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Blankness: The Architectural Void of North Sea Energy Logistics

Nancy Couling and Carola Hein

Introduction

Energy logistics is the management of intangible flows of petroleum, gas, electricity, and of their physical counterparts, such as cables, pipelines and drilling platforms. Since the mid-twentieth century, these systems and structures have been a major determining factor in the spatial configuration of the North Sea region. The structures of energy logistics are invisible – linear, frictionless, automated or buried, and cut off from public access; and omnipresent – vast, ubiquitous, and controlling increasing areas of both land and sea. Operating in the visual background, energy logistics shapes the form and function of the built environment. Its networks have created a framework for landside development and for marine spatial planning, yet the intensification of logistical activity has been accompanied by a paradoxical emptying of its spaces. The ocean's cultural value and social status has been evacuated in the process. This is a central paradox of logistical space: logistics is paramount to global urbanisation, yet the structures it produces are the elephant in the architectural dining room, too large to be ignored and too awkward to be discussed.

In response to the questions posed in this issue of *Footprint* – Have logistics accidentally created subversive architectural conditions despite their inherent anti-architectural tendencies? – we argue that energy logistics forms a series of subversive spaces in critical need of architectural intervention, both in order to expose and to enrich them. We focus on spaces of ocean-borne energy logistics and their landside extensions, which have developed into specialised, impermeable structures of energy extraction, transportation, transformation and storage around the North Sea. The tangible and intangible elements of energy logistics are a huge but largely invisible space. They are a key shaper of ocean urbanisation[1] and they are spatially and financially the most expansive layer of the global petroleumscape.[2] Architectural tools of mapping, analysis, and representation can render this space visible, describe its formal properties and invite public access and debate. In a preliminary step, these tools mediate the human position in the world and both question and clarify complex spatio-cultural relationships. The operators of energy logistics currently present its spatial impact to the public in an overwhelmingly linear, two-dimensional way, but architecture has a responsibility to seek out the full and often hidden dimensions of such mechanisms, including their social and political dimensions. In a second step, architecture can then propose new readings and articulate spatial potential.

Exploring energy logistics' impact on waters and coastlines through the example of the North Sea, this article first shows how this vast, rich, historic space has been transformed into a crowded industrial void. Petroleum has been a main driver of this process. Secondly, it explores the multiple and largely unrecognised ways in which energy logistics has shaped the surface of the sea and the invisible sea-floor, and how together with legal and planning interventions, new unfamiliar structures are rapidly evolving. The third section examines energy logistics as it emerges from the sea and 'solidifies' at landings, and how existing UK port-towns are affected by mutations in the delivery system.

Despite its evasive nature, energy logistics has set up architectural conditions in each of these contexts. In the final section, we approach these conditions through the concept of blankness, as expressed in the writings of the architectural critic Jeffrey Kipnis and the philosopher and politician Roberto Mangabiera Unger. We propose that their ideas have the potential to interpret the conceptual void of energy logistics in a completely fresh manner, demanding new social meanings, political engagement, and architectural visions.

Part I: The emergence of the industrial void

The North Sea and its coastline stand as an example of a saturated space of logistics that is widely viewed by the public as a void. This paradoxical spatial condition has been gradually constructed by corporations and governments over several centuries, with an acceleration of the process due to industrialisation, low prices and availability after the Second World War. The diverse temporalities and fluctuating fortunes of energy logistics are illustrated in particular by the development of refineries in ports around the North Sea and the emergence of offshore extraction.[3]

In his comprehensive study of ocean space across historical phases and societies, Phil Steinberg discusses the evolution of a modern western idealisation of the ocean surface as a 'great void'.[4] Maritime cartography up to the sixteenth century had incorporated narrative features, expressing both real and imagined experiences at sea, but by the seventeenth century, the sea (as mapped by Dutch cartographer Frederik de Wit, for example) had become largely empty. [Fig. 1] Then eighteenth-century early industrial capitalism, rooted in landed place, conceptualised the ocean as non-developable void.[5] This transformation of the map reflects the growth of European sea-powers and their view of the sea as a place to exert and consolidate their political and economic strength. This did not mean territorial domination of the seas; rather, the mercantilist states, in particular the Netherlands and the United Kingdom, aimed to defend the unhindered sea-borne trade on which their economies were based.

The ocean void served nations and growing corporations at the time of industrialisation and changing energy consumption patterns. It was also a time when land masses were more and more settled and scrutinised. The use of petroleum first as lighting oil and then as engine fuel at the end of the nineteenth and in the early twentieth century encouraged investors to scale up industrial petroleum drilling and processing, creating a need to connect areas of production and consumption around the globe. Shipping was the cheapest solution for transportation from sites of production to sites of consumption. The perceived emptiness of the ocean disguised the rapid growth of petroleum shipping, first from the United States and later from around the world to the ports of the North Sea.

Scholars have recognised a correspondence between a nation's energy consumption and its material prosperity – since the use of coal to transform production methods in the industrial revolution in eighteenth-century Great Britain, energy consumption has continuously increased and living standards for the larger public have improved.[6] This tendency has led to the transformation of ocean space, coastlines, ports and cities through increased shipping of oil, logistical development and offshore energy production. In the early years, ports had been sites for importing, storing, and redistributing refined oil. Greater control over the process of production by the oil industry led to

Fig. 1

Fig. 2

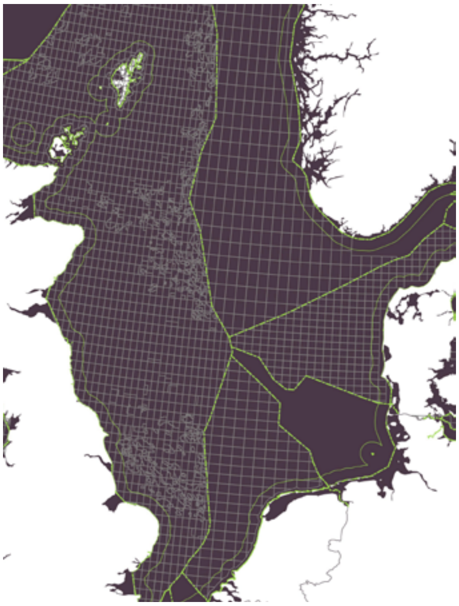

Fig. 3

Fig. 1: Olaus Magnus, Carta Marina 1949, full colour facsimile of the original 1539 edition. Source: Wikimedia Commons.

Fig. 2: Energy logistics, North Sea, December 2017. Source: www.havbase.no.

Fig. 3: National petroleum extraction grids, North Sea. Source: Nancy Couling.

also locating refineries at these port sites – a key element in petroleum logistics. Refining near places of consumption allowed corporate or public refinery owners to buy foreign crude oil from various locations, and to refine it into the necessary products near the places where they would be used.[7] Once set up, refineries and their supporting infrastructure are hard to move and remain as fixed ensembles despite the otherwise flexible pathways of oil flows. Thus, even as petroleum structures disappear, age, or fail, this configuration has its own rules that shape our future.

Meanwhile, the ocean itself is not only home to a temporary layer of petroleum shipping, it has also long hosted the long-term physical structures of extraction. In 1949, after Soviet engineers discovered offshore oil in commercial quantities, they built the Neft Daşları settlement, an extensive network of drilling platforms, housing, and leisure structures, around a hundred kilometres from Baku and fifty kilometres offshore. This 'town' heralded a new era of ocean urbanisation through oil. Twenty years later, the discovery of the Norwegian North Sea field of Ekofisk (1969) by Phillips, an American oil company, brought the topographic and geological properties of the northern European continental shelf sharply into focus for national and corporate petroleum companies, inciting them to drill in deeper and rougher waters. The last fifty years have seen vast spatial transformations related to energy logistics both on- and offshore, and a new unfamiliar logistical architecture in the offshore energy sector has begun to emerge. The North Sea is now one of the most industrialised seas in the world.[8]

Oil has a ubiquitous, pervasive presence within our society. The oil industry has inserted physical artefacts into ocean space that are small in comparison to the vast scale of the sea itself, but their presence is underpinned by rigid ordering systems of territorial dimensions.[9] These systems have been set up through legal devices, engineering, and world market logistics rather than integrated political/democratic planning processes. A variety of shields guard the border between the public and logistics spaces. Individuals require specialist knowledge, skills, and security clearances to enter these realms. For the public at large, who do not have passkeys, the ocean takes on an abstract, remote status that is home to select, highly specialised technical interventions.[10] If a commodity is kept at a distance and its materiality negated, its cultural dimension becomes equally challenging to excavate. The public imagination is steered by national and corporate advertisement campaigns. Hein's research, among others, unravels the representative imagery that cloaks the black and viscous oil and names the parties who dominate the production of oil narratives. Governments have issued celebratory visuals of oil infrastructure on official documents such as stamps and banknotes whereas corporations glorify the positive impact of petroleum through advertising, information booklets, and even art.[11] This is a dangerous fiction and at the same time a sleight of hand, since corporations and nations control the spaces of oil and gas in secrecy and concealment, making it extremely difficult to *site* as well as *sight*.[12]

The oil and gas industry is a multinational giant without a face, both ostensibly liberated from and inextricably implicated in state operations. Energy companies with identifiable leaders, such as John D. Rockefeller (the founder of Standard Oil) or Pakhuismeesteren (the local company that first stored oil in the port of Rotterdam), have evolved into a set of corporations with anonymous leadership, which is reflected in the industry's logistical spaces. Constantly 'swapping assets' and reconfiguring ownership constellations, the industry is also made up of numerous operators delivering specific services and has therefore mostly been able to avoid public liability. The largest oil spill in the history of the offshore industry, the 2010 Deepwater

Horizon disaster in the Gulf of Mexico, is a tragic illustration of this point.[13] Given the previously mentioned relationship between energy consumption and material prosperity, it comes as no surprise that the objectives of this industry resonate with neo-liberal practice in business and politics more generally, even though the UN led countries into the 2015 Paris Agreement over CO_2 emissions.

Journalists report a particularly contradictory relationship between the UK government's commitment to renewables and the important revenues gained from the oil and gas industry.[14] The US president has acted more directly and announced his withdrawal from the agreement in 2018 to support the country's oil industry.

The dominant presence of multinational energy corporations in ocean space has resulted in the erasure of a common non-industrial (non-oil-based) concept of the sea. We argue that the homogeneous, infinitely extendable extraction grid of the North Sea, created by nations under pressure from corporations, exemplifies Henri Lefebvre's notion of abstract space.[15] Lefebvre makes it clear that the state, having gained its sovereignty through latent or overt violence, goes about accumulating wealth and land, imposing administrative divisions, and 'aggressing nature' according to the rationality of accumulation.[16] He argues that the political principle of unification (of legislation, culture, knowledge, and education) is imperative to this project, without which it cannot be realised. National interventions work hand in hand with the demands of global corporations in the field of energy logistics. The establishment of 'unified' exploration legislation in the North Sea as discussed in Part II of this article, is a clear example. This principle of unification explains the simultaneously abstract and concrete character of the state's institutional space. Passing for absence, abstract space in fact conceals the presence of operational procedures and their results, and it is intrinsically violent.[17] The half-century of hydrocarbon extraction hinders any attempts to question petroleum narratives and practices.

Part II: North Sea energy logistics

Energy logistics dominates the space of the North Sea at the territorial scale, yet the material traces of this sector have been hard to decipher and pin down. The North Sea has historically formed the central logistical space of a highly active trading realm, which extended east to the Baltic Sea and the central European river system, west across the Atlantic and south to the Mediterranean. Traditionally a trading ground for the exchange of furs, grain, timber, and luxury goods, today the North Sea is characterised by the generation and exchange of energy – an indispensable, shapeshifting, and often invisible commodity.

The North Sea measures around six hundred kilometres at its widest part, a distance that the Vikings easily crossed in four to five days.[18] Frequent exchange across the sea meant coasts had more in common with their opposite shores than with their hinterlands. After the departure of the Romans around the first century AD, control of trade around the North Sea changed hands several times over the centuries, beginning with the Frisians (first to eighth century), followed by the Vikings (eighth to tenth century), and subsequently the Hanseatic League (eleventh to fourteenth century). All of these groups were highly skilled navigators who knew the seasons and the North Sea tides and currents; their logistical space was a kinetic, topographical zone filled with human activity and the narratives of first-hand experience. The Vikings did not use maps, but instead communicated navigational information through the spoken word. Before road- and rail networks, sea-crossings connecting to coastal and inland waterways comprised the major logistical space of northern Europe.[19]

Since the mid-twentieth century, North Sea oil and gas production has made a vital contribution to global energy supplies, occupying second place in combined offshore oil/gas quantities in 2006 after the Persian Gulf.[20] It is still the location of the most offshore rigs world-wide with a count of 184 in 2018.[21] The 185 million people living in the highly industrialised northern European countries of the North Sea watershed also consume the highest proportion of northern European energy. Yet despite North Sea oil and gas production, the EU as a whole is marked by a significant energy gap between supply and demand and is still 80 percent dependent on oil imports.[22] Energy logistics therefore not only laces through and around the North Sea extraction sites, but also carry out the functions of transport, storage, and relocation of oil and gas from external sources. The sea-surface and floor comprise the double ‘motherboard’ of northern European energy transactions.[23]

Energy logistics appears on the surface of the sea as a fleeting, yet continuous stream of shipping, which is becoming increasingly consolidated through electronic systems and dedicated deep-water routes. According to EU port statistics, liquid bulk goods headed the list of cargo handled by type at 38 percent in 2015, followed by dry bulk goods at 23 percent and containerised goods at 21 percent.[24] In Europe’s top port of Rotterdam, crude oil, mineral oil products and liquified natural gas accounted for 40 percent of port throughput by weight in 2017, therefore more tons of liquid bulk goods travel through North Sea ports than containers.[25] Offshore shipping cargos, volumes, and frequencies are spatially elusive. The map in figure 2 translates data transmitted from the Automatic Identification System for the one-month period of December 2017 into a spatial format, rendering shipping pathways for the energy industry visible across the entire North Sea.[26] In addition to oil and gas tankers, the map also shows the routes of service vessels to and from offshore fields, revealing the North Sea’s central seam dividing the Norwegian and UK Exclusive Economic Zones.

Not only a petroleum-based energy landscape, the North Sea is also coveted by the post-oil energy industry. Under current international objectives to reduce CO_2 emissions, formalised in the 2015 United Nations Paris Agreement, the North Sea has been earmarked by the EU as a favourable site for the rapid expansion of offshore wind-energy production.[27] Augmenting existing energy logistics, this sector’s activities create additional logistical networks of component production (turbines, blades, transformers, monopoles, cables, foundations), assembly, servicing, and delivery routes. These uses compete for space with food production, transportation, military activities, sand and gravel extraction, fish and bird sanctuaries, and other protected natural areas. Intensification of all activities has resulted in spatial competition. In response, the EU now requires all littoral nations to produce Maritime Spatial Plans by 31 March 2021.[28] Originally a UNESCO initiative to improve cross-sector coordination of multiple maritime uses,[29] Marine Spatial Planning has since developed into a specialised discipline, for which educational institutions have set up courses and qualifications.[30] The North Sea has become a crowded and contested realm. Through these plans, the space of energy logistics clearly emerges in its full force. [Fig. 4]

The steady, periodic sea-surface of shipping is mirrored on the seafloor by an invisible template of cables and pipelines. As a liquid medium for systems of flow and exchange, the ocean itself is an environment of minimal friction, ease of transfer, and minimal boundaries. Here, legal structures are less solid than on land, where ownership principles have long legacies. Outside the twelve nautical mile territorial boundary, which in economic terms directly translates into tax advantages, the sea is

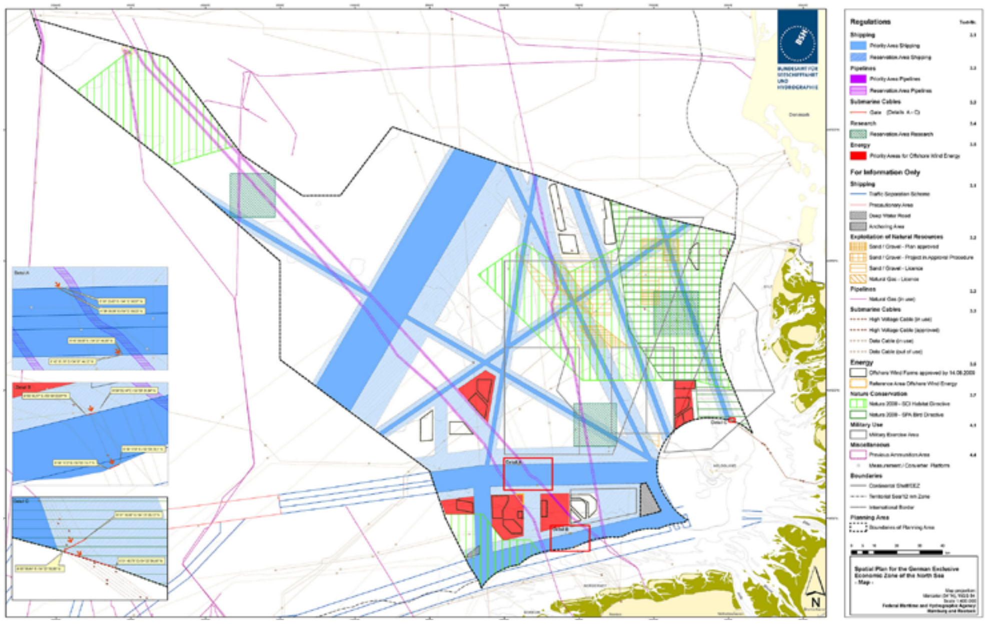

Fig. 4

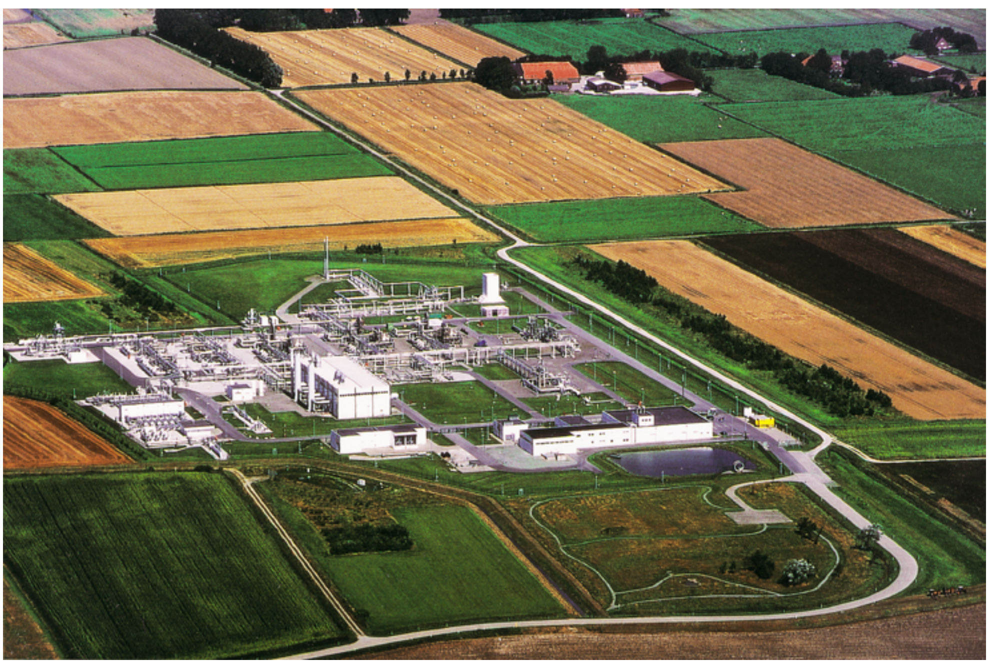

Fig. 5

Fig. 4: Spatial plan for the German North Sea, 2009. Source: BSH.

Fig. 5: Europipe I & II receiving terminal in Dornum in Northern Germany. Source: Statoil.

thus an ambiguous space.[31] The political neutrality of this space, its extra-territorial status endorsed by international law, and the relative technical ease of offshore operations, make subsea pipelines more attractive than overland options: 'Offshore lines minimise issues of land ownership and concerns of political instability.'[32] According to the UN Convention on the Law of the Sea, all states are entitled to lay or maintain cables and pipelines on the continental shelf, and coastal states cannot impede such activities.[33] This complex web of infrastructure supports offshore extraction sites. Oil and gas pipelines of differing sizes connect satellite platforms to each other as well as to the main facility on land, while fluids and 'umbilicals' – a combined string of steel pipes – deliver further fluids, controls, power, and communication from the land side. This ubiquitous, invisible underwater infrastructure will remain in place even when it is no longer used – unlike installations, according to decommissioning law pipelines are not subject to a legal requirement of disposal after use.[34] Some environmentalists argue that removing this infrastructure can often be more harmful to the marine habitat than leaving it in place. They therefore remain attached to the North Sea floor as permanent fixtures, unseen from above and evolving into new cyber seascapes as they are taken over by marine life. This logistic nervous system is threaded through the seafloor's very composite matter.

Above and beyond energy's physical infrastructure, the case of the North Sea demonstrates the expansive, rigid, invisible ordering systems within which offshore operations are embedded; a system that was swiftly established in response to the needs of the oil industry. The basis for offshore legislation was established at the second UN Convention on the Law of the Sea in Geneva in 1958, the UN response to heightened maritime territorial conflicts after the Second World War, in particular in relation to offshore oil and gas resources.[35] Following significant onshore gas finds in Groningen (the Netherlands) in 1959, the petroleum industry pressured the UK and Norwegian governments to proceed with national legislation on sovereignty over the seabed and natural resources, eager to explore the hydrocarbon potential of the continental shelf. In March 1965, the Norwegian and UK governments jointly agreed to divide the North Sea into quadrants according to the median line principle of one degree latitude by one degree longitude. On the Norwegian continental shelf, quadrants were then subdivided into twelve blocks of 15' latitude x 20' longitude, corresponding to about 10x25km, whereas the UK subdivision contained thirty smaller blocks. This continuous extraction grid formalised the offshore petroleumscape. It has become the state's framework for issuing licenses to exploration companies anywhere on the continental shelf. [Fig. 3]

International legislation further refined the occupation of the seas in the third UN Convention on the Law of the Sea of 1982, which established a 200-nautical mile offshore Exclusive Economic Zone for all coastal nations – a radical new spatial feature of unprecedented global proportions that consumes around 36 percent of the world oceans.[36] Planning activity was then unleashed as coastal nations began to organise this new offshore territory. Germany was the first European nation to produce legislative spatial plans for their part of the North and Baltic Seas in 2009, within which securing and strengthening safe and unimpeded shipping routes was a national priority. The plan's shipping corridors created large residual fields for wind-energy development – Germany's second economic priority. The dominance of logistical space in Maritime Spatial Planning is most vividly demonstrated in this plan. [Fig. 4]

Part III: The architecture of energy logistics

The transfer of energy from land to sea produces new interfaces and global geographies. We discuss the architectural results of this transfer through two instances: landings and mutations. At landings, the infrastructure of energy logistics is inserted into landscapes outside of established towns, whereas mutations refers to the effects of energy logistics as it interacts with established urban areas, in particular ports. Energy logistics sustains and promotes movement, but at nodal sites of system transfer, more complicated processes take place and linear modules multiply and expand into industrial-scale plants that occupy large sites. Here, as Rania Ghosn argues, 'Energy needs space'.[37] Refineries, storage tanks, port facilities, and pipeline landings transform regional landscapes in ways that are foreign to established patterns of local settlement, in particular persistently avoiding the emergence of architectural form.

According to network theory, the spatial aspects of network behaviour are irrelevant to a system, which is based on the vertex and the edge – a path connecting vertices.[38] Notions of distance, density, and connectivity are mathematically defined according to the characteristics of these two elements. The urban planner and theorist Gabriel Dupuy named the three main criteria characterising modern urban networks: topological, kinetic and adaptive.[39] Networks direct energy logistics, which means that specific spatial phenomena result from the connections to established urban tissue. The shifting patterns of energy transfer are evident in the post-World War II transformation of coastlines and ports around the North Sea. Here, results of the restless mutations of neo-liberal seaborne logistics have produced different versions of architectural stagnation and blankness. Developers have exploited the spatial and legislative freedom of the vast unimpeded realm of the sea and expanded offshore energy logistics without coordinated planning. However, in order to distribute energy to user populations, they must negotiate the land-sea interface. This requires the convergence of cables and pipelines into restricted corridors. Energy logistics then emerges from the sea in visible form at unspectacular landings on sparsely populated sites – next to camping grounds on the East Yorkshire coast (UK), for example, or on the moors of Ostfriesland (Germany).

Landings inhabit morphological landscapes, but deny the architectural opportunity afforded by their volume, function, placement, and human dimension. Europipes I and II deliver gas from the Norwegian part of the North Sea, Europipe I in a direct line from the Draupner E riser platform, to within five kilometres of the German coastline.[40] From there they take a specialised pathway determined by the highly valuable and protected Wadden Sea ecosystem, which is listed under UNESCO World Heritage classification. The pipeline is steered through a tunnel lying seven to eight metres under the seabed to reach dry ground behind the dykes and arriving at the Europipe Receiving Facility (ERF) terminal just outside Dornum – a village with a population of around 4,600. At the receiving facility, the gas is measured and adjusted for transfer into the European onshore network involving preliminary filtering, pressure reduction, and reheating, since the gas has lost heat through the offshore segment. Thus such landings constitute a major planning exercise; the facility covers a site of eight hectares and includes a range of building types, which are however designed so as not to be there; 'In order to minimize the visual impact, a maritime design was implemented in the architecture of the ERF and some vegetation planting in the surrounding had been carried out.'[41] The project is architecturally mute, avoids contact with the adjacent town, is secured, and specialised. The 'designers' have not exploited the potential of expressing the ongoing material processes or the importance of this connection to European energy networks through architectural means. [Fig. 5]

It is deep in the earth where energy such as gas fills out a pre-defined form. The major European gas connections trace peripheral rings around main cities, converging at sites of storage. These patterns of circulation still remain perfectly concealed and operate just outside established patterns of human settlement. But it is these locations that express our deep geological relationship to oil and gas. The cavern site Etzel in North Germany offers storage capacity for oil and gas within excavated salt formations over one thousand metres underground extending four kilometres vertically and twelve by five kilometres horizontally. Caverns accessed by boreholes are solution mined of the salt in vertical volumes ranging between about 250,000 and 700,000 cubic metres. A total of seventy-five caverns can hold forty-six million cubic metres of oil and gas with additional expansion potential in reserve. Initiated with thirty-three caverns in 1971 under the new government oil storage strategy as a response to unstable supplies and the oil crises, the site then slowly increased its gas storage capacity to forty-one caverns as the Europipe I and II came online in 1995 and 1999, respectively. The scale and shape of the total Etzel salt formation is indiscernible from above. Embedded in hollowed-out shapes resembling dormant, suspended cocoons, here energy momentarily escapes its logistic circuit to rest close to its own place of origin. [Fig. 6] Although unseen, in order to translate and communicate this immense geological scale to the public, architectural drawing and rendering techniques are used. It is through these drawings that potential channels of spatial understanding regarding the spaces of energy logistics, are offered.

The twin UK Humber estuary ports Grimsby and Immingham illustrate the types of *mutations* produced by networked energy systems as they interact with local urban conditions. A third port, Hartlepool, is an example of an unusual recovery strategy within mutating cycles of energy logistics. Until 1945 the UK had been mainly fuelled by coal, mined in the coal belts of central England, Wales, and Scotland and transported by rail to industrial towns and ports throughout the country. Grimsby's history exemplifies the restless changes in the energy industries, the pressure on ports for adaptive responses, and above all the ensuing trail of social and urban degradation. Grimsby was an important trading port across the North and Baltic Seas in cotton, salt, iron and agricultural machinery, and particularly in coal and timber.[42] Coal mined in the south Yorkshire coalfields was taken to Grimsby for short-sea shipment around the coasts to national destinations. After 1945, the increase in energy consumption combined with decreasing domestic coal production meant that British coastal ports imported coal to fuel their power stations.

To meet the increasing energy demand, the port of Grimsby was bypassed in favour of its neighbour, Immingham, and instead experienced a dramatic rise and fall in prosperity through the fishing industry. Between 1970 and 2013 the number of trawlers based in the port dropped from four hundred to five. Grimsby post-war housing estates were gripped by massive unemployment, making them the second most deprived in the UK. But the legacy of Grimsby's past wealth is still visible in the historic buildings of the fish docks, such as the Grimsby Ice Factory, and the Kasbah – a quarter of historic shops, smokehouses, and cafes, characteristic of the fishing industry's high period between the late nineteenth and early twentieth century – which is now nearly deserted and barely generating revenue. The Kasbah is currently a managerial question-mark for owners Associated British Ports – a blank with potential. In the port, the berths vacated by trawlers are slowly being replaced by new vessels employed in service of the expanding North Sea offshore wind industry.

Ahistorical, no-name ports offer advantages to energy logistics over ports with established towns. Around thirteen kilometres along the estuary from Grimsby, Immingham is only a small town, but it is the UK's first port in terms of tonnage and second in terms of value. A totally artificial construct, it was built by the Humber Commercial Railway and Dock

Company in 1906–12 primarily for the export of coal. The new Humber location was an alternative to extending the Grimsby port due to its naturally deep navigable channel, but before the construction of the railway and docks, Immingham was a village with a population of less than three hundred so labour for the developing docks came from Grimsby.[43] Port facilities here expanded after World War II with an oil terminal (1969), a bulk terminal for coal export and iron ore import (1970), a gas jetty for LPG import (1985), an international terminal for bulk cargo including coal (2000), and most recently the Renewable Fuels Terminal, which supplies imported wood pellets to Drax – the combined bio and coal power-station with the UK's highest generating capacity. These expansions occurred after mechanisation of port systems, therefore required limited additional labour. The Port of Immingham holds 28 percent of the UK's refining capacity, but its diversification across the energy spectrum demonstrates the level of port adaptability demanded by central nodes in the logistic system of UK energy delivery. It is an example of the type of port that is able to meet such requirements precisely because it is detached and anonymous – a port without a town.

Recent developments at Hartlepool reveal this UK port to be both a mutating site and a new type of landing. Hartlepool has a legacy of maritime industries suffering from economic decline. The thriving shipbuilding and steelwork industries experienced setbacks after heavy bombing in the Second World War. Subsequent de-industrialisation and the closure of the British Steel Corporation in 1977 contributed to the highest levels of unemployment in the UK at the time. Today a new generation of energy logistics is delivering a major commodity to Hartlepool and other specially equipped ports. These are severed topsides of decommissioned rigs. Topsides are literally the part of the rig above the waterline, functioning like petroleum factories with production facilities and accommodation, in this case for 160 people. On 2 May 2017, the topside from Brent Delta, a Shell-operated field in the northern North Sea, arrived at the northern UK port of Hartlepool for dismantling and resale as scrap metal by British company Able UK. [Fig.]

Landings for the logistical giants of such topsides are also highly specialised sites with heavily reinforced docks to handle the weight. Together, the ports of Grimsby, Immingham and Hartlepool demonstrate how cycles of specialisation, resource exploitation, decline and redefinition determine the network of energy logistics, steering its search for optimal routes and nodes. An estimated 1200 wells are to be plugged and abandoned and their structures removed from the North Sea in the foreseeable future, making decommissioning an important economic sector and a initiating a new chapter in the history of North Sea oil.[44]

Conclusion: the possibilities of blankness

The space of energy logistics across seas and coastlines is continually reorganised by nations and corporations in what Harvey and Brenner discuss as a process of 'creative destruction'.[45] This process produces differential, uneven spatial development in ongoing sequences that can destabilise established urban formats. Therefore, energy logistics plays a vital role in the shaping of the built environment both on land and at sea – a role in urgent need of recognition by professionals. Architects, engineers, logistic planners and lawyers must take on expanded and intersecting roles in order to find new forms and expressions for this century's spatial challenges, in particular across the land-sea interface. We urge for architectural interventions that critically reflect on questions of access and visibility, develop new typologies and programmatic overlays, and find architectural expression for the intersection of natural and cultural ecosystems generated by energy logistics.

In particular, infrastructural systems utilised by energy logistics have an important public dimension.

Fig. 6: Visualisation of storage caverns Etzel. Source: Storage Etzel GmbH.

Fig. 7

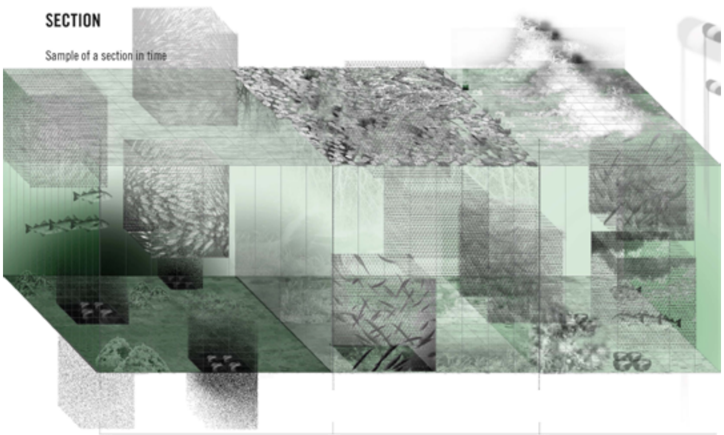

Fig. 8

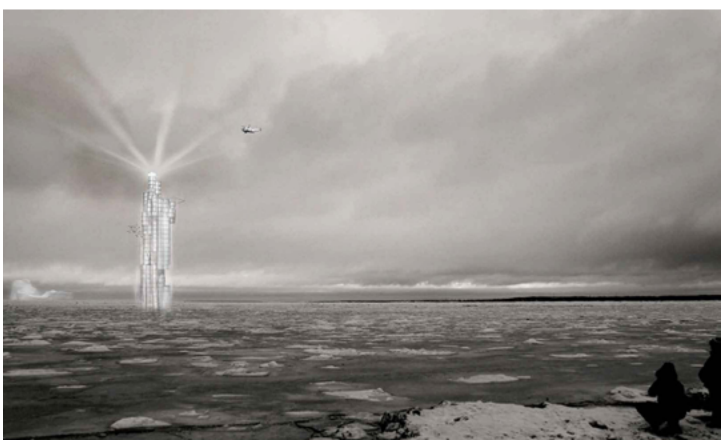

Fig. 9

Fig. 7: Brent Delta topside at Able Seaton Port, Hartlepool, UK. Source: Able UK.

Fig. 8: Section: Barents Sea water-masses in flux. Source: Laba, EPFL.

Fig. 9: Barents Calling, perspective view. Source: Laba, EPFL.

Rather than being part of an extended public design brief, urban infrastructure has mostly been hidden underground, functionally restricted to strategic delivery tasks and taken entirely for granted. The question of its larger role in our relationship, for example with nature, has rarely been addressed. Architects Mason White and Lola Shepherd propose that infrastructure could potentially catalyse new economies that are adaptive and responsive to environment and use.[46] In this century, things we have previously buried and forgotten are returning with urgent environmental questions that we are ill equipped to answer. Geographers Maria Kaika and Erik Swyngedouw argue that it is exactly this hidden form of urban networks which has separated the 'processes of social transformation of nature from the process of urbanisation'.[47] Understanding the apparent spatial and conceptual blankness of energy logistics is the first step towards a conscious, meaningful, and inclusive design for their extended terrain: tracts of land, sea, and the connecting thresholds. The cases discussed here illustrate the ways in which energy logistics has refused architecture. However, we argue that interventions in this field should be fundamental to the field of architecture, and that architecture should not refuse energy logistics.

Jeffrey Kipnis discussed blankness as one of the five criteria for a new architecture alongside vastness, pointing, incongruity and incoherence/intensive coherence.[48] At the time (1993), he named this quality partly in relation to postmodern architecture, and blankness was a potential release from collage as the 'prevailing paradigm of architectural heterogeneity'.[49] The five criteria had first been formulated and introduced by the neo-modern social theorist Roberto Mangabiera Unger in 'The Better Futures of Architecture', his contribution to the Anyone conference in Los Angeles in 1991.[50] Unger called for architects to insist on new expressions of collective life in physical form, and for proposals describing 'possible futures for a more democratic society and a more empowered individual'.[51] He urged them to create a greater range of narratives, resist societal norms, and foster conflict between alternatives.[52] According to Unger, architecture must embrace the ambivalence of both pragmatic, established systems and inspirational, transcendent spatial ideas. In his concept of radical-democratic politics, an architectural vision is needed.[53] But such a concept and such a vision are critically lacking in the field of energy logistics.

The political dimension of Unger's argument resonates with the politics of energy logistics in the neoliberal market system. To differing degrees, this logistical space has, over the continuing course of industrialisation, devoured its counterparts of social and technical labour and of historical spaces of trade interaction. Smooth, efficient logistics developed in the service of the global economy cuts off social interactions: security zones at ports and around offshore wind parks and rigs prevent intrusion; compressed shipping turnaround times in ports hinder crews from making real social contact on shore. Energy logistics, particularly offshore, is still blank in architectural terms – that is, is we have not yet ascribed new democratic, socially-relevant meanings, heterogeneous human activities, cultural references or detailed forms of ownership to it. In the absence of such common meaning, nations and corporations have prescribed spatial patterns and constructed banal enclosures on land and at sea. The conversation between Kipnis and Unger on the notion of blankness calls to the general public to acknowledge energy logistics as a key player in the shaping of our built environment and for architects to consciously move into this domain of design, including its offshore spaces.

In stark contrast with the eighteenth-century vision of the sea as a great void and subsequent capitalist emptiness, for Kipnis, Unger's blankness was architecturally optimistic and full of potential. It was neutral, non-ascribed, without formal reference, and combined with other criteria including vastness, could enable incongruous entities to enter into dialogue with each other while also avoiding 'traditional hierarchical spatial patterns'.[54] Kipnis's new architecture proposed large mute volumes formed by incongruous, unfamiliar geometries that set up unexpected relations to their surroundings and therefore enhanced the heterogeneity of the resulting spaces. We argue that considering oceanic water masses as vast, deep volumes rather than flattened planes can stimulate architectural thinking along the lines Kipnis intends. In addition to volume, they possess cores and density; properties normally associated with solids. While still unfamiliar to architects, these organic geometries are precisely determined according to the oceanographic parameters of depth, currents, bathymetry, temperature, and salinity.

In response to radical transformations generated by a neoliberal mode of operations, energy logistics developed and expanded unchecked across ocean space. Throughout this process, planners prioritised economic and logistic concerns, but erased the public in the process. How can the tools of an architect expand and dismantle this sectorial approach to design and communicate an integrated public vision? Rather than the largest periphery, the high seas are the largest public space on earth and require innovative approaches that can both capture the public imagination and develop scenarios in tune with the dynamics of the sea itself. Conceptions of heterogeneous diversified futures for energy logistics, particularly in offshore space, are lacking. Visions are required that can create awareness and inspire design research, extending the field of architecture beyond the shoreline and embracing the spatial challenges of the ocean. The sea is not a void or a tabula rasa, but a moving volume housing differentiated habitats and internal spaces, including inherited logistical systems. The role of architecture has long been to translate such functionalities into meaningful habitats. This essay argues that the blankness of sea-borne energy logistics, as a corporate strategy designed to make us look away, can – and must – do the opposite: attract attention and inspire architectural intervention. The alternative understanding of blankness discussed by Kipnis offers a way of responding to ocean volumes, celebrating architectural manoeuvring space and ultimately imagining such interventions.

Some designers are already taking on the challenge. The project illustrated in figure 8, 'Resources: A Territorial Strategy for the Barents Sea', demonstrates how the frameworks of established extraction grids can be usurped for new purposes and manipulated to engage with the fundamental spatial properties of the sea: kinetic, layered, emergent and periodic. This strategy uses the petroleum grid to set up a highly flexible fishing tool that manages shifting, four-dimensional fish-harvesting fields according to stock numbers and habitats over time. The gridded unit is an abstract coordinate reference over the full water depth, but is vertically subdivided into three zones; surface, middle and deep waters. The management tool opens different fields and layers for fishing, which change over time in response to the state of the fish stocks, since some species require longer recovery periods or may have been depleted due to other environmental factors.

A second architectural project, depicted in figure 9, proposes a new offshore typology. Combining the functions of search and rescue, vessel service, a swell-activated power plant, biofuel production, meteorological observation, and algae cultivation in vertical succession through a tower, this project reinterprets the lighthouse typology as a beacon and watchtower to protect both humans and the Barents Sea environment.[55] It stands at a strategic position relative to search and rescue operations along the Northern Sea Route in the Barents Sea, its craggy outline offering migrating birds, mammals, and corals a range of resting places.

The North Sea has developed historically as a vital logistical space, first filled then emptied of large-scale human interaction, narratives, and imagery. The sea space is now planned, monitored, excavated, mobilised for transport, and operationalised for energy production. As environmental considerations become urgent and fish stocks collapse, as the climate changes and new generations of offshore infrastructure are both installed and dismantled, new architectural interventions are required which re-programme this logistical space with heterogeneous human activities and reinvigorate the public dimension of energy logistics and of our common ocean imagination.

Notes

1. Nancy Couling, ‘Formats of Extended Urbanisation in Ocean Space’, in *Emerging Urban Spaces- a Planetary Perspective*, ed. Philipp Horn, Paola Alfaro d’Alençon, and Ana Claudia Duarte Cardoso, The Urban Book Series (Springer International Publishing, 2018), XII, 219.
2. For further analysis of the petroleumscape and detailed exploration of some of the examples presented in this article, see: Carola Hein, ‘Analyzing the Palimpsestic Petroleumscape of Rotterdam’, *Global Urban History Blog* (2016) [https://globalurbanhistory.com]; ‘Port Cities: Nodes in the Global Petroleumscape between Sea and Land’, *Technosphere Magazine*, 15 April 2017; ‘Between Oil and Water: The Logistical Petroleumscape’, in *The Petropolis of Tomorrow*, ed. Neeraj Bhatia and Mary Casper (New York: Actar/ Architecture at Rice, 2013); ‘Global Landscapes of Oil’, in *New Geographies* 2: *Landscapes of Energy*, ed. Rania Ghosn (Cambridge, MA: Harvard University Press, 2009); Carola Hein and Mohamad Sedighi, ‘Iran’s Global Petroleumscape: The Role of Oil in Shaping Khuzestan and Tehran’, *Architecture Theory Review* 21, no. 3 (2016): 349–374; Carola Hein, ‘Oil Spaces: The Global Petroleumscape in the Rotterdam/The Hague Area’, *Journal of Urban History* 44, no 5 (2018): 887-929. https://doi.org/10.1177/0096144217752460.
3. Carola Hein, ‘Temporalities of the Port, the Waterfront and the Port City | PORTUS – Port-City Relationship and Urban Waterfront Redevelopment’, *PORTUS: RETE Online Magazine* 29 (June 2015), http://portusonline.org.
4. Philip E. Steinberg, *The Social Construction of the Ocean*, (Cambridge: Cambridge University Press, 2001).
5. Ibid., 118.
6. Keith Chapman, *North Sea Oil and Gas: A Geographical Perspective* (Newton Abbot: David and Charles, 1976).
7. Carola Hein, ‘Old Refineries Rarely Die’ *Canadian Journal of History* (forthcoming).
8. European Committee (UK), ‘The North Sea under Pressure: Is Regional Marine Co-Operation the Answer?’, House of Lords Paper (London: House of Lords, 17 March 2015), https://publications.parliament.uk.
9. Nancy Couling, ‘Urbanization of the Ocean; Extractive Geometries in the Barents Sea’, in *Infrastructure Space*, ed. Ilka and Andreas Ruby (Berlin: Ruby Press, 2016).
10. Couling, ‘Formats of Extended Urbanisation’.
11. Hein, ‘Oil Spaces’.
12. Sheena Wilson and Andrew Pendakis, ‘Sight, Site, Cite. Oil in the Field of Vision’, *Imaginations: Journal of Cross-Cultural Image Studies* 3, no. 2 (2012): 4–5, http://imaginations.glendon.yorku.ca, accessed 9 July 2018.
13. Lance Duerfahrd, ‘A Scale That Exceeds Us: The BP Gulf Spill Footage and Photographs of Edward Burtynsky’, *Imaginations: Journal of Cross-Cultural Image Studies* 3, no. 2 (2012): 115–129, http://imaginations.glendon.yorku.ca, accessed 9 July 2018.
14. Felicity Lawrence and Harry Davies, ‘Revealed: BP’s Close Ties with the UK Government’, *The Guardian*, 21 May 2015, https://theguardian.com.

15. Henri Lefebvre, *The Production of Space*, trans. Donald Nicholson-Smith (Oxford: Blackwell, 1991).
16. Ibid.
17. Ibid., 289
18. Michael Pye, *The Edge of the World : How the North Sea Made Us Who We Are* (London: Penguin Books, 2015).
19. Henk Engel et al., eds., *OverHolland 10: The Transformation of the Landscape of the Western Region of the Netherlands (9th to 21st Century)* (Amsterdam: Sun, 2011).
20. Lucien Chabason, 'Toward International Regulation of Offshore Oil Drilling?' in *Oceans: The New Frontier*, (Delhi: TERI Press, 2011), 216–19.
21. 'Number of Offshore Rigs Worldwide as of January 2018 by Region', Statistica (website), 2018, https://statista.com.
22. North Sea Commission, 'CPMR North Sea Commission – Integration Approach to Sustainable Development in the North Sea Region' (Brussels & Gothenburg: North Sea Commission, 27 November 2017), http://cpmr-northsea.org.
23. The motherboard of a computer system facilitates communication between electronic components, including peripherals.
24. Liquid bulk goods include crude oil, gasoline, diesel, liquefied natural gas, biofuels, liquid chemicals and edible oils & fats (eg palm oil).
25. Port of Rotterdam, 'Throughput Port of Rotterdam 2017', press release, 15 February 2018), https://portofrotterdam.com.
26. Introduced for vessels of a certain tonnage and function by the International Maritime Organisation (IMO) in 2004.
27. Multilateral Treaties Deposited with the Secretary-General, United Nations, New York, as available on https://treaties.un.org, accessed 3 June 2018.
28. The European Parliament and the Council of the European Union, 'Directive 2014/89/EU' (2014), http://eur-lex.europa.eu
29. UNESCO, Marine Spatial Planning website, http://msp.ioc-unesco.org, accessed 3 June 2018.
30. Currently a Master in Maritime Spatial Planning programme is available at IUAV, Venice; see their website: http://iuav.it.
31. This gave the undersea-routing option for the Nord Stream double gas pipeline in the Baltic Sea significant advantages over alternative routes on land. Source: Interview with Nord Stream Deputy Communications Director, 10 July 2012.
32. Willem J. Timmermans J, 'The Future of Offshore Pipelining', *Offshore Magazine* 62, no. 6 (6 January 2002).
33. UN, 'UNCLOS 1982', 1982, http://un.org.
34. D. G. Gorman and June Neilson, eds., *Decommissioning Offshore Structures* (London; New York: Springer, 1998).
35. Arvid Pardo, 'Speech to the United Nations General Assembly 22nd Session, Official Records.' (United Nations, 11 January 1967), http://un.org.
36. Nancy Couling, 'Legislation of the Sea: Spatializing a New Urban Realm', in *ARCH+ Legislating Architecture* 49 no. 225 (2016): 120–23, http://archplus.net.
37. Rania Ghosn, 'Energy as a Spatial Project', in Ghosn, *New Geographies* 2, 7–10.
38. Mark E. J. Newman, *Networks : An Introduction* (Oxford: Oxford University Press, 2010).
39. Gabriel Dupuy, *Urban Networks – Network Urbanism* (Amsterdam: Techne Press, 2008).
40. Henning Grann, 'Europipe Development Project: Managing a Pipeline Project in a Complex and Sensitive Environment', in *The Industrial Green Game*, ed. Deanna J Richards (Washington DC: National Academy Press, 1997), 154–64, https://nap.edu.
41. Bioconsultant Schuchardt & Scholle, 'Environmental Impact Assessment Europipe II in Germany: Offshore & Onshore Section', Environmental Impact Assessment. Client: Statoil Deutschland (Bremen, July 1998), https://equinor.com.
42. Matthew Whitfield, 'Grimsby Fishdocks – an Assessment of Character and Significance', Historic England Kasbah Report (Great Grimsby Ice Factory Trust, April 2009), http://ggift.co.uk.
43. R.N. Rudmose Brown, 'Holderness and the Humber', in *Great Britain: Essays in Regional Geography,* ed.

Alan G. Ogilvie (Cambridge: Cambridge University Press, 1928), 812–21.

44. Julian Manning, Baker Hughes Process & Pipeline Services, presentation, Offshore Energy Conference, Amsterdam, 10 October 2017.
45. David Harvey, *The Urban Experience* (Oxford: Blackwell, 1989). Neil Brenner, 'Theses on Urbanization', *Public Culture* 25, no. 1 (69) (1 January 2013): 85–114, https://doi.org/10.1215/08992363-1890477.
46. Mason White and Lola Shepherd, 'New New Deal: Infrastructures on Life Support', in *Infrastructure as Architecture : Designing Composite Networks*, ed. Katrina Stoll and Scott Lloyd (Berlin: Jovis, 2010).
47. Maria Kaika and Erik Swyngedouw, 'Fetishizing the Modern City: The Phantasmagoria of Urban Technological Networks', *International Journal of Urban and Regional Research* 24, no. 1 (2000): 120–138, https://doi.org/10.1111/1468-2427.00239.
48. Jeffrey Kipnis and Alexander Maymind, *A Question of Qualities : Essays in Architecture* (Cambridge, MA : MIT Press, 2013), 294.
49. Ibid., 292.
50. Roberto Mangabeira Unger, 'The Better Futures of Architecture', in *Anyone*, ed. Cynthia C. Davidson (New York: Rizzoli, 1991).
51. Ibid., 30.
52. Ibid., 30.
53. Ibid., 35.
54. Kipnis and Maymind, *Question of Qualities,* 294.
55. Harry Gugger, Nancy Couling, and Aurélie Blanchard, eds., *Barents Lessons: Teaching and Research in Architecture* (Zürich: Park Books, 2012).

Biographies

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