rotterdam in het olietijdperk 1862-2016/Oildam: Rotterdam in the oil era 1862-2016* Delft University of Technology, was open from July 18, 2016, to January 15, 2017. Several follow-up exhibitions at TU Delft, the universities of Groningen and Leiden, and a workshop held in May 2017 at on the global petroleumscape have both deepened the conceptual discussions and expanded the geographical scope of the project.

The digital aspects of the exhibition allow citizens to play an active role in historical studies of their own physical and social context. A website (oilscapes.nl) can help scholars and the general public track the history, location, spread, and history of the petroleumscape and their role in the popular imaginary; an augmented reality tool allows citizens to explore the city through their lens of oil as they walk it. Digitization of historical information in a responsive manner empowers citizens with not only views of their own past but also means to enrich these views: for example, they will be able to upload their own images and stories. Researchers and the general public can see these images and analyze them or use them to create alternative tourist tours or narratives. This promotes citizen science and serves as a foundation for critical reflection: it employs storytelling to explain and educate, and helps redefine local identities. Engagement with the public at the Rotterdam site will also help us refine and expand these tools for broader (global) use.

If the represented layer of the petroleumscape influences how people generate a new physical petroleumscape and its buildings and urban forms, then this inclusive approach to oil is fundamental to any rethinking of energy usage and sustainable architecture and to breaking up the feedback loop.⁵⁴ Changing it is perhaps the second step (after understanding history) in creating fossil-free energy landscapes. We also need to generate new imaginaries of fossil-free technologies, images, and practices that allow the general public to embrace these technologies and create new landscapes. Architectural and urban design can help implement such changes, including through studio design at universities (Figure 40). After all, traditional windmills and canals were also originally engineering devices and have now become part of the national imagination and a



Figure 40. In this post-oil imaginary, refineries have become heritage sites.

Source: Olivia Forty and Deniz Üstem in the Architecture and Urbanism Beyond Oil MSc 2 Studio at Delft University of Technology, under the supervision of Carola Hein and Henri van Bennekom, spring 2016.

tourist attraction. Couldn't we achieve the same for new technologies? History, both its writing and its remnants in the built environment, is a powerful tool: we can help shape the future by carefully re-reading and re-presenting the past.

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