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Energy Overlays
Civic Art for a Circular Economy (2018)

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"The next culture will be a culture of 'stewardship,' the energy driving it will be renewable, and the art it produces will be quite different from the art favored by production and consumption cultures."
— Margaret Atwood on the writing of Barry Lord[1]

"All life is a struggle for free energy." — Leslie White[2]

More than a decade after the release of Al Gore's *An Inconvenient Truth* there remains a vocal segment of the public who are unmoved by images showing rising sea levels and global heat map projections. Talk of mass extinction events and droughts still does not seem to motivate many of us to take civic action to protect the climate. In some cases it can have the exact opposite effect, either entrenching denial or causing political paralysis in the face of the problem's enormity. The scope of climate change leaves many feeling un-empowered as individuals to make a difference.

It pains us to hear such acquiescence on display, like the time we casually remarked about the unusual weather we were experiencing during the week of one of our LAGI workshops. A 14-year old girl responded in earnest, "I heard the world is ending because of the climate."

What if instead we could change the message of fear and disaster into one of hope and optimism—an inspirational message about the greatness of a post-carbon future? What if rather than show disaster images to run away from, we could instead design a future that people desire to run towards? What if we changed the conversation about gloom and doom to one of beauty and cultural transformation? While science communication has enlightened the world and brought us to where we are today in the climate debate, it is the humanities and the arts that make us unique and that remind us of what is worth saving for tomorrow.

Culture and energy are two sides of the same coin, but as a consequence of this geometry they rarely catch a glimpse of one another. We know that fuel and electricity keep the lights bright upon our stages, the welding torches lit, and our audio visual equipment humming. It is energy that makes it possible to turn four billion trees every year into magazines, journals, paper, and books.[3] Culture can be thought of as a reflection of a society's ability to orchestrate the use of energy beyond that required for the most basic human survival.

For millennia following the advent of agriculture, cultures of opulence were made possible through the exploitation of the energies of wood fuel, animal and slave labor, water wheels, windmills, turpentine, and whale oil. Today, we live at the tail end of a petroculture[4] in which the patronage of the arts and the production of art is deeply rooted in the extraction and burning of fossil fuels.[5] The same is true for all aspects of our culture from food to architecture, from travel to communications.

Throughout the 20th century, the rapid expansion of available energy through an uptick in fossil fuel extraction resulted in a massive explosion of human culture, invention, and creativity. Our task in the twilight of this petroculture is to ensure that we maintain a high level of human connectedness and beauty as we intelligently transition to new forms of energy and ways of producing and consuming.

While our culture is a reflection of our energy use, the way that we decide to produce and consume energy is also a reflection of our culture. To change one is to change the other. Often the solutions to climate change and resource scarcity are framed as scenarios in which the act of energy transition drives cultural shifts (we will need to conserve energy, use less material, limit our lifestyles), but the key to success may lie in understanding that culture has its own agency. In this equation, culture leads and transition follows.

Your house is an open system. You can transfer things from the grocery store to your kitchen and you can take your trash to the curb where it disappears from your worries. The planet Earth is a closed system. It has a finite barrier (the ionosphere) beyond which nothing much leaves (other than one-way rockets and reflected radiation) and almost nothing enters besides a few asteroids, some tired old space junk, and radiation energy. If the Earth runs out of something—say a species of life for example—she doesn't have a neighbor she can go and borrow from.

Inside an open system, rapid change can be adapted to rather easily (the indoor air temperature rises and you can open some windows or turn on the air conditioner). In a closed system there are strict limits to how rapidly change can be adapted to and to how quickly things can be consumed. We can't just open the windows on the planet.

But nature is resilient. Over geological time periods she has adapted many times to major changes in the system, from a planet with no ice to a planet in deep freeze and back. Throughout these shifts, the depth of Earth's oceans has varied dramatically across hundreds of feet in elevation, which was fine for the fish, and the land animals slowly shifted their habitat inland as required.

Closed systems are like islands where over-extraction of natural resources can lead to their fast disappearance. It's the repeated story of overfishing, and the plight of whales in the 19th century. We can read the long history of extinction events when rapid changes to natural systems have taken place on Earth before (asteroids, volcanic eruptions, etc.), and we want to make sure that humans are not soon next on the list, victims of a new kind of rapid change to natural systems brought on by the pollution of our atmosphere from fossil fuel combustion.

It makes sense that exponential expansion (an open-ended approach to population growth and resource extraction) within a closed system is not something that can go on forever. Before you realize it is happening, it may already be too late. Take Bartlett's beaker,[6] which illustrates the inability of the human mind to appreciate exponential growth in a closed system. A glass cylinder with a bacteria that doubles in population every minute will be half full at 59 minutes and full at 60 minutes. At 55 minutes it will be only 3% full. Mankind is akin to the bacteria, and the Earth is our glass cylinder, but the clock is well past minute 59.

Unfortunately, the evolutionary process of natural selection did not instill in us an innate desire to consume less or to live within our tiny slice of the planet's carrying capacity. In fact, cultural norms, moral codes, and ways of thinking that have evolved over the past thousand years tend more aptly to reinforce the opposite of stewardship. Instead they reinforce dominion over the Earth and tell us that her resources are at our disposal.

In order to bring forward new ways of thinking it falls to the creators of culture today to educate, inspire, and manufacture a desire for sustainable economic systems-—to popularize an aggressive platform towards decarbonization. While individual behaviors may be increasing energy efficiency within certain segments of the population, the upward trajectory of our global per capita carbon footprint is showing no signs of slowing down. As of the writing of this introduction in the summer of 2018, the emissions of carbon dioxide into the Earth's atmosphere have yet to peak. In 2017 we pumped out 32.5 billion metric tons of carbon according to the International Energy Agency[7]—a 1.4% increase over the previous year.

History shows that humans are not naturally inclined to make sacrifices of our own initiative. As Margaret Atwood puts it in her 2015 essay I*t's not Climate Change—It's Everything Change*,[8] "Unfortunately, like every other species on the planet, we're conservative: we don't change our ways unless necessity forces us." Atwood stakes out the

opposite poles of potential post-carbon future scenarios—one extreme in which we transition in a measured, peaceful, and thoughtful way, replacing all of our sources of energy with clean and sustainable technologies, and the other extreme in which a sudden collapse of energy coupled with unchecked anthropogenic climate change leads to massive starvation, collapse of governments and police protection, and mass migration.

We can hope that most of us are not rooting for the apocalyptic social collapse scenario, and yet we live in a world in which energy policy remains "grounded in fear of deleterious change in life-styles and options."[9] There is a paralyzing worry that to truly become decarbonized, we must sacrifice quality of life—a sentiment deeply reflective of our culture of consumption.

One of the bedrocks of contemporary human culture is free-market capitalism—an economic system that came to maturity during the last great energy transition, as the limitations that river waterwheels placed on production and labor gave way to the unfettered expansion offered by the coal-fired steam engine.[10]

It is an open question whether the profit motive of corporations and social entrepreneurs can possibly bring about a post-carbon and resource-sustainable economy. Today the responsibility lies with the established leaders and organizations that sit atop the global economic hierarchy to put forward an honest and workable plan that starts today and concludes no later than the year 2050 with a fully decarbonized and circular global economy. So far it seems that these institutions are incapable of doing so because their fundamental value structure is intrinsically petrocultural in its relationship to energy and deeply colonial in its relationship to social and natural resources.

Scientific consensus tells us that time has already run out on the stated decarbonization goal—that the existing targets (including those established at COP 21 in Paris) are not at all sufficient.[11] Capitalism, if it is to live up to its promise to make the world a better place for the greatest number of people, should welcome a greater degree of transparency, social responsibility, regulation of pollution and resource extraction, and adopt valuation systems that recognize natural capital and strictly enforce the social and environmental cost of carbon. It must deal directly and honestly with its existential reckoning with the limits of planet Earth to endlessly supply the raw natural resources and handle the toxic waste streams that make possible capitalism's continuous growth. Unfortunately, there does not seem to be a recognition of these facts among policy makers and certainly not in popular culture.

There are many influential people who are openly hostile to what it might mean to transition to a steady state of economic activity—a circular economy—that does not rely on the percentage increase in production and consumption (GDP) as its rubric of "success." Today, the things that we measure the health of our economy by are not measures of social health and human welfare. Instead, our definitions of success are grounded in a culture of consumption. Depending on your world view, an economic system designed to respect the Earth's carrying capacity can be described as a "culture of stasis" or as a "culture of stewardship." As long as maximizing economic growth remains the standard by which policies are made, we will be powerless to stop the more apocalyptic scenarios from unfolding when we are no longer able to rely on carbon fuel.

First we change the culture. Then the technology will be rapidly adopted and implemented as we make policy decisions based on new definitions of what is "valuable" and what investments in infrastructure "cost."

What does a post-carbon culture of stewardship look like, and can we begin living it today?

Individuals could be incentivized to be responsible for contributing to the installation, connection, and maintenance of up to five kilowatts of solar power plus storage at some point during their lifetime, or some average equivalent related to a determined percentage of income.[12] For less than the cost of a new car, this action taken collectively would result in a 100% energy transformation over a generation. This is not the yet the kind of culture we live in, but it could be. What would your 5 kW installation look like? Would it be a work of art?

In a culture of stewardship we could make solar modules the most popular canvas upon which to create mural programs in cities around the world.[13]

In a post-carbon culture we will stop dreaming about a world with limitless growth and domination over non-renewable resources. We will instead celebrate the transition from a linear economy to a circular economy,14 from a world that extracts resources without limits and dumps unwanted and toxic materials into rivers, oceans, and landfills to a world that manages the harvesting of renewable natural resources and finds ways to create feedstocks for new industries from the waste streams of others.

With the technology available to us, with the political will to enact public policies that place a reasonable check on extractive, polluting, and exploitative systems of commerce and goods production, and with an economic system that factors natural capital into all measurements of gross domestic product, this wonderful planet—the only one we can be sure that we will ever have—can share its abundance more equitably across world populations in support of more fulfilling human quality of life.

Scientists tell us that we can do it. Engineers have already patented the solutions. All we need now is for people to demand change and hold those in positions of power accountable. This is where the present cultural chasm seems unbearably great. The inertia of the status quo is incredibly persuasive and policymakers still seem to not understand (or choose to ignore) the simple math of sustainability in a closed system like planet Earth.

Thought leaders, influencers, and the post-industrial monopolists too often unthinkingly operate within a culture of decision making that prioritizes shareholder profit and increased stock valuation over all other considerations. There seems to be a lack of imagination of what a world could look like in which we achieve harmony with natural resources in a steady-state of feedback-conscious living, taking care to not over populate or over consume so that many generations can all find happiness in a world of plenty.

In fact we do live in a world of plenty and the carrying capacity of the Earth is impressive. We have the technology today to bring this prosperous net-zero world about by harnessing the energy of the sun, the wind, and the water.[15]

While "the constraints of the biosphere are fixed,"[16] the available freshwater, fertile land for food production, and raw materials of the planet are sufficient, according to Harvard University sociobiologist E.O. Wilson, to sustain about 10 billion people while leaving half of the world's land area as nature preserve. This vision will only be possible if all 10 billion people are vegetarian and live in a post-carbon culture of stewardship that practices sustainable resource management and strictly limits the ability of corporations to pollute the environment. This is little consolation to the populations of vertebrate species who have already declined by 58 percent between 1970 and 2012, the start of the planet's sixth great mass extinction event brought to you by human activity.[17] With the present dominant popular culture that celebrates the excessive consumption habits of the world's top billion, we have in effect already maxed out the carrying capacity of the Earth, using 1.7 Earths every year.[18]

If we can't rely on scientific literacy to influence debate, and we can't rely on people to make personal sacrifices to their own standard of living, and we can't rely on governments to sagely enact environmentally-sound public policy that makes it too expensive to pollute, then what and who can we rely on?

When civil discourse can no longer root itself in fact-based arguments, then what we need is a recipe for an "argument-free" cultural shift. You don't have to convince people to adopt mobile phone use because of an intellectual or moral argument on the subject of human connectedness and knowledge sharing. People adopt mobile phones because it brings with it convenience, beauty (a nice and small package with no wires), and enhances quality of life. Tesla has begun to show the efficacy of this approach with their electric vehicles and more recently their solar roof.

Designers around the world are starting to make sustainability sexy. We need more of this. We have to show that a culture of stewardship supports lifestyles that are happier and healthier than we can ever hope to achieve in a petroculture.

We need every cultural tool of influence at our disposal and all creative hands on deck. One such tool—and one of the most visible—is the design of public space and our built environment.

Now that we know the fragile nature of the closed system of our biosphere, and that it can no longer handle additional external inputs, the goal for designers in our newly enlightened world should be to ensure that the systems of human survival that they contribute to are as close as possible to closed systems within themselves. We need no longer rely on externalizing waste streams or importing raw materials and energy. If we are designing a building or a city district, let us make it a fully regenerative one that takes advantage of available sunlight and other natural energies to power itself and clean its own water. If we are designing an industrial system or a set of public policies, let us make them compliant with the rules of a circular economy. Let's ask that lawmakers codify these requirements into new building codes and ordinances so that we can change the culture of building.

If we are designing a work of civic art or a public park, let us make it regenerative as well. Let's use sustainable materials and think about how it gives back to the needs of people and the needs of its environment. Every new urban development and plan should aspire to be zero carbon over its lifecycle and meet the most stringent standards of circular economics, regenerative design, and aesthetics.

When people come together with passion around the goal of creating a better world for themselves and for their children there is no limit to what we can accomplish. The infrastructures that we constructed in the 19th and 20th centuries have taught us many lessons that we can now apply to the infrastructure of the 21st. When we landed on the moon and safely returned to Earth we demonstrated that no goal is too ambitious. The space program was perhaps the most ambitious undertaking within the culture of consumption and fossil fuel energy. In a culture of stewardship, will we implement programs just as ambitious to bring about the clean energy and circular economy transition?

When we established the Land Art Generator Initiative (LAGI) in 2008, we were not yet thinking about how the project fit within the establishment of a culture of stewardship. We were looking back at the most inspiring cultural achievements of the 20th century, and the Land Art movement stood out to us as one of the most profound. While its foundation in the 1960s is also rooted in the petroculture of consumption and the domination of mankind over nature, it holds within its manifesto the potential to do well for the planet. The ability of large-scale site specific landmark works of art—the wonders of the ancient world and the wonders of the modern world—to influence culture can't be denied.

What do wonders of the post-carbon world look like? How can we inspire the design and construction of regenerative works of large-scale public art that give back real and sustainable infrastructural needs for human survival? If every city had at its centerpiece of development an iconic renewable energy power plant that functionally met the needs of its citizens, would this not help to usher in the kind of culture of stewardship that is so critical to pulling humanity back from the brink of a catastrophe born of previous cultural movements?

Ten years on from the founding of the LAGI idea[19] and eight years from the launch of our first open-call design competition, we can honestly say that the response to this invitation has exceeded our wildest dreams. When we see the beautiful designs come in every two years, it confirms the validity of the LAGI project and gives us great hope for the future. We are already seeing new art forms and trends emerging in public space. Throughout the portfolio of LAGI design ideas, you can see a tendency to celebrate the sun-facing plane, to harness the kinetics of spinning nodes and waving poles, to encourage the playful engagement of human energy with public art, and a focus on art's important role in teaching us about ourselves.

While civic artwork and the design of public places are important drivers of popular culture, the Land Art Generator Initiative also demonstrates models of educational tools for a post-carbon culture. This year's educational material for LAGI 2018 is a set of playing cards that feature design submissions from past LAGI competitions. The game asks you to "play to zero to win the great energy transition." Through the act of play we strengthen our memory. The game requires players to speak aloud the new technologies that will be key to a clean energy transition as they look for card matches. It reinforces the value of "zero" as a positive cultural meme so important to understanding a circular economy—one in which we do not pollute our environment because we use biodegradable materials and reduce our waste streams to zero.

Detailed in the pages of this book are examples of what civic artwork for a circular economy looks like. As primary media for creative expression the participants in LAGI 2018 use the energy of nature itself—incorporating all types of solar, vertical and horizontal axis wind, high altitude kites, kinetic harvesting, triboelectric fabrics, and urban algae farms, to name a few. Their narratives weave the inherent qualities of these new technologies into the deep history of St Kilda Triangle.

That history is carefully portrayed in the opening pages of this book by David Helms, a life-long resident of St Kilda who has put together a narrative of this beautiful coastal suburb of Melbourne and the St Kilda Triangle site. The participating teams in LAGI 2018 responded to the rich site history in their designs and have proposed their own next chapter to continue its legacy for generations to come.

Carbon Arts is a public art consultancy that brings forward works that engage people "in imagining and shaping a more sustainable future."[20] The founder, Jodi Newcombe, provides a thoughtful and expansive definition of what artists and arts organizations can do to help bring about and support a culture of stewardship. Her writing is a rallying cry for building the kind of bold and ambitious regenerative artworks and beautiful systems of power generation infrastructure that can help to catalyze lasting cultural and societal change.

Andrew Dana Hudson provides his own contribution to this new culture of stewardship with a short story set in the year 2040. In a world in which the energy transition is nearing completion, he asserts that society places great value on those whose lives are dedicated to caring for our cherished infrastructures. Hudson's work is at the cutting edge of a new wave of fiction, sometimes referred to as "solar punk" or "cli-fi" where young writers who stand to inherit a broken planet are presenting potential near-futures imaginaries and positive science fictions that are imminently achievable—a kind of cultural blueprint for action. His beautiful glimpse into life in future cities in *The Lighthouse Keeper* will leave you wanting to live in that world, desiring to experience the wonder of the Land Art Generator installations that define the sustainable landscape of St Kilda at the middle of the century.

Energy Overlay, n. the superimposition of energy and art onto an emerging masterplan for urban regeneration.

LAGI 2018 overlays the climate policy goals of the State of Victoria onto the planning vision of the people for a site at the heart of their community, and it does that by bringing forward innovations in the design of renewable energy infrastructure.

The teams were asked to propose an art and energy overlay onto the 2014 Council-approved masterplan for the St Kilda Triangle site. The masterplan, referred to as "The Purple Document" is the result of a co-design process with the community, the standards of which were enforced by an engaged and enlightened public. The entries to LAGI 2018 are a reflection of a spirit of civic engagement so vibrant in the City of Port Phillip. In keeping with St Kilda's great urban planning tradition, the community is demanding a civic place that is timeless, beautiful, lasting, sustainable, and regenerative. The LAGI 2018 proposals present hundreds of fascinating and cutting-edge design ideas for how to carry that vision forward. Now it is up to the community once again to decide the best course of action to ensure that St Kilda Triangle lives on as a cherished and frequented destination for generations to come.

1 Margaret Atwood, "It's Not Climate Change—It's Everything Change," *Medium*, July 27, 2015, https://medium.com/matter/it-s-not-climate-change-it-s-everything-change-8fd9aa671804.

2 Leslie White, Ethnological Essays, eds. Beth Dillingham and Robert L Carniero (Albuquerque: University of New Mexico Press, 1987), 118, quoted in Dominic Boyer, "Energopower: An Introduction," in *Energy Humanities: an Anthology* (Baltimore: Johns Hopkins University Press, 2017), 185.

3 Sam Martin, "Paper Chase," *Ecology Global Network*, September 10, 2011, http://www.ecology.com/2011/09/10/paper-chase.

4 Whether limited by available oil, gas, and coal reserves, or by the carbon bubble of atmospheric limits to climate resilience.

5 For a publication that explores big oil's sponsorship of the arts: *Not if but when: Culture Beyond Oil*, eds. Jo Clarke, Mel Evans, Hayley Newman, Kevin Smith, Glen Tarman (UK: Art Not Oil, Liberate Tate, Platform, December, 2011), https://platformlondon.org/cbo.pdf. Liberate Tate's six-year campaign successfully say BP withdraw its sponsorship of the Tate London in 2016.

6 Professor Allen Bartlett, University of Colorado at Boulder.

7 Global Energy & CO2 Status Report: The latest trends in energy and emissions in 2017," International Energy Agency, last modified March, 2018, https://www.iea.org/geco/emissions.

8 Margaret Atwood, "It's Not Climate Change—It's Everything Change," *Medium*, July 27, 2015, https://medium.com/matter/it-s-not-climate-change-it-s-everything-change-8fd9aa671804.

9 Laura Nader, *The Energy Reader* (Oxford: Wiley-Blackwell, 2010), 241, quoted in Dominic Boyer, "Energopower: An Introduction," in *Energy Humanities: an Anthology* (Baltimore: Johns Hopkins University Press, 2017), 187.

10 Andreas Malm, *Fossil Capital: The Rise of Steam Power and the Roots of Global Warming* (London: Verso, January 12, 2016).

11 United Nations Environment Programme, **The Emissions Gap Report 2017**, (Nairobi: UNEP, 2017), https://www.unenvironment.org/resources/emissions-gap-report. The report addresses the gap that exists between the 2 degree goal of the Paris Agreement and the Nationally Determined Contributions (NDCs) of governments. It does not address the unsustainable relationship between exponential growth and the carrying capacity of the Earth's natural resources.

12 5 kWp x 300 million US citizens = 1,500 GWp solar power capacity. As of 2016, the total electrical generator nameplate capacity of all US energy sources was 1,177 GWp per the US Energy Information Agency, "Electricity Data," https://www.eia.gov/electricity/data.php#gencapacity. 5 kWp is the size of the solar sculpture that Land Art Generator installed with the young participants of the 2015 Art+Energy Camp in Pittsburgh, PA (http://artenergycamp.org).

13 More information can be found at http://solarmural.com.

14 More information about the circular economy can be found at the Ellen MacArthur Foundation's website, https://www.ellenmacarthurfoundation.org.

15 Mark Z. Jacobson, Mark A. Delucchi, Mary A. Cameron, and Bethany A. Frew, "The United States can keep the grid stable at low cost with 100% clean, renewable energy in all sectors despite inaccurate claims," *Proceedings of the National Academy of Sciences*, June 2017, 114 (26) E5021-E5023; DOI: 10.1073/pnas.1708069114.

16 Edward O. Wilson, *The Future of Life* (Knopf, 2002), and *Half-Earth: Our Planet's Fight for Life* (Liveright, 2017).

17 World Wide Fund For Nature, "WWF Living Planet Report 2016," https://c402277.ssl.cf1.rackcdn.com/publications/964/files/original/lpr_living_planet_report_2016.pdf.

18 "Overshoot Day" is August 1, 2018. That is the day that "humanity's demand for ecological resources and services in a given year exceeds what Earth can regenerate in that year." The equation is: "(Planet's Biocapacity ÷ Humanity's Ecological Footprint) x 365 = Earth Overshoot Day." https://www.overshootday.org.

19 "The Time Is Now," *That Fleeting Moment*, DUCTAC (Dubai Community Theater and Arts Center), Dubai, February 2009.

20 Jodi Newcombe, Carbon Arts, http://carbonarts.org.