The Plan Journal 10 (1): 109-130, 2025
doi: 10.15274/tpj.2025.10.01.5
Peer-Reviewed

Rain, Rain, Go Away: Geoengineering and the Illusion of Control

Hannibal Newsom

CROSS-DISCIPLINARY STUDIES

ABSTRACT - *"Geoengineering" is increasingly seen as the best, perhaps even last, hope in the fight against global warming. Calls for such practices as Solar Radiation Management are becoming urgent as the effects of the climate crisis make themselves visible. This essay uses California's Salton Sea, a geo-engineered palimpsest of once natural terrain turned toxic and inhospitable through human intervention, as a case study against the illusion of control. Through the critical lens of Magical Realism and the visual language of the architecture studio, this essay calls into question the desire to exert human control over natural systems, illustrating that the unintended consequences of such efforts will only serve to compound the problems they were initially meant to resolve.*

Keywords: climate change, extraction, geoengineering, Salton Sea, solar radiation management

"Man's ability to triumph over nature is limitless… modern science and technology have armed him with powerful means of reclaiming barren deserts, subjugating the cosmos, changing the climate, and mastering the mighty and inexhaustible energy of the atom." [1]
Boris Lyubimov, 1959

The information age in the twentieth century was a time of incredible scientific and technological progress. As the cold war fueled first the nuclear arms race and then the space race, innovation and invention in

the sciences blossomed. For the first time in human history computers allowed the processing of information faster and more accurately than ever before. As our computational capabilities developed, we began to direct them, increasingly, toward the modeling, predicting, and ultimately control, of natural systems and processes – one of which was the weather. In the two decades following World War II scientists were optimistic about freeing human civilization from its dependence on the unpredictable variability of weather systems. Scientists such as the Soviet Union's Boris Lyubimov were regularly making bold proclamations about the promise of weather control. Science, they claimed, would learn how to create rain, and how to stop it; geodesic "biodomes" would control crop production or maintain desired climates in cities.[2]

These visions supported the first widespread attempts at planetary level geo-engineering. Not "Geoengineering" as it is most commonly defined today – "the deliberate large-scale intervention in the Earth's natural systems to counteract climate change," [3] – but rather geo-engineering as we must understand it in order to understand and ultimately reframe our relationship to this planet – that is, as any large-scale human endeavor aimed at leveraging technology to reshape existing natural processes and phenomena in order to fit human needs and desires.[4] By such a definition, any means, no matter how powerful, of reclaiming "barren" deserts, subjugating the cosmos, changing the climate, or mastering the atom constitute geo-engineering.[5] In fact, humans have been involved in this type of geo-engineering since the development of agriculture: the redistributing of natural water systems for irrigation, the management of land by fire, or the domestication and husbandry of once wild animals. The people of the Beni, in the pre-Colombian Amazon in what is now Bolivia, for example, had a fully constructed and well-maintained infrastructural system of roads, causeways, dikes and reservoirs. They built intricate social networks and mobilized efforts around fabricating trapping mechanisms and techniques for managing waterways.[6] Their concentrated efforts, including large scale clearing by fire, transformed not only the land but the local plant species through geo-engineering. Geo-engineering therefore was clearly not a new idea in twentieth century western territories: it was only that scientific progress from the Industrial Revolution through the Information Age suddenly allowed us to operate faster and on a much larger scale.

While scientists such as Boris Lyubimov and his contemporaries were prophesying a new level of global human mastery over natural forces in the mid-twentieth century, a different, a contradictory idea was emerging, that of climate change denialism. The idea of global warming due to industrial carbon emissions was first posited in 1908 by Swedish scientist Svante Arrhenius in his book *Worlds in the Making*. And, in the hundred plus years since its publication, "global warming" has become a household term.[7] Yet, in the face of scientific evidence of warming, and in spite of robust and enthusiastic claims to the contrary by popular scientists, came

the contention that human action could not possibly be powerful enough to impact the climate on a planetary scale. Perhaps this was in the hopes of avoiding any negative consequences that might emerge as a result of human interference, whether through resource extraction, industrialization, or any other facet of so-called progress.

At first it was because of the oceans. Arrhenius argued that the oceans acted as a carbon sink and would have the capacity to absorb excess emissions and thus keep the planet cool. This turned out not to be exactly true – the oceans do absorb some carbon emissions, temporarily, but these eventually evaporate back into the atmosphere. Then the issue became political. In the 1980s, when NASA scientist Jim Hansen publicly fixed the start of global warming a hundred years prior in 1880, the United States Department of Energy immediately cut his funding.[8] Thirty-five years later, in February 2015, United States Senator James Inhofe (Republican, Oklahoma) carried a snowball into the halls of Congress as clear evidence against global warming, "In case we have forgotten because we keep hearing that 2014 has been the warmest year on record, I ask the chair, 'do you know what this is? It is a snowball just from outside here.' So, it is very, very cold out. Very unseasonable." [9] Despite the snow, 2014 did set global heating records, so did the following eight years.

The past two years, 2023 and 2024 sequentially, have proven to be the hottest years on record yet again, and we are right back where we started: atmospheric control.[10] Calls for large scale "Geoengineering," designed specifically for mitigating global warming, are increasing. At the World Climate Research Programmes (WRCP) Open Science Conference in 2023 there were dozens of papers and speakers discussing Solar Radiation Management (SRM), the plan to inject aerosols, most commonly sulfur, but sometimes calcite, into the stratosphere to increase the earth's albedo, reflect solar heat gain, and directly mitigate rising temperatures. By comparison, in 2011, almost no one at the WRCP conference was discussing SRM.[11] These calls for action are driven by a sense of urgency, a concern that we are running out of time. But they are widely palatable for another reason, they do not interrupt business as usual, "…many climate scientists until recently regarded such proposals as fringe, if not heretical, arguing that they undermine the case for urgent reductions in greenhouse gas emissions. A group of scientists writing in *Nature* as recently as April last year [2018], called solar geoengineering 'outlandish and unsettling… redolent of science fiction." [12] There is a serious concern that these strategies, like that of cap-and-trade, create a fungible right to do harm, as they will allow some companies to earn billions of dollars spraying sulphates, which are also an ingredient in coal emissions, into the high atmosphere while. others continue to pollute down on the ground.[13] While we absolutely must address issues of warming, air quality, water quality, and clean energy if we are to mitigate the effects of the ongoing climate crisis, it seems, time and again, that the only path we can see forward is to engineer ourselves out of disaster.

But perhaps there are other ways to address the climate crisis than through the eyes of a "Geoengineer." Yes, the climate crisis is driven by the release of atmospheric carbon, and we know that the built environment is responsible for a significant portion of all carbon emissions. According to Architecture 2030 "building operations are responsible for approximately 27% annually, while the embodied carbon of just four building and infrastructure materials – cement, iron, steel, and aluminum – are responsible for an additional 15% annually," so it is only appropriate that as architects we question our role and our position in the fight against further climate change.[14] Perhaps that role is not through geo-engineering.

EXPLORING GEO-ENGINEERING THROUGH PEDAGOGY

In the fall of 2021, I constructed an architectural design studio to question the practices of geo-engineering and their seen and unseen impact on the planet and its people, environment, and resources. The site of inquiry was Southern California's Salton Sea. The method of inquiry was Magical Realism, which provided a lens through which the studio could question and make visible the impact of geo-engineering on

(a) the flow: of energy, food, goods, air, and people to, through, and from the Salton Sea;
(b) minerals: dense, lithium rich, geothermal brine present – but not yet accessible - deep beneath the Salton Sea;
(c) water: on August 17, 2021 the United States Federal Government announced the first ever water shortage on the Colorado River, the source of all water in Imperial and Coachella valleys near the Salton Sea; [15]
(d) air: the air quality around the Salton Sea is consistently among the worst in the US, desert winds kick up dust storms that cloud the skies, and hidden in that dust is a century's worth of fertilizers, pesticides, and toxins released by the rapidly evaporating seawater; and, finally, the sum effect of all of these
(e) people: despite the evident health hazards posed by the retreating sea or the rampant social and economic inequalities in the region more interest has been expressed in gaining access to underground lithium than has been paid to addressing the ongoing human crises in this region of Southern California.

The Salton Sea as Site of Inquiry

In Southern California, inland, nestled between the Chocolate Mountains and Joshua Tree National Park to the west and the Anzo-Borrega Desert State Park to the east, just north of the Mexico-United States border and south of Palm Springs is the desert paradise known as the Salton Sea: an

eerie, inhospitable body of water polluted by a hundred years of agricultural run-off. The sea itself is one of the last remaining flyway resources for nearly 400 species of migrating birds, but because of the pollution, it brings death to those who feed on it. In 1992, 150,000 eared grebes died on the shores of the sea, and on August 12, 1999, 7.5 million fish died in a single day. Their corpses stretched along the waterfront in a band 10 mi. [16 km] long and 3 mi. [4.8 km] wide. Forget about swimming in it, residents are warned not to come too close.[16]

South of the Salton Sea lies the Imperial Valley – a verdant agricultural landscape that consumes a full 20% of Colorado river water annually and produces two-thirds of the United States' winter vegetables. Despite the massive $2 billion a year agricultural production industry, it is also a food desert where 20% of residents are unable to access healthy food. It is home to an economically depressed, linguistically isolated community that suffers the highest unemployment and poverty rates in California and is host to among the highest rates of asthma in the country.[17] As temperatures rise, the Salton Sea evaporates, each year exposing more and more toxified playa to desert winds and locals' lungs. Meanwhile, north of the sea is home to Riverside County and Palm Springs Desert Resort, the self-proclaimed golf capital of the world with well over one hundred desert golf courses and a $6 billion dollar-a-year tourist industry.[18]

Below it all: the San Andreas Fault. This seismic division runs directly beneath the Salton Sea and Riverside and Imperial Counties and provides access to superheated geothermal brine deep beneath the earth's surface. This brine feeds the Salton Sea Known Geothermal Resource Area located on the southeast shore of the sea and which, since the 1980s, has been home to eleven geothermal power plants. Not only is this area a generator of clean energy, but the geothermal brine it relies on is lithium rich, and it promises 3,747,858.5 tn [3,400 kt] of lithium, which, if it can be extracted, would become the world's largest lithium resource.[19]

The government of California, backed by private investors, has hopes of transforming Imperial Valley into "Lithium Valley," envisioning another economic powerhouse like Silicon Valley. A host of billionaires including Warren Buffet, Bill Gates, and Elon Musk have proposed investments in the project. In 2021, General Motors announced a partnership with Controlled Thermal Resources, an Australian mining company that already owns one geothermal plant near the Salton Sea, to build 7,000 acres [2,832.8 ha] of industrial buildings including power plants, lithium refineries, and battery manufactories.[20] Electric vehicle plants and other accessory services may follow. But many local residents are concerned that they will be forgotten or pushed out in the process. They are also concerned about the potential impact to the environment, their environment. And they are right to be concerned; back in the 1980's when Silicon Valley first took off and was better known as a manufacturing hub for computer hardware than as a

Mecca for software developers, the immense industrial activity produced a total of twenty-three EPA Superfund sites, many of which still exist today.[21]

Naturally, there is great interest in investment and harnessing of Lithium Valley's clean geothermal energy with battery grade lithium as a by-product, but there seems to be almost none in addressing its existing environmental issues. Before Imperial Valley can become Lithium Valley, we need to take a closer look at the material and energy flows that lie behind lithium-ion battery and electric vehicle production. As we will see, this entire landscape is a result of geo-engineering, the good and the bad. Will transforming this region yet again into Lithium Valley, the fourth such Anthropocentric change this region has experienced, address the existing environmental problems, or contribute more? Is extracting lithium from geothermal brines, in mass and over a fault line, as safe as the energy companies claim? What other environmental risks might this industrial development bring to the area, and who will profit from all of this new economic activity, the local residents who are now suffering, or outside investors and politicians?

Magical Realism as Method of Inquiry

Magical Realism is a mode of artistic production critical of structures and centers of power. While popularized as a literary genre, the title Magical Realism was first applied to a style of painting that emerged in Weimar Germany after World War I. At the core of many of these Magical Realist paintings, especially those by German artists, was the inequality and cruelty of post-war life in the Weimar Republic. This art was reported on by a Spanish language journal, *Revista de Occidente*, that spread the term to Central and South America where it became synonymous with the burgeoning literary style now known globally as Magical Realism.[22] Though popularly synonymous with Central and South America, Magical Realist writing appears from authors the world over, most commonly from post-colonial, or post-occupied countries and or writers. Whether in painting or in the written word, anti-bureaucratic themes continue to run through Magical Realist works,

> magic realist writing achieves this end by first appropriating the techniques of the "central line" and then using these, not as in the case of these central movements, "realistically," that is, to duplicate existing reality as perceived by the theoretical or philosophical tenets underlying said movements, but rather to create an alternative world "correcting" so-called existing reality, and thus to right the wrongs this "reality" depends upon. Magic realism thus reveals itself as a "ruse" to invade and take over dominant discourse(s).[23]

In her essay, "Scheherazade's Children," Wendy Faris describes five primary characteristics that are present in, or define, Magical Realist texts:

(1) an “irreducible element” of magic;
(2) descriptions that detail a strong presence of the phenomenal world;
(3) a hesitation between two contradictory understandings of events;
(4) the closeness or near-merging of multiple worlds; and
(5) the questioning of received ideas about time, space, and identity.[24]

We will see how each of these characteristics is leveraged in the studio course structure, as a means for students to develop critical positions relative to the vastly complex and highly geo-engineered landscape of the Salton Sea.

Pedagogy as Method of Critique

The studio was divided into three sequential phases. In the first, students were asked to develop a visual understanding of the phenomenal details described above at three scales: global, regional, and local (Fig. 1). Globally students looked at lithium production and exchange worldwide along with various means and locations of battery and electric vehicle production. Regionally, they explored Colorado River water usage including water use agreements, infrastructure plans, and drought statistics; geothermal power production, capacity, and distribution; and the regional impact of drying lakes and desert dust. And locally, they investigated agricultural production and water use in Imperial Valley; demographics in Imperial County (Brawley, El Centro, Calexico) and Riverside County (Palm Springs, Cathedral City, Palm Desert); and water and air quality throughout the region. The narrative critiques developed by each student were built on this detailed description of the phenomena in and around the Salton Sea.
The second phase of the studio asked students to study both Magical Realist paintings and texts and then to experiment with various modes of visualization and representation derived from this study. Following Nicolas Mirzoeff’s argument that “power visualizes History to itself,” and “in so doing, it claims authority above and beyond its ability to impose its will,” [25] along with Faris’ description of magical realism as inherently anti-bureaucratic, [26] this exercise required students to explore the ways in which large energy companies, agricultural corporations, the state, and others, use visualization to entice us to look toward some things and away from others, and then in turn use these same practices to entice our audience to look not at what they are told to look at, but at what they otherwise might not, or might not want to see (Figs. 2, 3).

Finally, based on their detailed description of the issues at play and the content of their magical realist visualization studies, each student was tasked with designing a project in the Imperial Valley, just south of the Salton Sea. No specific site or program was given, each student chose for themselves where and how to engage with the territory. The only directive was to

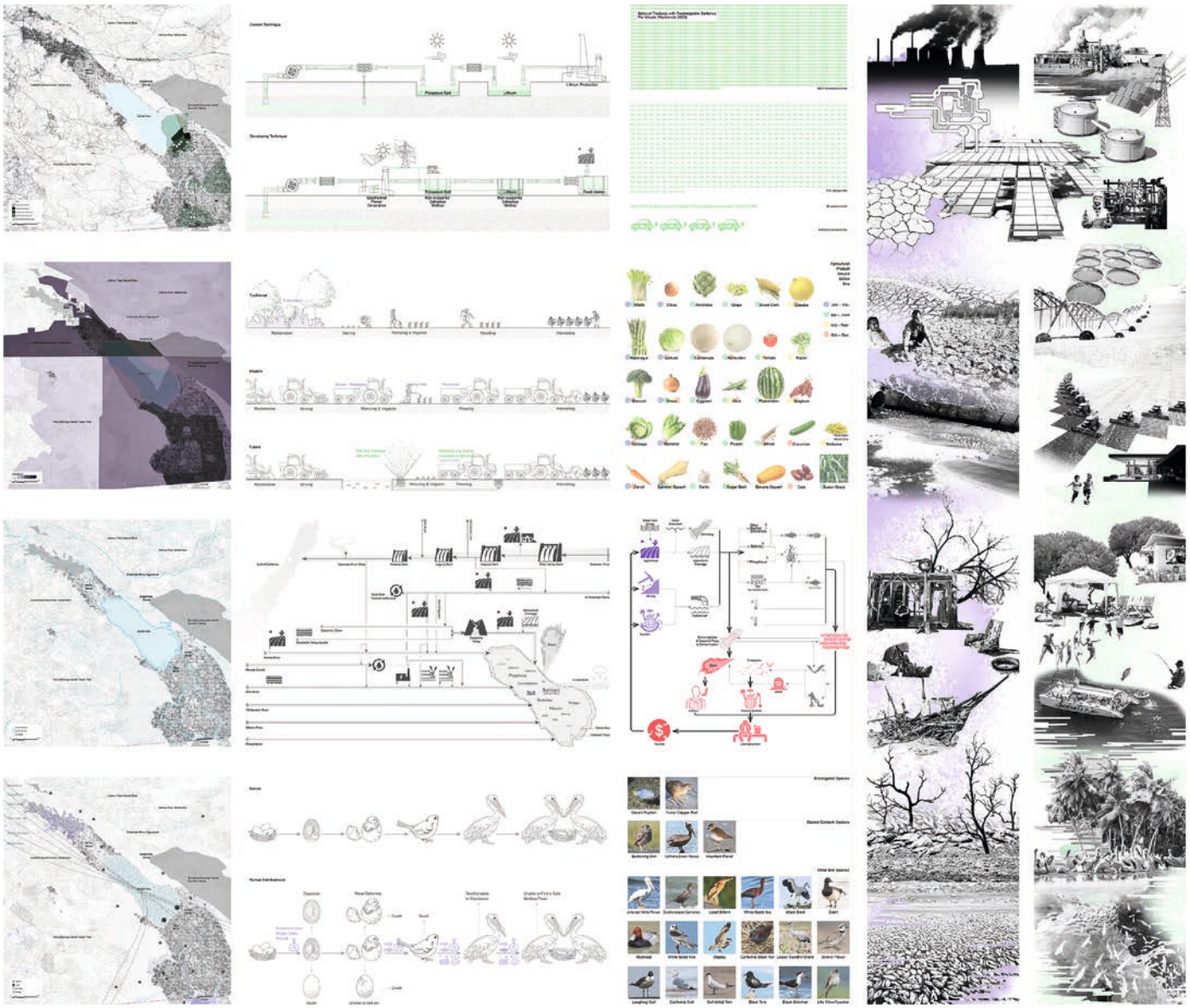

Figure 1. Research graphics, lithium and the Salton Sea, 2021.

approach the architectural element as one that does not have the power to “solve” problems, but rather to expose important issues, confront power structures, and make visible that which others would prefer remain hidden. In each project students produced designs and images that appear as potential solutions to the Salton’s crises, but in fact work to draw attention to existing humanitarian and environmental problems. That each of these projects could be critiqued and accepted as serious “Geoengineering” proposals highlights the irony of our misguided attempts to solve climate problems through the exertion of environmental “control.”

The following three projects produced in this studio, which I will call “Green Water,” “Green Air,” and “Green Power,” illustrate a reframing our

understanding of geo-engineering and its impact on the environment. Green here refers to both environmental impact and financial incentives. I begin with water, as it is impossible to comprehend the Salton Sea without first understanding the role of the geo-engineering of water in this region. Air follows, as the majority of air quality problems here stem directly from the treatment of water. Then, finally, power, as we question whether the proposed Lithium Valley Commission might be the saving grace of the Salton Sea or the nail in its environmental coffin, and who gets to decide. I will discuss how each of these projects builds on the characteristics derived from Magical Realism to question the status quo.

Figure 2. Visualization study, geothermal waterslide, 2021.

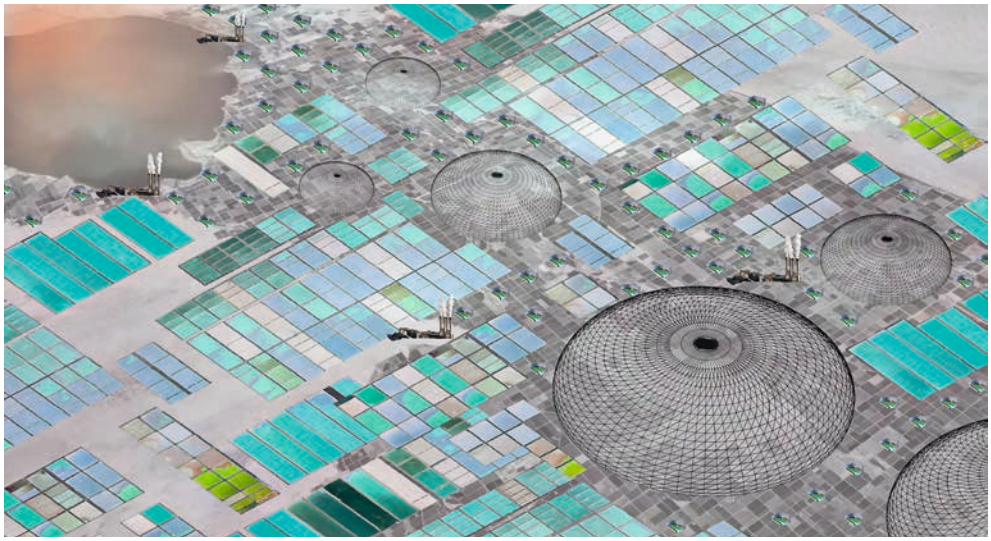

Figure 3. Visualization study, domed cities of Lithium Valley, 2021.

Green Water

On the surface, Green Water appears as a proposal for a water treatment plant (Fig. 4). It starts with a critique of the Salton Sea's purported origins in a failed infrastructure project that resulted in water currently twice as salty as the oceans (and predicted to be five times as salty by 2045) and which emits a rotten sulfuric smell that has reached as far away as Los Angeles.[27] To understand why the water is so toxic and in need of purification it is necessary to understand the history of this sea.

During the westward expansion and the Gold Rush of 1848-1849, American settlers encountered a brutally dry, and in their view, barren, desert in Southern California, littered with seashells and boasting suspiciously fertile but salty soils. Moving immediately to assert their "mastery" over the landscape, they created vast dams, rerouting the Colorado River and constructing a plethora of irrigation canals to supply what is now known as the Imperial Valley with water for agriculture.[28] This valley, and the small town it supported thrived until, in 1905, levees broke in two places and the Colorado River flooded into the valley. The flooding continued for two years straight before geo-engineers were finally able to contain it again. The result, an inland sea 600 sq. mi. [1,554 km^2] and 200 ft. [61 m] deep, subsequently named the Salton Sea. American geo-engineers considered this sea a mistake, the result of an engineering failure, a failure of their "limitless potential to overcome nature," and when in 1907, they finally corrected this failure and repaired the dams, they also permanently disconnected the Salton Sea from the replenishing waters of the Colorado River.

What is not often mentioned, but what was certainly well understood by the local Indigenous population at the time, was that the Salton Sea was not exactly new, nor was it exactly a failure of American engineering. For centuries, the Colorado River had regularly flooded this region bringing with it fish and nutrient rich waters for desert agriculture – hence the seashells and the salty soils. In fact, Mexico's Gulf of California once stretched inland as far north as what is now Riverside County California. Thirty million years ago, the Colorado River had carried enough sediment, sand, and silt down from the Rocky Mountains to divide the gulf of California in two, more or less right where the Mexico-United States border now runs. Over the next millennia the delta of this river would swerve back and forth, sometimes emptying south into the Gulf of California, and sometimes shifting northward to empty inland, creating a host of large and small lakes in the process. The largest of these, which stood in exactly the same spot as the Salton Sea, was known most recently as Lake Cahuilla by the Cahuilla people of the region. Over the last two millennia it is estimated that this shift had occurred approximately every 500 years.[29]

Since being cut off from the periodic replenishment once provided by the Colorado River in 1907, the Salton Sea has been sustained only by polluted

run-off from industrial farms. For most of the twentieth century the runoff sustaining this desert lake was about equal to its rate of evaporation, but after a 2003 water deal sent the majority of the Imperial Valley's water to San Diego, the supply of runoff diminished drastically.[30] With less runoff and rising temperatures, the rate of evaporation has increased, and with it the amount exposed playa and the density of salt and toxins in the remaining water. Without an abundant source of clean water to dilute it, the Salton Sea seems doomed to become ever more toxic until it disappears

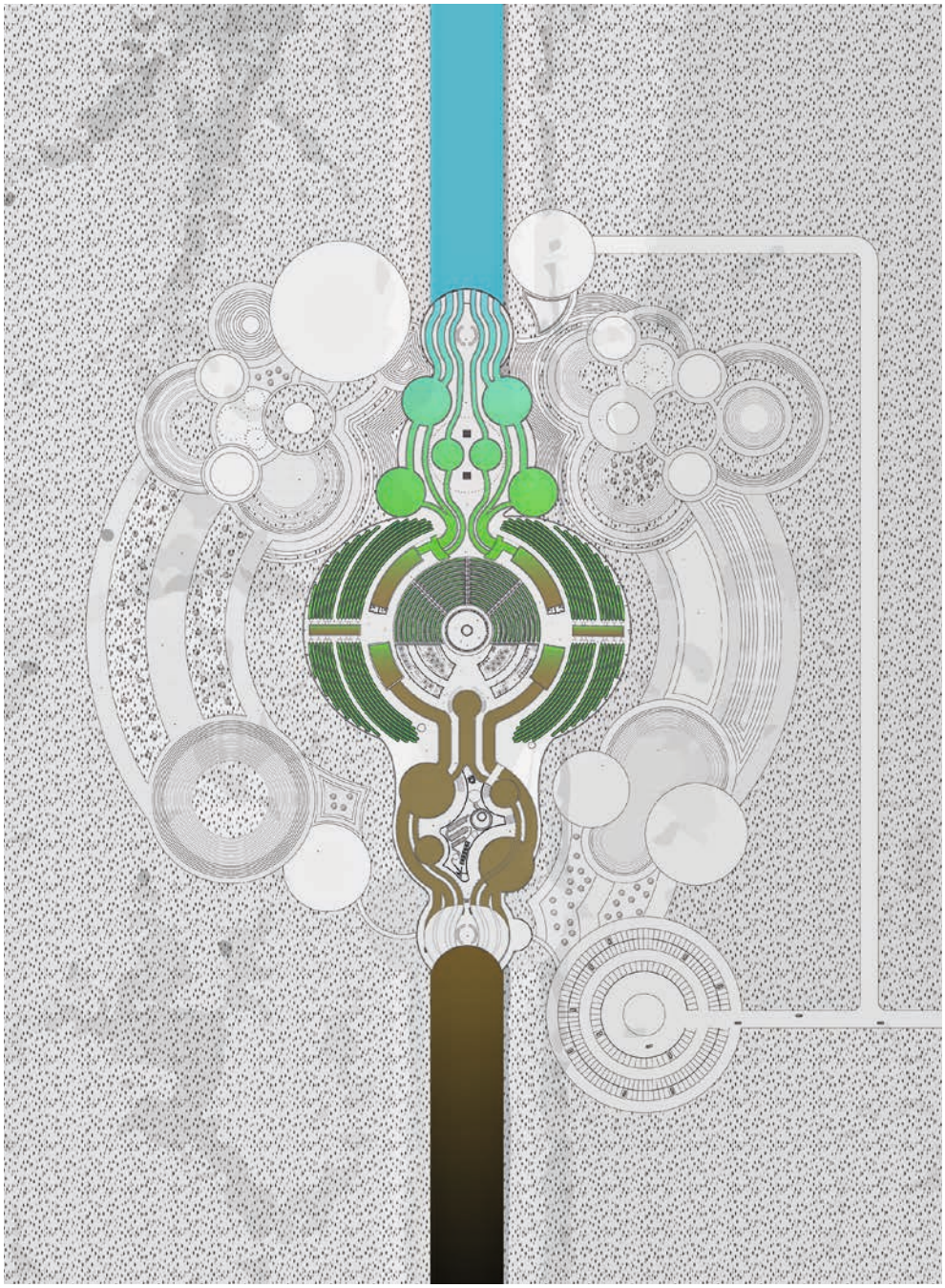

Figure 4. Green Water, schematic plan, 2021.

altogether, leaving behind a truly barren and inhospitable scar in the desert. Green Water seems to propose a pilot project for algae-based water filtration on the All-American canal, which branches off from the Colorado River and feeds both Imperial and Coachella Valleys. Its image is of a highly sophisticated filtration system which, implemented at scale, would cleanse the waters of the valley. However, it quickly becomes apparent that, like Jorge Luis Borge's imperial map, this treatment plant would have to be as large as Imperial Valley itself if its intent is to clean all water of salt and toxins before it drains into and dilutes the Salton Sea.[31] Such a vast enterprise, it is proposed, would eventually overrun the farmland and erase the agricultural industry and the profits it sustains in order to clean a sea that itself generates no financial value. Perhaps, it whispers, *Geoengineering* is not interested in saving the natural world, but only the profit driven world of capital.

Green Air

The Salton Sea is not unique in its "accidental" environmental devastation, it is one of many such places. In the 1950's, in his Virgin Lands program, Nikolai Khruschev had the Syr and Amu Rivers that fed into the Aral Sea – the fourth largest lake in the world – dammed and diverted to irrigate the steppes of Central Asia. Deprived of its replenishing waters, the Aral Sea, much like the Salton Sea, began to evaporate, and, again much like the Salton Sea, began to expose playa made toxic by decades of industrial farming runoff. Today, the Aral Sea has diminished to a tenth of its original size; [32] and desert winds spread its toxic sand for 500 mi. [805 km] in all directions.[33]

To understand the lack of action in mitigating the air quality problems caused by wind driven dust at the Aral and Salton Seas, it is helpful to look at Owen's Lake and the largest dust mitigation project in the world. The problems at Owen's Lake began in a similar way to those at the Aral and Salton Seas. In 1913, water was diverted from the lake to supply the growing population of Los Angeles, 200 mi. [322 km] to the south, with drinking water.[34] Eventually the entire lakebed dried up, and winds began kicking up an astounding amount of dust. At its worst the lakebed emitted 75,000 tn [68 kt] of particulate matter per year, one hundred times more dust than is considered safe by the US government. At times residents were forced to stay in their homes, unable even to see the houses across the street. Finally, in 1997, eighty-four years later, Los Angeles agreed to fund a dust mitigation project. This involved subdividing the lakebed into smaller cells and employing different mitigation strategies in each cell – gravel beds, sprinklers to keep dust moist, hyper-saline brines. If the Owen's Lake dust remediation project were to be stopped at any time, the lake would dry again, and the dust emissions would resume. These efforts cost the city more than $2 billion over twenty-five years for a lake that only covered 108 sq. mi. [280 km^2] – the Salton Sea started at 600 sq. mi.

[1,554 km^2] in 1907, and the Aral Sea was originally 26,300 sq. mi. [68,117 km^2] in area.[35]

Green Air engages with the air quality problems created as a byproduct of such human geo-engineering of natural waterways. Standing tall above the Imperial Valley is a highly mechanized tower, more machine than building, equipped along its height with solar panels, wind turbines, carbon-capture and sequestration machines, and air filters (Fig. 5). Like Green Water it appears that this tower exists as a machine to purify the air and,

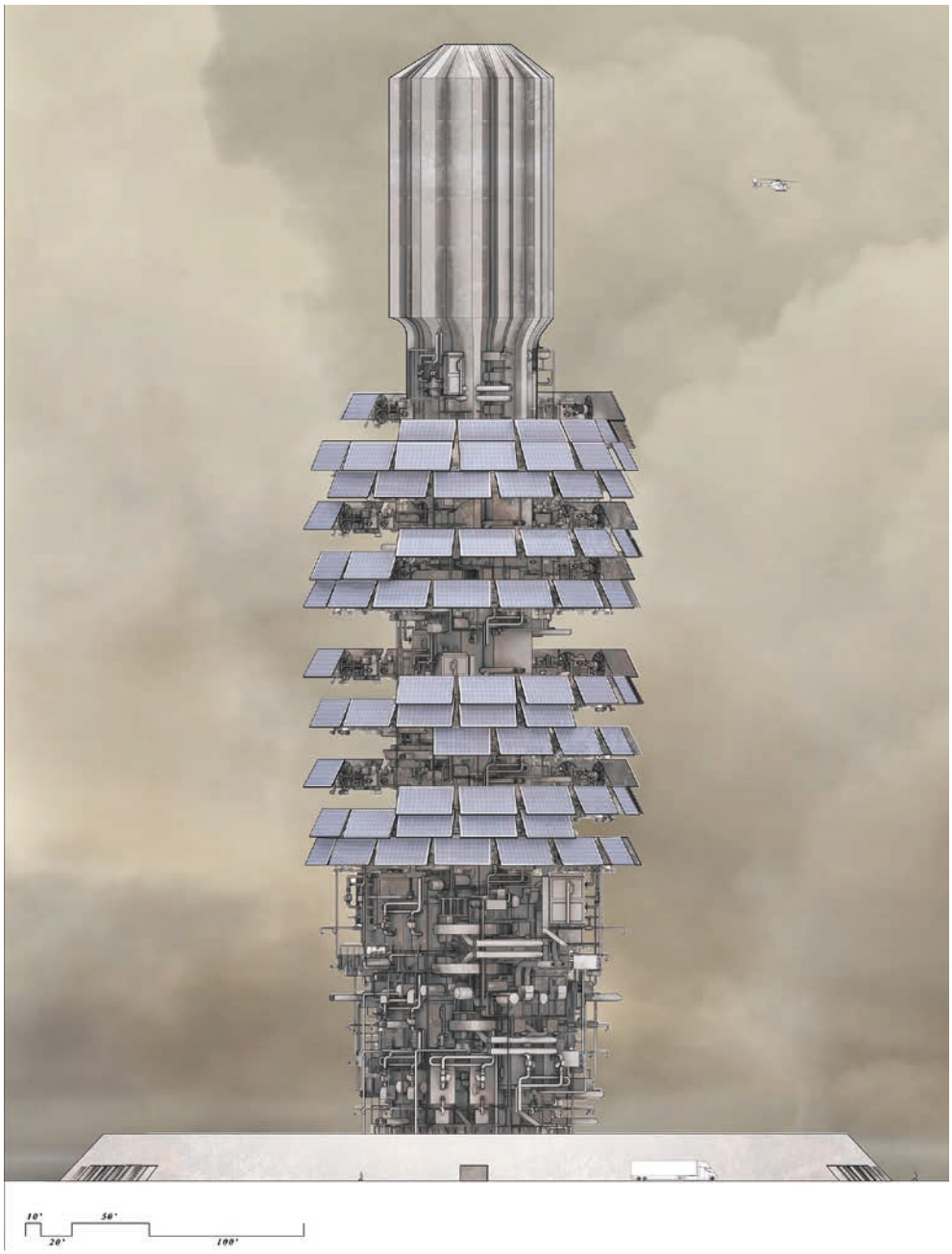

Figure 5. Green Air, mechanized tower, 2021.

if deployed throughout Imperial Valley, make it breathable once more. A closer inspection, however, reveals that the tower only cleans the air for it's one apartment, and that the residents of the Imperial Valley, those who suffer poverty, unemployment, and asthma at rates far higher than the rest of the country, are housed in the basement below (Fig. 6). At the top of the tower sits John Dales, in his single penthouse, a private aerie high above the polluted valley.[36] In this hermetic bubble it is no longer necessary to

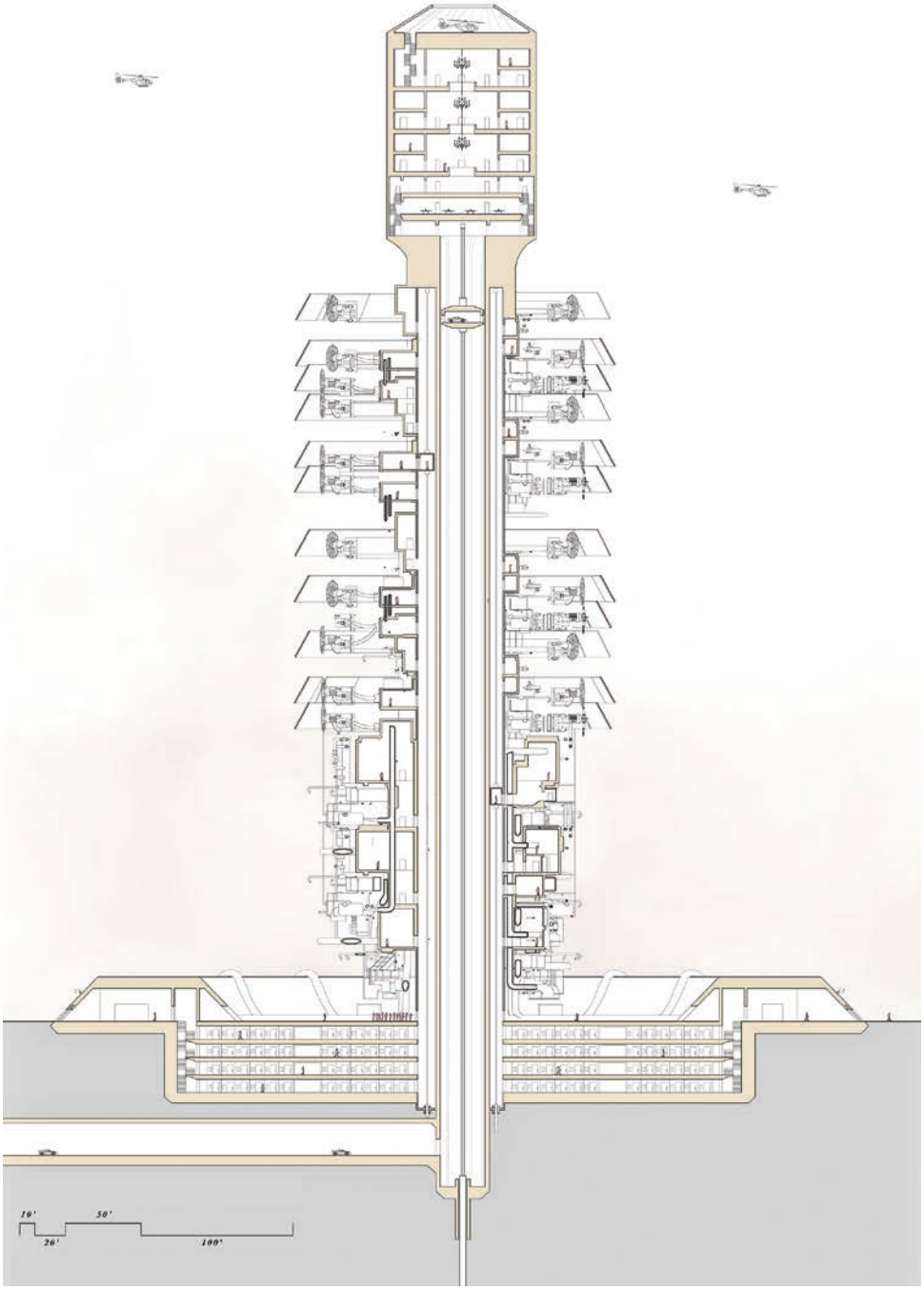

Figure 6. Green Air, mechanized tower section illustrating separation between penthouse and worker housing, 2021.

concern oneself with the high rates of asthma, bronchitis, and aerosolized carcinogens endured by the workers down below, only their labor matters. They are allowed tight, dark quarters below, out-of-site and out-of-mind, unimportant except for the wealth they produce, which allows the tower to exist (Fig. 7).

This project makes visible the inequalities inherent in cap-and-trade programs in which the $2 Billion agricultural market "rather than scientific expertise or democratic opinion decides who exercises this right." [37] The wealthy land-owner in his tower can afford to pay to offset their emissions and to avoid the pollutants emitted into the air, ground, and water from the fertilizer on their farms (Fig. 8). They can afford to "live elsewhere" protected from the immediate devastation, while those whose low-income labor they rely on for their wealth suffer the most harm. Despite its height, Green Air flattens the physical, cultural, and financial separation between the Geoengineers and the geo-engineered, in order to force us to see the often-unacknowledged side-effects of transforming the environment to meet human ends.

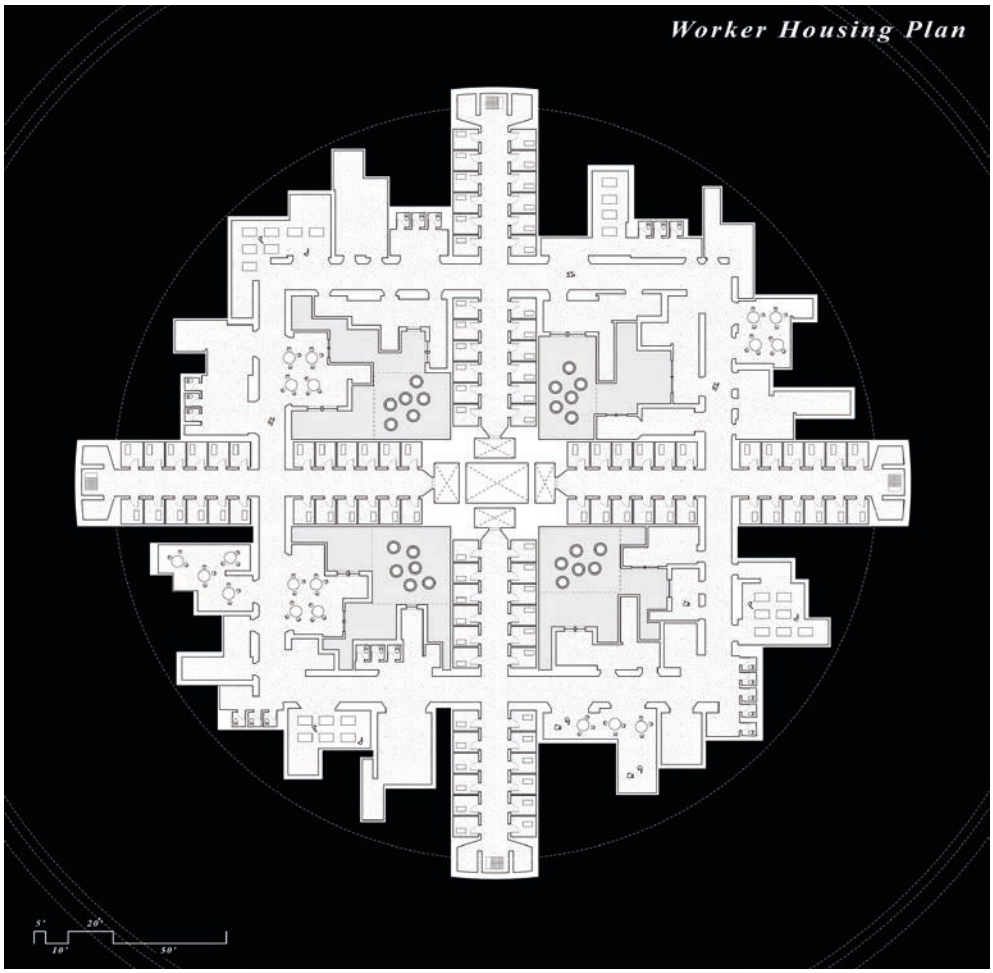

Figure 7. Green Air, worker housing plan, 2021.

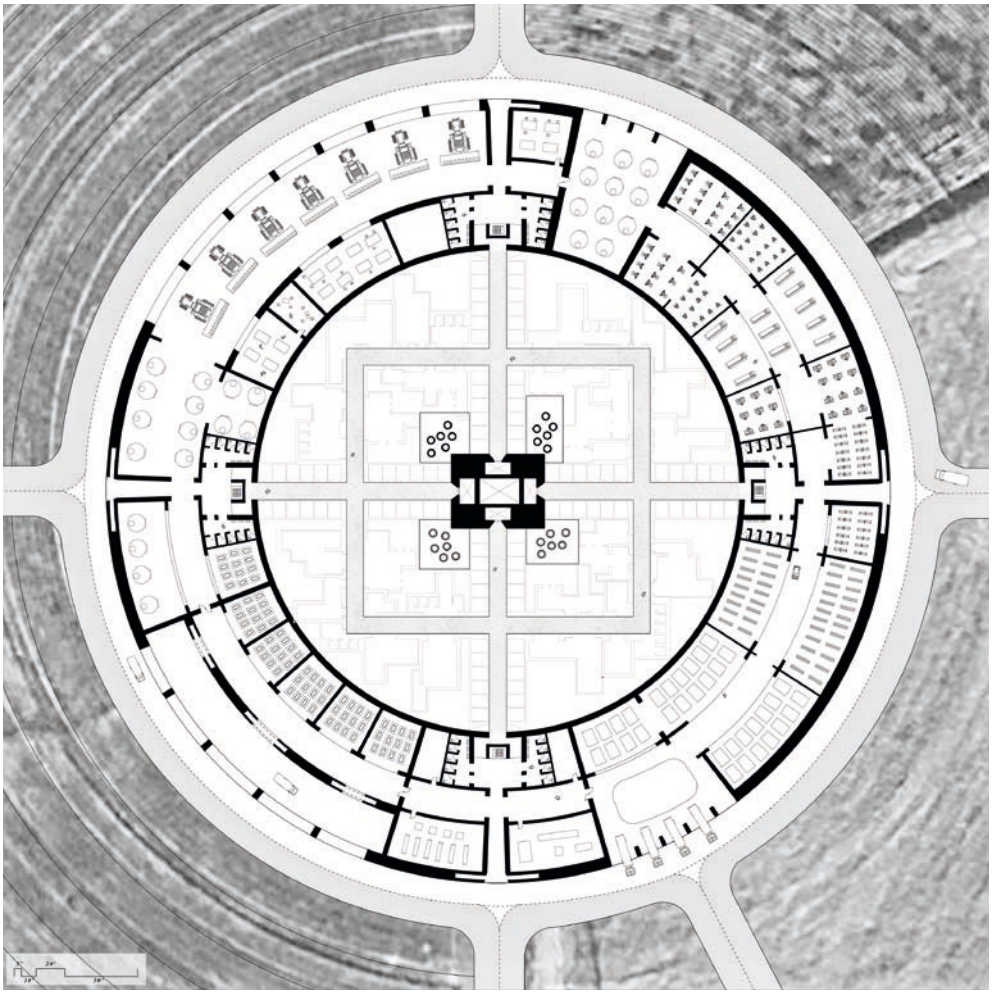

Figure 8. Green Air, tower base and farm site plan, 2021.

Green Power

The name Lithium Valley comes from the superheated lithium-rich brine used to create geothermal power at the Salton Sea Known Geothermal Area. This mineral dense brine, at times up to 30% solid, promises to produce a significant amount of lithium if energy companies can figure out how to separate the lithium from the other elements in it. There are several major corporations currently working on this project – including previously mentioned Controlled Thermal Resources, Warren Buffett's Berkshire Hathaway, which already owns eleven geothermal plants at the Salton Sea, and Energy Source, a company invested in by Bill Gates. Previously, in 2015, a fourth company called Simbol Materials announced that they had discovered a way to extract lithium from the brine, and were offered a $325 M buyout from Tesla before the deal fell through and Simbol went under.[38]

Green Power, calls into question, and makes visible, the potential hidden costs of this promised clean energy growth. The San Andreas fault line runs directly beneath the sea, and significant digging along the fault could trigger anything from minor to major seismic activity.[39] Further, the dredging up of geothermal brine brings with it a number of toxins, including some of the minerals in the brine itself, and additional heavy metals dug up as by products. Much of the material is returned to the earth with the brine once it has cooled, but many plants rely on tailings ponds to hold their heavy metal tailings and prevent them from leaching into the ground water. Just as with the Superfund sites created in Silicon Valley in the 1980s, residents and some local officials are concerned about the unintended environmental consequences of all this industrial activity. Lastly, while the geothermal brine is sourced from, and returned to, the earth, it can require up to tens of billions of gallons of water to cool the brine before reinjection. In an area like the Salton Sea where farmers, golf courses, and residents are already battling over access to clean water, what would it mean to siphon off a significant amount of what remains to cool additional geothermal plants? [40]

Green Power invokes Cedric Price's Fun Palace and the history of the Salton Sea by transforming the Known Geothermal Resource Area into a theme park. On display are innovations in clean energy side by side with the dying sea, the polluted air, heavy metal tailings ponds, and the impoverished Imperial Valley residents fighting not to be overlooked in the creation of Lithium Valley (Figs. 9, 10). Presented together it is difficult not to experience the simultaneous and conflicting histories driven by geo-engineering at the Salton Sea. By exposing to full view the inhumane and toxic conditions at the Salton Sea, Green Power asks us where our values lie.

Each of these projects questions the motivations behind geo-engineering and attempts to make visible the myriad social, economic, environmental, and cultural risks inherent in meddling with the environment. These are not proposals for what should be done, but fun-house mirror reflections of what

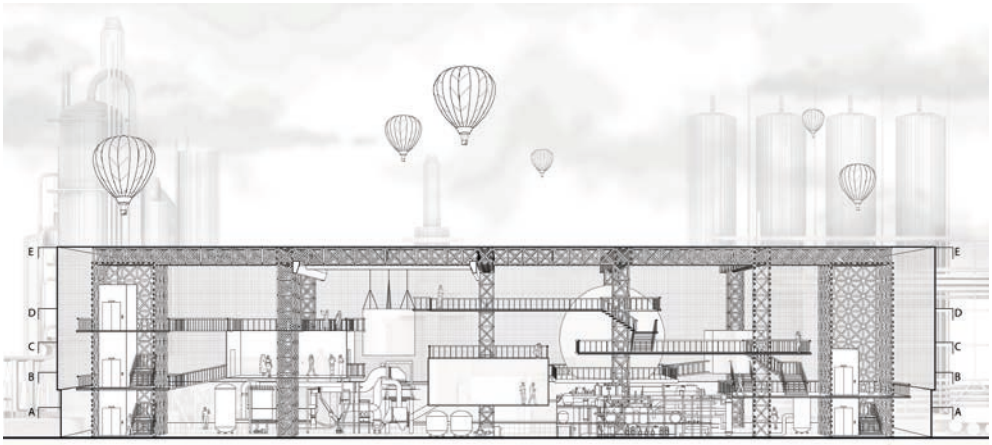

Figure 9. Green Power, Lithium Valley Fun Factory section, 2021.

Figure 10. Green Power, Lithium Valley Fun Factory, 2021.

we have already done and continue to do; this investigation of the Salton Sea, a region which seems to encapsulate the climate crisis in miniature, gives us new insight into the potential unintended consequences of geo-engineering.

CONCLUSION: THE ILLUSION OF CONTROL

Prediction was thought to be the key to weather control, and the key to prediction: modeling. Edward Lorenz was one of the many meteorologists

working on the question of weather prediction in the 1960s, but he eventually came to see things differently than his contemporary, Boris Lyubimov. “The average person, seeing that we can predict the tides pretty well a few months ahead would say, why can we not do that same thing with the atmosphere, it is just a different fluid system, the laws are about as complicated. But I realized that ‘any’ physical system that behaved nonperiodically [like the weather] would be unpredictable.” [41] Lorenz’s work illustrates that we have the technology to change the weather, to block the sun or seed the clouds, but if we do, there is no way to truly know what will happen next.

Solar Radiation Management, for example, might work, it might even work well, but it also might not. And no matter how many times we model it, there is no way of knowing what else it will do until it is tested on a planetary scale. By then it may be too late. As we rush to mitigate warming, it is important not to forget that we need the atmosphere to breathe, that the climactic engine on this planet is driven by the energy from the sun, and that the goal of Solar Radiation Management is to, literally, block out the sun. Even if it were attempted, over time anything we might inject into the stratosphere would disperse, requiring us to reinject additional aerosol every few years. The plan proposed by Harvard University’s Solar Geoengineering Research Program, for example, includes 4,000 flights in the first year, 8,000 in the second, 12,000 in the third, and so on until, after fifteen years, fleets of purpose-built, high-altitude tankers would make 60,000 flights annually.[42]

If all that sulphate remains in the stratosphere and does not sink down to terrestrial levels as Geoengineers claim, how long before the concentration of particles from thousands of flights blocks out too much solar energy? Will we then need to Geoengineer the skies clean again? If we are to inject the stratosphere with aerosolized sulfur without first reducing fossil fuel emissions, we might actually be increasing overall pollution. Meanwhile, sulfur is one of the many components of fossil fuel emissions that got us here in the first place. While there would be a certain poetic justice in fossil fuel pollutants being the thing that saves us from fossil fuel pollution, it seems better not to tempt fate.

At the Salton Sea, Aral Sea, and Owen’s Lake, we exerted “our ability to triumph over nature” at massive scales, to divert the natural course of rivers to irrigate otherwise dry areas. These geo-engineering projects were each pursued with noble goals – to control the flow natural systems to provide food and water to growing populations. But each effort brought with it disastrous unintended side effects: water shortages, dust clouds, dying lakes, and devastation to human and animal habitats. If these are the results of the rerouting of rivers, what will come of aerosol injection into the atmosphere, iron fertilization of the oceans, cloud whitening, or any of a dozen other high-tech schemes for engineering ourselves out of

a crisis we engineered ourselves into? Geo-engineering is a dangerous gambit, albeit one that humans have been and continue to be involved in since the beginning of civilization. As we consider the changing climate in the twenty-first century, we would do better to change our attitudes to be in tune with the ebbs and flows of the environment around us, to be more aligned with the shifts of geologic time, than to continue to work to bend the environment and the planet to our will. As shown by the Salton Sea, that way lies disaster.

Notes

1. Troy Vettese and Drew Pendergrass, *Half-Earth Socialism: A Plan to Save the Future from Extinction, Climate Change, and Pandemics* (Verso, 2022), 34.
2. James Gleick, *Chaos: Making a New Science* (Penguin Books, 2008), 18.
3. Fred Pearce, "Geoengineer the Planet? More Scientists Now Say It Must Be an Option," *Yale Environment 360*, May 29, 2019 – https://e360.yale.edu/features/geoengineer-the-planet-more-scientists-now-say-it-must-be-an-option.
4. For clarity I will use Geoengineering to refer to efforts specifically designed to mitigate global warming and geoengineering to refer to any human endeavor aimed at leveraging technology to reshape existing natural processes and phenomena to fit human needs and desires.
5. The idea that deserts are barren is a Western imaginary often used as a foil in arguments that they must be reclaimed. See previous *Journal of Architectural Education* issue "Deserts" 77, no. 2, Fall 2023 for more.
6. Charles C. Mann, *1491: New Revelations of the Americas Before Columbus* (Vintage, 2006), 5. This definition of geoengineering could even be extended to colonial expansion, 1493, Charles Mann's follow up to 1491 describes in detail the ways in which the events following the Columbian Expedition fundamentally transformed the world in which we live, not just culturally or politically, but environmentally as well. Charles C. Mann, *1493: Uncovering the New World Columbus Created* (Knopf, 2011), 3.
7. Svante Arrhenius, *Worlds in the Making: The Evolution of the Universe*, trans. H. Borns (Harper and Brothers, 1908).
8. David Lipsky, *The Parrot and the Igloo: Climate and the Science of Denial*, 1st ed. (W.W. Norton & Company, 2023), 102.
9. Ted Barrett, "Inhofe Brings Snowball on Senate Floor as Evidence Globe Is Not Warming," CNN Politics, February 27, 2015 – https://www.cnn.com/2015/02/26/politics/james-inhofe-snowball-climate-change/index.html. For climate change denialism see: Lipsky, *The Parrot and the Igloo*, 59-77. For record temperatures see: Rebecca Lindsey and Luann Dahlman, "Climate Change: Global Temperature | NOAA Climate.gov," National Oceanic and Atmospheric Administration, January 18, 2024 – http://www.climate.gov/news-features/understanding-climate/climate-change-global-temperature.
10. "2023 Was the World's Warmest Year on Record, by Far," National Oceanic and Atmospheric Administration, January 12, 2024 – https://www.noaa.gov/news/2023-was-worlds-warmest-year-on-record-by-far; "2024 Was the World's Warmest Year on Record," National Oceanic and Atmospheric Administration, January 10, 2025 – https://www.noaa.gov/news/2024-was-worlds-warmest-year-on-record.
11. "Solar Geoengineering Is Becoming a Respectable Idea."
12. Pearce, "Geoengineer the Planet?."
13. Vettese and Pendergrass, *Half-Earth Socialism*, 48.
14. "Why the Built Environment: Why Buildings, Why Infrastructure" – https://www.architecture2030.org/why-the-built-environment/, accessed January 28, 2024.
15. Henry Fountain, "In a First, US Declares Shortage on Colorado River, Forcing Water Cuts," *The New York Times*, August 16, 2021 – https://www.nytimes.com/2021/08/16/climate/colorado-river-water-cuts.html.
16. Traci Brynne Voyles, "Environmentalism in the Interstices: California's Salton Sea

and the Borderlands of Nature and Culture," *Resilience: A Journal of the Environmental Humanities* 3 (2015): 212 – https://doi.org/10.5250/resilience.3.2016.0211. For fish dying off, see: Diana Marcum, "7.6 Million Fish Die in a Day at Salton Sea," *Los Angeles Times*, August 12, 1999 – https://www.latimes.com/archives/la-xpm-1999-aug-12-mn-65092-story.html.
17. Lilian Manansala, "A Sea That Never Was and the Community That's Paying for It," *The Click*, December 14, 2020 – https://theclick.news/a-sea-that-never-was-and-the-community-that-is-paying-for-it/. For food desert, see: "Need in Imperial Valley," Imperial Valley Food Bank – https://www.ivfoodbank.com/about/need-in-imperial-valley#:~:text=Imperial%20County%20has%20the%20highest%20food%20insecurity%20rate%20in%20the,an%20active%20and%20healthy%20lifestyle, accessed January 12, 2024. For agriculture, see: Lindsey Fendt, "As the Salton Sea Shrinks, It Leaves behind a Toxic Reminder of the Cost of Making a Desert Bloom," Food and Environment Reporting Network, January 13, 2020 – https://thefern.org/2020/01/as-the-salton-sea-shrinks-it-leaves-behind-a-toxic-reminder-of-the-cost-of-making-a-desert-bloom/.
18. Ian James, "Golf a Major Drain on Palm Springs Area Water Supply," *The Desert Sun*, March 18, 2014 – https://www.desertsun.com/story/news/environment/2014/03/19/golf-major-drain-coachella-valley-water-supply/6594019/.
19. "US Department of Energy Analysis Confirms California's Salton Sea Region to Be a Rich Domestic Lithium Resource," Energy.gov, November 28, 2023 – https://www.energy.gov/eere/articles/us-department-energy-analysis-confirms-californias-salton-sea-region-be-rich-domestic.
20. David Ferris, "EV Deal Shows 'Lithium Valley' Could Be for Real," *POLITICO*, July 7, 2021 – https://www.eenews.net/articles/ev-deal-shows-lithium-valley-could-be-for-real/.
21. Evelyn Nieves, "The Superfund Sites of Silicon Valley," *The New York Times*, March 26, 2018 – https://www.nytimes.com/2018/03/26/lens/the-superfund-sites-of-silicon-valley.html.
22. Irene Guenther, "Magic Realism in the Weimar Republic," in *Magical Realism: Theory, History, Community*, Lois Parkinson Zamora and Wendy B. Faris, eds. (Duke University Press, 1995), 34. Art critic Franz Roh coined the term *Magischer Realismus* in 1925. That same year Gustav Hartlaub curated an art exhibition featuring many of the same artists of which Roh wrote, but he called the style *Neue Sachlikheit*, or New Objectivity.
23. Theo L. D'Haen, "Magical Realism and Postmodernism," in *Magical Realism*, 195.
24. Wendy Faris, "Scheherazade's Children," in Magical Realism, 167–74.
25. Nicholas Mirzoeff, ed., *The Visual Culture Reader*, 3rd ed (Routledge, 2013), xxx.
26. Faris, "Scheherazade's Children," 179.
27. Michael Zelenko, "As California's Largest Lake Dries Up, It Threatens Nearby Communities with Clouds of Toxic Dust," *The Verge*, June 6, 2018 – https://www.theverge.com/2018/6/6/17433294/salton-sea-crisis-drying-up-asthma-toxic-dust-pictures; and Hector Becerra, "Salton Sea Confirmed as Source of LA Basin Smell," *Los Angeles Times*, September 12, 2012 – https://www.latimes.com/archives/la-xpm-2012-sep-12-la-me-smell-20120912-story.html.
28. Including, in 1887, a fifteen mile stretch of canal that was routed south of the US-Mexico border before turning north again and back into the United States, transgressing acknowledged international borders to relocate vital resources for the former at the expense of the latter.
29. Voyles, "Environmentalism in the Interstices," 215–23.
30. "Quantification Settlement Agreement," Water Education Foundation, June 22, 2020 – https://www.watereducation.org/aquapedia/quantification-settlement-agreement.
31. Jorge Luis Borges, "On Exactitude in Science," in *A Universal History of Infamy* (Dutton, 1972).
32. Vettese and Pendergrass, *Half-Earth Socialism*, 34.
33. Timelapse – Google Earth Engine, "Aral Sea" – https://earthengine.google.com/timelapse#v=44.92322,59.69655,6.071,latLng&t=3.63&ps=50&bt=19840101&et=20221231.
34. "Owens Lake," in Wikimedia Foundation, last modified December 5, 2023 – https://en.wikipedia.org/w/index.php?title=Owens_Lake&oldid=1188516494.
35. Zelenko, "California's Largest Lake." For Owens Lake, see: "Owens Lake." For Salton Sea, see: Voyles, "Environmentalism in the Interstices," 226–27. For Aral Sea see: "Aral Sea," Wikimedia Commons, last modified January 21, 2024 – https://en.wikipedia.org/w/index.php?title=Aral_Sea&oldid=1197766930.

36. Vettese and Pendergrass, *Half-Earth Socialism*, 48. John Dales devised Cap-and-Trade in 1968.
37. Ibid.
38. David R. Baker, "California's Salton Sea Could Contain Lithium for Electric Car Batteries," *Bloomberg*, November 19, 2020 – https://www.bloomberg.com/news/features/2020-11-19/california-s-salton-sea-could-contain-lithium-for-electric-car-batteries. For lithium extraction process see: Sammy Roth, "Lithium Will Fuel the Clean Energy Boom. This Company May Have a Breakthrough," *Los Angeles Times*, October 14, 2019 – https://www.latimes.com/environment/story/2019-10-14/california-lithium-geothermal-salton-sea. For billionaire investments see: Kevin Fitzgerald, "Welcome to Lithium Valley: One of the World's Largest Lithium Deposits Is Located at the Salton Sea – and the Potential Economic Ramifications Have Drawn Comparisons to Silicon Valley," Coachella Valley Independent, June 14, 2021 – http://cvindependent.com/2021/06/welcome-to-lithium-valley-one-of-the-worlds-largest-lithium-deposits-is-located-at-the-salton-sea-and-the-potential-economic-ramifications-have-drawn-comparisons-to-silicon-valley/.
39. Brooke Staggs, "Could the Rush for Lithium near California's Salton Sea Trigger Earthquakes?," May 30, 2023 – https://phys.org/news/2023-05-lithium-california-salton-sea-trigger.html. Bettina Boxall, "Geothermal Plants Trigger Small Quakes near San Andreas Fault," *Los Angeles Times*, July 11, 2013 – https://www.latimes.com/local/la-xpm-2013-jul-11-la-me-geothermal-earthquakes-20130712-story.html.
40. Ivan Penn and Eric Lipton, "Lithium Mining Projects May Not Be Green Friendly," *The New York Times*, May 6, 2021 – https://www.nytimes.com/2021/05/06/business/lithium-mining-race.html; Julie Cart, "Will California's Desert Be Transformed Into Lithium Valley?," *CalMatters*, February 25, 2021 – https://calmatters.org/environment/2021/02/california-desert-lithium-valley/.
41. Gleick, *Chaos*, 18.
42. Fred Pearce, "Geoengineer the Planet?"

Credits

Figure 1: image by © Jingwei Cao.
Figures 2, 9 and 10: images by © Laura Duke.
Figure 3: image by © Tyler Bernier.
Figure 4: image by © Nanditha Rayudu.
Figures 5–8: images by © Kyle Lenihan.

Hannibal Newsom is an Assistant Professor at the Syracuse University School of Architecture and a licensed architect in New York State. His research and teaching focus on the development of small-scale community-oriented construction and design-build projects, while inviting students to engage in complex social and political contexts through design. He is the founder of Mago Architecture, an architecture and design firm based in New York City and Syracuse, New York. He has taught at Syracuse University, Pratt Institute, the University of Pennsylvania, and Washington University at St. Louis. E-mail: hnewsom@syr.edu