Fracking Futures, Reclaiming Dead Fossil Fuel Sites

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SUMMARY

Transforming former fossil fuel industrial sites to places of cultural production has become a way of reviving the desecrated landscapes of the machine age. Given the societal benefits of merging culture with industrial preservation, it has nevertheless led to a lessening of the environmental devastation the fossil fuel industry has wrought on the planet. A more pressing issue I suggest is to conceptualize the industrial transformation in keeping with the history of the site. The recently decommissioned Caltex Oil Refinery, located in Sydney's Botany Bay, has presented opportunities to reimagine and adapt its infrastructure to promote a new human-ecology for the site. Epitomized by the burning flame emanating from its processing extraction stack, the Caltex Oil Refinery survives as a haunting symbol of the fossil fuel industry; billowing shadows of toxic emissions clouding skies and polluting the earth, rivers and streams. The potential to transform this 'dead site' into a living and self-sustaining community of industrial re-colonialists, engaged in the remediation of toxic waste, begins to redefine the practices of heritage preservation regarding humankind's industrial past. *Fracking Futures* explores, through concepts and practice, a series of projects undertaken by honors students in Spatial Design at the University of Technology Sydney under the tutorship of Benedict Anderson, Olivia George and Andrew Macklin. Deploying sustainable and bioclimatic architecture principles, the projects explore how the Caltex Oil Refinery is reimagined, producing a new urban model for social interaction, economic reliance and self-governance, to usher in a future world which is better cared for.

Introduction

The biggest industry in the world is the fossil fuel industry. The biggest industrial polluter in the world is the fossil fuel industry.[1] The establishment of mass manufacturing in the late 18th and 19th centuries during the Industrial Revolution, and its exponential global expansion in the 20th and 21st centuries, depended on the mass mobilization of fossil fuels, to run the machines of factories, and to transport goods across the world. As each century bore witness to hundred or even thousand-fold increases in energy consumption, demands for consumer goods rose, driven by the rise in population growth. By far the most impressive in terms of growth and commodities production, the 20th century thrived on a toxic mixture of environmental exploitation and consumption of fossil fuel based products, walking a metaphorical tight-rope between '[t]he political history of capital versus the geophysical history of carbon'[2]. Subsequently, an unbalanced relationship has prevailed, transforming humanity's vast time-based ecological coexistence with the earth to its present instability, and turbulence within the world's atmosphere. Defined by geologists as the Human Age or Anthropocene, this new epoch in humanity's evolution has superseded nature as the prime governor of the earth's natural cycles[3]. Smoke billowing from manufacturing plants, resulting in catastrophic air pollution and atmospheric depletion, tsunamis, hurricanes, drought, famine, glacial melting, rising sea levels, acid-yellow rivers from chemical dumping, and planet warming, are some of the realities of living in the Anthropocene.

Geography's once stable ground has been transformed under the weight of humanity's material demands, creating the new era of geological and atmospheric volatility. In the face of scientific proof, global warming sceptics, governments and powerful corporations continue to deny the reality of the problem. The shock and speed at which humanity is orchestrating its own destruction belies a schizophrenic illness where delusion reigns. What has

resulted from this schism between humans and the planet can best be described as a form of substance abuse of the earth's resources, producing hallucinogenic realities where consumption and profit dominate the earth's and ultimately humanity's survival. The inhibited motivation exhibited by governments and corporations in dealing with earth's environmental problems can be measured in terms of economic and geo-political contests between countries, and carbon emission reduction targets.

Populist policies for untenable growth predictions are traded against the cost of environmental degradation and animal and plant species extinction. In *Extinction: A Radical History*, Ashely Dawson proposes that humanity's confrontation with its own demise cannot be decoupled from industrial capital and societal inequality. 'Extinction is both a material reality and a cultural discourse that shapes popular perceptions of the world, one that often legitimizes a non-egalitarian social order'[4]. The results of a 'non-egalitarian social order' are clearly visible in the increasing disorder of the world's population spreading over the earth's geography. The capital held by an infinitesimally small corporate minority has mobilized the global migration of the world's population from rural areas to mega-cities, to fill the factory floors with their labor. The example of China's and India's economic surge over the last 30 years has led to an unprecedented explosion in disposable income, and an insatiable appetite from a bourgeoning middle class for consumer goods. Of course these countries are not alone – growth and capital have spread throughout the world's developing economies. In *Das Kapital*, Karl Marx's critique of capital was to draw connections to labor fetishization in the exchange for the consumption of goods, which, if we are to believe the economists, has not yet reached its peak in the 21st century. Marx called for a 'metabolic' convergence between people and nature; usurping the capitalist system of plundering the earth's resources in favor of an ecological partnership. In the 20th and 21st centuries, automated production, along with a shift in energy generation from fossil fuel fed furnaces to alternative energy sources, has resulted in the abandonment of outmoded industrial sites. In many developed economies, this has led to either their demolition or preservation as relics of a region's industrial heritage. Nevertheless, a cloud remains over the question of what it means to preserve heritage sites associated with environmental degradation. Given that former industrial sites contain visually arresting infrastructure, the practices of preservation often put in the foreground aesthetic conversions to the point of fetishizing their histories of environmental depletion and destruction.

Transformation, adaptation and gentrification are terms usually associated with the redevelopment of former industrial sites – altering, more often than not, their original production and economic function. Reprogrammed industrial sites, such as the Zollverein in Essen, a former coal processing plant, the Battersea Power Station in London, a former coal-fired plant, and the remuneration of 'ruinscapes' created by coal and ore mining, such as Broken Hill in New South Wales, Australia, are some examples of the transformation of dead fossil fuel sites to places of cultural heritage spectatorship. In his seminal work, Guy Debord reminds us that, 'THE SPECTACLE IS NOT a collection of images; rather, it is a social relationship between people that is mediated by images'. Debord continues to assert that dislocation is where the spectacle appears: "…at once as society itself, as a part of society, and as a means of unification"[5].

Within the makeover preservations of dead fossil sites, there is a pervading sense that preserving industrial sites as modern heritage markers is under-supported by the safety net of cultural production; museums, exhibitions, theatres, performances, and night-time light phantasmagorias, that celebrate and exonerate, in my view, their destructive past. Indeed, there persists an obsession that cultural production can reseed industrial landscapes by performing environmental cleansing. In *Augmented Landscapes*, architects Mark Smout and Laura Allen argue that human-controlled landscapes take on 'an artificial patination. Alien materials interrupt the processes of growth and decay. New and evolving features created by man are, to an extent, absorbed by the fluid and yielding nature of our surroundings'[6].

Culture, it appears, has become a safe vehicle for industrial conversion, but one, I argue, which leads to a forgetting of the environmental destruction wrought in the process. Such practices have more in common with the glorification of the past, whereby industrial memories of environmental degradation are ceded to industrial scale entertainment. In *Manifesto for Living in the Anthropocene*, Katherine Gibson asks for collaborative 'economy-ecology relations', and ways 'of imagining and enacting an

Fig. 1: View of fuel processing infrastructure buildings, Caltex Oil Refinery Botany Bay Sydney (2016)

ethic for living in the Anthropocene'[7]. To imagine new communities of people engaged with an ethical co-existence with the earth is further echoed by Ian Angus, who argues that 'survival in the Anthropocene requires radical social change, replacing fossil capitalism with an ecological civilization, ecosocialism'[8]. To engage an 'ecosocialism' ideology calls for a radical new conception of living, inhabiting and working in the toxic histories of dead fossil fuel sites.

Fracking Futures is an attempt to illustrate an 'ecosocialism' through a set of projects undertaken by honors students in Spatial Design, who were tasked with conceiving new programs at the decommissioned Caltex Oil Refinery in Sydney's Botany Bay.[9] Remedial in conception, the projects express a test case exploration via design, economy, social and environmental responsibility, the capacity to confront humanity's convulsive destabilization of the earth's environment. The projects seek to assert a way of confronting the mirror of human environmental devastation by instigating the emergence of a radical practice of heritage. Conceived as an antithesis to shale oil drilling, the aims of the projects are fourfold: 1. to conceive a manifesto of action to adapt the site's existing buildings and infrastructure; 2. to process and treat toxic waste from sources such as mining, shipping, metals, contaminated soil and water, e-waste, human body, pharmaceutical, and fracking, and to finance the remediation of the site from the proceeds of toxic processing; 3. to design a commune for 100 people, who live and work as new settlers of the site, and 4. to develop a strategy for public engagement that places industrial responsibility in the foreground (Fig. 1).

Given these aspiring directives, there are nevertheless problems associated with generating a remedial project on a dead fossil fuel site such as an oil refinery. One such problem is the reasoning of remediating toxic sites that still contain the infrastructure associated with fossil fuel processing. In their volume *Oil Culture*, editors Ross Barrett and Daniel Worden allude to the material re-constitution of oil as spectacle production. 'Articulating oil's value in innumerable creative ways that transcend

Fig. 2: Alchemy, Mercury processing detailing Alchemy (2016)

(and obscure) its actual material constitution, the resulting images, narratives, and discourses have contributed to the formation of an oil spectacle that has sustained industrial and financial commitments to the expanding system of petrocapitalism'[10]. Aimed at avoiding the spectacle of 'petrocapitalism', the selected projects can be viewed as a set of generated conditions for remediating a toxic site by a generation who increasingly see themselves as responsible for the previous generation's environmental mistakes in wholly capitalizing fossil fuel mining and production. Deploying sustainable and bioclimatic architecture principles, public programming for social interaction, economic reliance, and self-governance for a new community of settlers, the projects seek to recuperate the geography and terrain lost through the site's industrialization. The students can therefore be viewed in this light as post-colonialists of the Caltex Oil Refinery, seeking to return the site to its native state, while at the same time eliciting a living and working manifesto that solicits human co-existence and sustainable conditions for the future planet.

Projects

Quicksilver – Hannah Clifton

Quicksilver proposes an alchemical transformation of the oil refinery through the farming of mercury. Since its discovery in antiquity, mercury has been valued as the prodigy element for transformation due to its liquid state and heat sensitivity. Cultivated by medieval alchemists engaged in a quest to create gold, it has since been banned in the 20th century by many countries, and removed from industrial processing and the public domain. What humans produce and use cannot be erased and mercury cannot disappear. Challenging current stigmas and fears associated with mercury, Quicksilver proposes a mercury distillation, temporary storage and research plant, to explore ways of transforming the liquid metal. Harvesting mercury from medical, mining and outdated technologies, the project defines a brave new world of co-existence with the histories of its toxicity, by conceiving new alchemical conversions (Fig. 2).

The overriding purpose of the project is to reinstate the alchemical seduction of mercury as the elixir for site transformation. In the present heated environment of toxic waste, Quicksilver actions modes of advanced technology for safeguarding human inhabitancy of the site. A key 'double skin' element of the project is the public program that provides for a safe interaction between the commune's children, who play in areas adjacent to the mercury storage areas; a symbolic imagery in which mercury is no longer an object of fear, but rather a desirable element to be re-employed for future applications. Orchestrated by zones of quarantine and livable freedom, the site's transformation embodies an evolving and immersive living model for regenerating the dystopic contaminated wasteland of the oil refinery. By combining the toxic material of mercury with the practices for sustainable, ecological and ethical human habitation, site transformation

and material adaptation are combined and reworked for both the present and the future.

Outpost – Gabrielle Veringa

Water accounts for 71% of the Earth's surface, and 70% of the human body. Of the 71% surface water, 0.001% is fresh water that sustains life. This vital and scarce resource is considered an economic commodity, and is increasingly being privatized for profit. An estimated 0.01% of this total accessible fresh water (18 billion cubic liters) is contaminated by fossil fuel production every year. Water privatization adds to these alarming statistics: where it has been approved, it has led to the contamination of water supplies through toxic dumping, which is further exacerbated by evaporation – spreading its contaminants throughout the troposphere. Worldwide, 748 million people live without access to clean water, and an estimated 3.5 billion without rights to clean water. For many people in many countries around the world, the equilibrium between fresh water supplies and replenishment is at risk due to increasing demands from manufacturing, unsustainable farming and population expansion (Fig. 3).

Outpost is conceived to challenge the territories of water pollution from industrial toxic waste, by deploying bacteria as the regenerative process for water purification. The human body contains approximately two kilograms of bacterial agents, which it deploys for multiple filtration purposes. The transformation of the bacterial body to the oil refinery for the processing of fresh water is used to amplify the tension between the body, toxic site and ecological health. Prokaryotic micro-organisms, the bacterial agent of which there are approximately forty types, are deployed as 'toxic eaters' to purify water on the site, and also reduce contamination seepage into the underground water-table. Having the appearance of vast land-based sails, scientifically engineered bacteria harvest toxic water through low energy microbiology. Combining ecological micro-industry, in-ground human residency, water dilution capitalization, socialized water tectonics, and water-embodied advocacy programs, the project aims not only to erase the site's toxic history, but also begin to reverse the degradation of fresh water through the processing of imported toxic water.

Horizon of Renewal – Christine Lee

The petroleum industry has undeniably fed industrial development at the expense and detriment of the earth's natural ecologies. In the wake of the electrical car moving to mass production and affordability, the future urban landscape will be dotted with decommissioned and redundant petrol stations. Horizon of Renewal proposes a twofold interconnected project; first, the transformation of heavily contaminated petrol station sites through soil remediation, sustainable energy harvesting, and 'filling' stations for electric cars; and second, remediation of oil refinery ground and soil for urban farming. The conversion of the petrol stations along with the

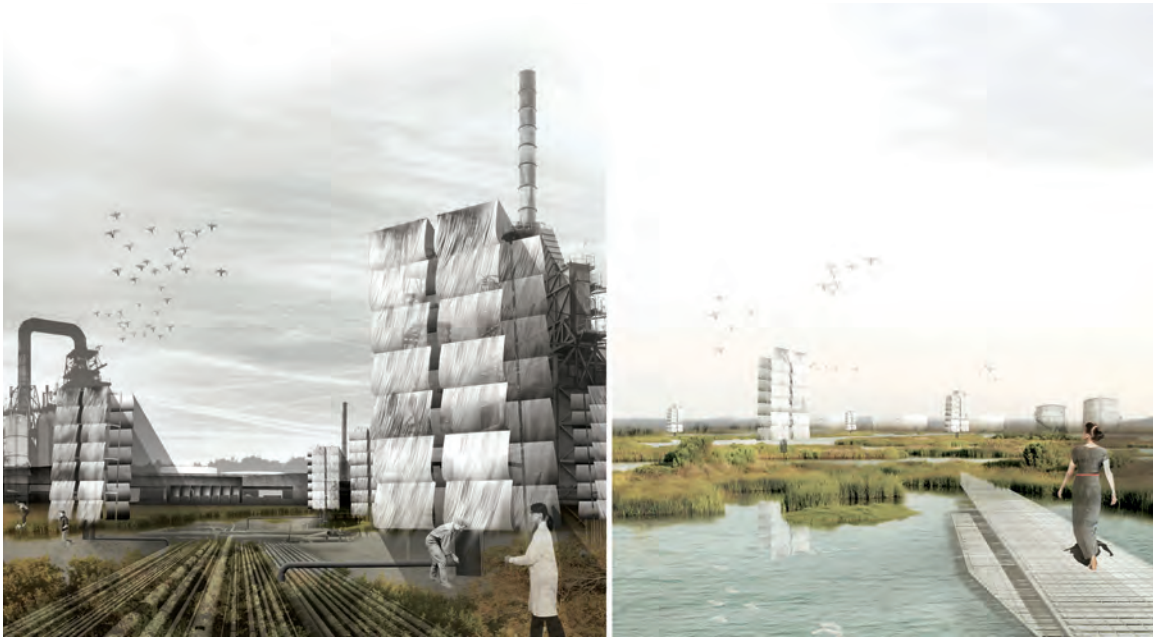

Fig. 3: Outpost, adaption of existing infrastructure for toxic water processing (2016)

Fig. 4: Horizon of Renewal, Overall site remediation urban farm and petrol station transformation to electric 'filling' stations (2016)

oil refinery highlights the trend in the present age towards freeing humanity from its dependence on toxic fossil fuels (Fig. 4).

The project is economically founded upon the remediation of petrol stations to finance the remediation of the oil refinery. Over time, the community of people living on the oil refinery site will transform their toxic wasteland into a regenerative agricultural landscape, including a market garden, that further sustains their livelihood. Horizon of Renewal seeks to revert the earth's fossil fuel destruction timeline to the organic rhythmical cycles of seasonal plantation and harvesting. The configuration of the commune is governed by this new concept for an organic age, through a process of adapting the destructive agency of the petrochemical industry to an emissions-free energy source for electrical transportation and food production. This self-governing and self-financing micro-community seeks to redress the past ills of the poorly regulated fossil fuel industry, and move towards a future of environmental agency, technology adaptation, and seasonal farm ecology.

Alkaline – William Kelly

Alkaline formulates a middle-ground in reprogramming the Caltex Oil Refinery, by focusing on the relatively recent process of extracting coal seam gas through hydraulic fracking. The extraction processes involved in hydraulic fracking have had devastating

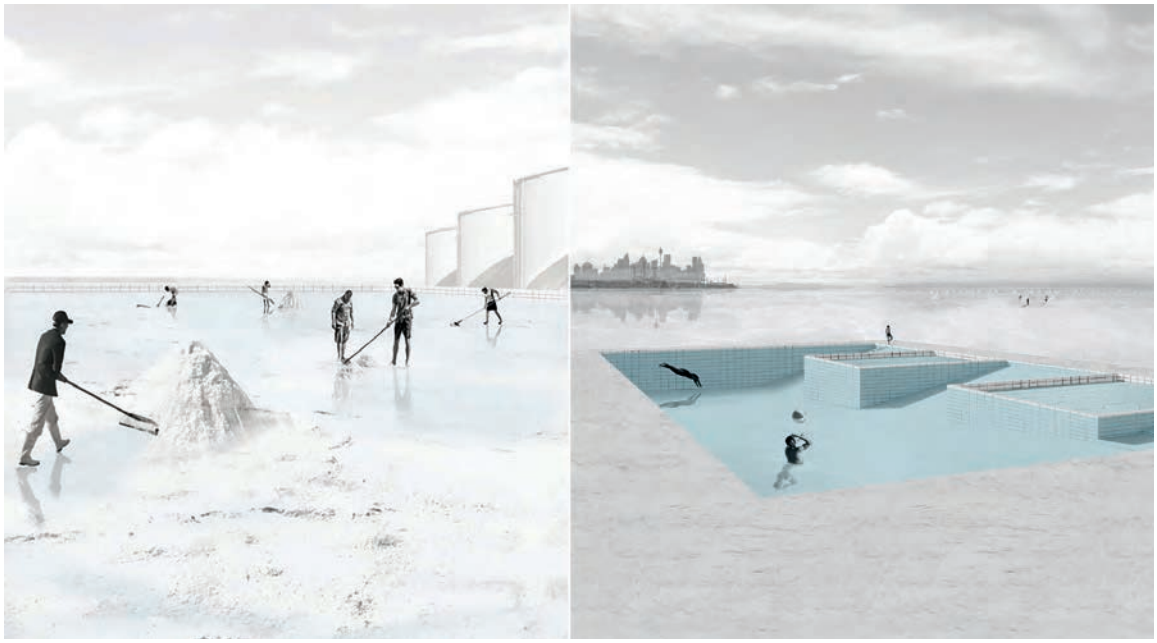

Fig. 5: Alkaline, urban salt farmers, saline cultivation, public swimming pool (2016)

effects on the earth's geological composition where it has been deployed. Like the ground it fractures, there is a layered and unavoidable social and environmental by-product exerted by fracking processes on once fertile farming lands. In response to the contamination fracking causes, *Alkaline* promotes an adaptive re-use scheme, in which the toxic flow-back brine generated from coal seam gas extraction is used to create a salt farm on the oil refinery site. The scheme counteracts the toxicity of the oil refinery area by laying a salt crust across its surface, producing a twofold remediation of the site through the by-product of fracking. Firstly, the liquid brine remediates the ground over time by absorbing the toxic chemicals from the surface, with subsequent processing to cleanse the soil. Secondly, the remediated ground allows for the production of crystalline salt through solar evaporation, with an end product of a locally sourced saline for medical applications (Fig. 5).

Alkaline proposes an urban salt-lake as the new landmark for a regenerated fossil fuel site to transform its destructive ecological history. Likewise, the project transforms the destructive impact salinity exerts on agriculture to the interior of the body, to provide the basic element of salt required for human survival. As a new micro industry, the salt farm provides employment for a transient population of 'salt farmers' engaged in evaporative salt cultivation, and, at a public level, the scheme deploys transformative bodies of water in the form of a public swimming pool.

Village Vessel – Mitch Winter

Conceived as an anti-thesis to challenge the duality of passive leisure and environmental ocean degradation, Village Vessel processes the toxic waste products from visiting passenger liners entering Sydney Harbour. The project remediates the black water waste from pleasure liners that is often discharged in the open sea. Black water waste is instead collected from the cruise ships prior to their entering Sydney Harbour, which is then processed on the former oil refinery site. The waste water is conceived as an energy source and through the process of anaerobic digestion transformed into bio-electricity and fertilisers to power the village-commune, resident homes of the nearby town, and the neighbouring desalination plant, as well as supplying itself and urban city farms with organic fertilisers (Fig. 6).

Creating a spatial composition that metaphorically "berths" the pleasure cruise to site remediation and energy production, the realities of passive leisure association with toxic waste by-products is spatially and ecologically combined in developing a new industry to support the commune. The bio-electricity and fertilisers created from processing the waste water is also deployed to remediate the oil refinery's toxic soil, together with a regenerative re-wilding program of indigenous vegetation. The aim is to ignite the balance between human desire for pleasure, symbolized by the ocean cruise, to a regenerative awareness of the environmental costs the desire for passive leisure creates.

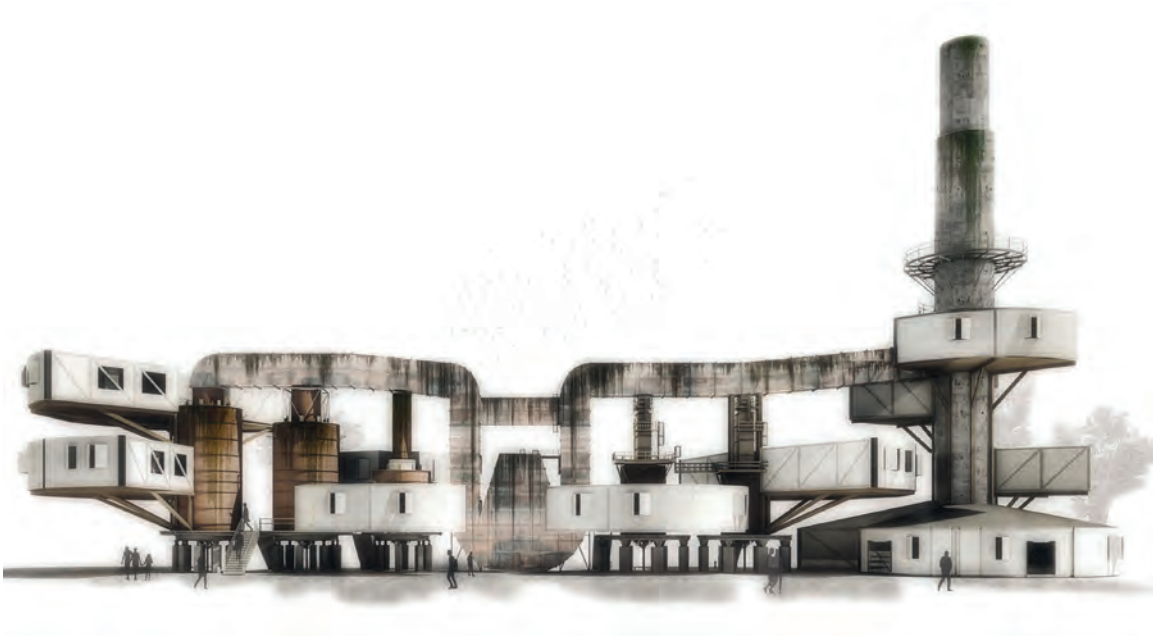

Fig. 6: Village Vessel, adaption of oil refinery processing plant to commune housing (2016)

Conclusion

The projects summarized present a conceptual rethinking of a dead fossil fuel site. *Fracking Futures* is aimed at counteracting the fossil fuel industry's capacity for environmental destruction, through radical, ecologically sustainable, and economically viable habitats, as the basis for a return to a human-nature co-existence. The hypothetical projects illustrated should be viewed as evidence of how a group of young people think and conceive projects to challenge, take hold of, and become responsible for, the environmental degradation wrought by previous generations. The schizophrenia, inhibited motivation, substance abuse, and hallucinogenic realities that presently befall humankind's relationships with the environment, may come to be usurped by a dynamic group of new designers, who seek to initiate a less toxic material future. Industrial heritage is not the gentrification of hard industrial machinery into soft treatments for public wonderment and spectacle entertainment, but purposed to build new ecologically sustainable industries through site remediation, in tandem with the challenges facing the epoch of the Anthropocene.

Image sources

1 Benedict Anderson

2 Hannah Clifton

3 Gabrielle Veringa

4 Christine Lee

5 William Kelly

6 Mitch Winter

Notes

1 These two statements are well known facts about the earth's environmental degradation, and are often referred to by environmentalists. One of the foremost outspoken leaders in the anti-fossil fuel movement is the environmental scientist and Columbia University Professor James Hansen. Hansen along with his granddaughter are presently suing the United States government for environmental destruction and neglect of sustainable energy, citing a lack of environmental policies to combat the fossil fuel industry, which they ague continues to grow, endangering the already fragile human-earth co-existence of future generations.

2 See Davis, Jeremy: The Birth of the Anthropocene, California 2016

3 Atmospheric Chemist Paul Crutzen coined the term Anthropocene in 2000 as a way of describing humanity's transformation of the earth's atmosphere as a result of mass global pollution from carbon emissions. Crutzen dates the beginning of the epoch with the advent of the industrial revolution in the late 18th century, and the exponential rise in the burning of fossil fuels such as coal to power mass mechanical manufacturing in the 20th century.

4 See Dawson, Ashely: Extinction: A Radical History, New York 2016, p. 15

5 See Debord, Guy: The Society of the Spectacle, translated by Donald Nicholson-Smith, New York 1994, p. 12

6 See Smout, Mark / Allen, Laura: Augmented Landscapes, Pamphlet Architecture 28, New York 2007, p. 6

7 See Gibson, Katherine / Bird Rose, Deborah / Fincher, Ruth (eds): Manifesto for Living in the Anthropocene, New York 2015, p. 8

8 See Angus, Ian: Facing the Anthropocene, Fossil Capitalism and the Crisis of the Earth System, New York 2016 p. 20

9 The design projects cited and rendered images for Fracking Futures are part of a larger research program undertaken by 14 honours students in Interior and Spatial Design at the University of Technology Sydney in 2016. This full-year study was devised and lead by myself with lecturer/architects Olivia George and Andrew Macklin.

10 See Barrett, Ross / Worden, Daniel (eds.): Oil Culture Minneapolis: Minnesota 2014, here Ross Barrett and Daniel Worden's introduction to their edited volume, 2014 p. xxv