Regenerative Infrastructures (2012)

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We are thrilled to present this selection of submissions to the 2012 Land Art Generator Initiative (LAGI) ideas competition for Freshkills Park (the former Fresh Kills Landfill) in New York City. In choosing a title for this compendium of design ideas we focused on the term "regenerative" for a number of reasons. Conceptually expansive, it encompasses the idea of clean energy generation, while it also calls to mind holistic notions of healthy cities and place-making, the permaculture ideal for human ecologies, adaptive re-use and reclamation, biomimetics, and a long-view approach to design. LAGI, and the teams who participate in its competitions, bring all of these ideas to the discussion of the evolution of design archetypes within renewable energy and other infrastructures in a sustainable city.

Cities are complex organisms with elaborate and interconnected distribution networks for energy, information, housing, transportation, resources, and much more. As a living organism, a city exists in the natural environment and can be most efficient and healthy when it establishes harmony and symbiosis with that environment. A city basks in the sunshine, it feels the movement of the air, and it intimately experiences the workings of the rain and water flow. A living city is nurtured by its inhabitants and by natural energies. At a slightly smaller scale, all of these eco-systemic relationships exist within each building, streetscape, and park space.

Over the past decades, sustainable design principles have been adeptly applied to the fields of architecture and landscape architecture. It is taken as an assumption that any new construction will begin the design process with sustainability goals in mind, and examples of net-zero-energy and net-zero-water buildings are being commissioned with more frequency. The terms "living" or "regenerative" have been applied to those exemplary works of architecture that are considered self-sustaining, requiring little or no input from external resources (energy, water, and even food). Ideally, these buildings also take into consideration their own embodied carbon footprint (the resources used in their construction) and work to settle that energy balance sheet over their entire life cycle by regularly giving back some amount of unused resources that have been generated on site.

Along the way, this revolution in the building industry has been facilitated by a perfect partnership of new and old techniques. Innovations in technologies such as building-integrated photovoltaics, heat exchangers, and building envelope engineering have combined with vernacular technologies such as passive heating and cooling to create a new paradigm wherein sustainable design can merge with modern convenience and urban aesthetic.

This last point is important because it would be tactically easier to design every building net-zero if we: 1) decided to live lives of post-consumer asceticism—abandoning our cars, televisions, refrigerators, and computers, and 2) abandon aspirations of contemporary design and convenience. But luckily we don't have to consider these options, because the steady advance of human ingenuity and technological progress has brought us to a place where our universal comfort and the health of our planet do not stand in mutual contradiction.[1] It is not "either/or," but rather "both/and." Employing existing technology, we have the opportunity to make decisions today that can secure a high standard of living for our children's children, while also correcting the past injustices that industrialization, commerce, and our externality-based economy have inflicted upon our planet.

We are in the early stages of a green revolution and its impact on our constructed environment will be just as consequential as was the impact of the industrial revolution. Much of the success of the emerging green design movement is owed to the "design" part. It is important to make sustainability appeal to everyone, because in order to proliferate universally, sustainability has to be universally attractive.

Responding to climate change, human health, and resource stability, policy makers and planners in cities around the world are increasingly paying serious attention to net-zero carbon development strategies. The latest round of post-millennial planning documents show how cities are thinking and strategizing more about regenerative design principals on a large scale. PlaNYC and Copenhagen's 2050 plan are two great examples.[2] As a result, utility-scale and micro-generation solar, wind, wave/hydro, and biomass energy installations are becoming more prevalent in both exurban and urban environments.

As we look towards urban and regional planning integration of a regenerative systems approach, the lessons about the importance of art and design to the successful commercialization of new technologies are just as applicable as they are to the integration of sustainable systems in buildings. Just as building-integrated renewable energy has evolved into a contemporary design archetype, so too should we be thinking about city-integrated renewable energy from a design perspective.

Historically the urban environment has undergone continuous design reinterpretations in response to shifting technologies and cultural standards. The introduction of the automobile, the rise of industry, innovations in zoning and building codes, and the exponential speed of the information age have all placed their mark on our constructed environment.

Contemporary social and urban imaginaries relating to the constructed manifestations of our future energy infrastructure are in a state of flux. The drivers of public opinion on the subject of transitioning away from fossil fuels and nuclear energy are complex, and the waters of debate are often murky and confusing. A false dichotomy has emerged, which sets utilitarian renewable energy infrastructure installations against the conservation of cherished landscapes and the protection of real estate values in residential communities.

One of the roadblocks impeding progress towards sustainable public policy and private development is a consequence of this false binary relationship between aesthetics and renewable energy infrastructure. Over the past decade we have seen the maturation of a future vision that is not universally embraced: mountaintops and seascapes lined with three-blade wind turbines and fields of waving wheat replaced with dark blue silicon panels.

Rather than take sides in this debate (which often pits environmentalists against renewable energy projects), we can instead work together to define an alternative design approach that can inspire people and help to bring about a more universal acceptance of a transition to renewable energy sources.

The design entries to the 2012 Land Art Generator Initiative design competition all embrace this alternative model, illustrating that there lies a vast middle ground that is shared by sustainable development infrastructure and the conservation of public and natural spaces.

Presenting the power plant as public artwork—simultaneously enhancing the community, increasing livability, and stimulating local economic development—is a way to address these issues from the perspective of the ecologically concerned artist and designer. By nature of its functional utility, the work also sets itself into many other overlapping disciplines such as architecture, landscape architecture, engineering, applied science research, industrial design, urban planning, education, and environmental science. This interdisciplinary result has the effect of both enhancing the level of innovation and broadening the audience for the work.

WHY FRESHKILLS PARK?

The choice of Freshkills Park in New York City's Staten Island was a natural progression for the LAGI competition. As a "canvas" it provided teams with rich cultural, historical, and conceptual terrain within which to develop their design approaches. And in reflection, it adds yet another angle on the concept of "regenerative." As it is completed in phases, the reclamation of Fresh Kills Landfill will continue to mark an era of healing and inspiration for Staten

Islanders and New Yorkers, standing as a beautiful monument to restoration and ecological adaptation, a symbol of our collective ability to learn from our past and move beyond a status quo and towards a more sustainable ideal.

This reclamation could be seen as a metaphor for the entire planet. After many generations of inconsiderate consumption of non-renewable natural resources and the disposal of the synthetic byproducts of industry and commerce within our fragile biosphere, we have recently awoken from our slumber. Many now understand that our planet cannot sustain itself as if it were one large landfill for our convenience.

The writing contributions in the following pages from Heather Rogers and from Terreform ONE [Open Network Ecology] bring the perspectives of environmental journalism and collaborative green design to the conversation, both essays highlight the potential for our waste infrastructure and disposal/reuse systems to be entirely revamped.

The 2012 LAGI design competition was an opportunity to juxtapose these important issues (our energy and waste infrastructures) and to conceive of solutions that could be adaptable to other landfill reclamation projects in cities around the world.

In choosing Freshkills Park, we hoped to present viable models for sustainable and multi-purpose "public energy landscapes," mindful of the fact that Freshkills Park is actively engaged in studying the feasibility of more conventional wind and solar installations within its landscape. The proposals that you see in this book set themselves apart from more conventional models by way of their integration and interaction with the park itself. Freshkills Park has shown that the world's largest landfill can become a great city park, and it seems fitting that the question be asked whether there is a capacity for our great city parks to artfully contribute to our sustainable energy infrastructure.

CONCLUSION

As we put the finishing touches on this book, we stand at a crossroads for the future protection of our environment. The latest scientific research—being done in preparation for the United Nations Intergovernmental Panel on Climate Change's Fifth Assessment Report (AR5) and which inspired the 350.org "Do the Math" tour this year—has shown that if we have any chance at all of keeping global temperature increase from going above 2° Celsius, then we simply cannot release more than 565 gigatonnes of CO_2 into the atmosphere.[3] Meanwhile, there are approximately 2,795 gigatonnes (Gt) of potential CO_2 emissions contained within the fossil fuel reserves that remain in the earth (using 2010 figures), but which have been proven extractable and which appear on the balance sheets of the world's private and public fossil fuel mining and drilling companies.[4]

Breaking down the details: 65% of the 2,795 Gt of CO_2 emissions would come from proven reserves of coal, 22% from petroleum reserves, and 13% from conventional natural gas deposits. This 2,795 Gt figure very likely underestimates unconventional oil reserves such as those contained in tar sands and does not include shale gas deposits, which together could add more than 1,000 Gt to the total.[5]

Our current rate of global CO_2 emissions is 35.6 Gt per year as of 2012.[6] At our current emissions growth rate of 3% per year, this means that we likely have only twelve years of fossil fuel consumption remaining before we irrevocably surpass the 2° Celsius threshold.

If we instead take collective measures to reduce our emissions by 6% each year through conservation and a phased transition to clean and renewable sources of energy like solar, wind, hydro, and biofuels, then we could stretch out our remaining carbon budget over 40 years.[7] This would allow us to make a measured transition to clean energy by 2050 and avoid the worst effects of global climate change.[8]

Achieving the necessary and historic shift in our energy economies will require the most successful and efficient public relations, marketing, and political lobbying campaigns that the world has ever seen. And we believe that it will require the construction of visionary examples of well-integrated sustainable infrastructures that can stand as monuments to this heroic endeavor. Because art has the proven capacity to speak directly to the hearts of people and inspire collective action, these "land art generators" can serve a critical role as catalytic agents of this change.

LAGI is founded on this assertion that collective action is desperately needed on issues of global climate change, environmental conservation, air quality, energy infrastructure, and sustainable development. With the parts per million of CO_2 and other greenhouse gases continuing to rise annually despite the generally agreed consensus that climate catastrophe will ensue unless we reverse course immediately, we can see clearly that more needs to be done in order to sway public opinion to the critical mass required for effective policy and legislative action.

The capacity of public artwork (especially large-scale and high-profile works) to increase economic activity is also well documented. According to the NYC Economic Development Corporation, "NYC Waterfalls" by Olafur Eliasson, cost $15.5 million to install (privately funded) and brought an estimated $53 million in incremental spending from visitors who came to see the installation over the nearly four months that it was in operation. That's an extra $483,000 per day to Manhattan businesses as a direct result of a public art installation.

Imagine a permanent work of art of a similar scale and with similar economic stimulus benefit.

And now imagine that this work of art educates hundreds of visitors every day about the technology that it employs, while contributing clean energy to the electrical grid equivalent to the energy consumed by hundreds or even thousands of homes. It may be that sustainable cities of the future will recognize the efficiencies that will come from the fusion of renewable energy infrastructure and public art amenity.

Perhaps New York City will seize on the opportunity to see one of the proposals in this book actualized. It will require dedicated popular support and significant private investment (with real returns in both capital and culture).

Embracing the idea of community ownership, one possibility towards implementation of land art generators is that they are crowd-funded construction projects.[3] The small investments made by individuals would be prudent, with return guaranteed from the sale of the electricity that the artwork will generate along with other revenue possibilities. With each citizen of the community owning some share of the public artwork, a collective pride in the clean energy generation output will ensure its continued operations and success.

The entries to the 2012 LAGI edition prove that renewable energy can indeed be beautiful. Many of the design ideas are practical in terms of their constructability and integrate proven technologies as working media within the artwork to generate large amounts of clean energy. Each of these designs would stand as a positive amenity to the public spaces of any city.

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[1] Bjarke Ingels goes so far as to propose the idea of "hedonistic sustainability" *TEDxEast* (New York City) 2 May 2011.

R. Buckminster Fuller pointed the way to a sustainable trajectory for "Spaceship Earth" in his 1981 book *Critical Path* (St. Martins Press). In it he presents an argument against the notion of "scarcity of resources" in the context of global sustainable development. Obtaining a global ecological balance while also universally increasing standards of living will not be an easy task (it requires a re-think of all of our present systems), but perhaps it is also not an impossible one.

[2] A few of the overarching elements that these sustainable urban (re)development strategies have in common are:

Systems Integration: Reduce inefficiency and counter-productivity to the benefit of the whole. One example is the shift to Waste-to-Energy power plants. By incinerating waste (making sure to clean the exhaust) cities can reduce the demand for outsourced electrical power while also reducing the amount of trash that ends up in landfills. Landfills are a large contributor of greenhouse gases (GHG) and are damaging to watersheds and habitats, and outsourced electrical supply can often be from fossil fuel sources, so this is a win-win for the environment.

Increasing Parks and Public Space: Activate streetscapes, create new parks in areas lacking green space, create opportunities for urban agriculture, and encourage ecological stewardship.

Diversified Energy Production: Take advantage of available renewable energy resources within the city by integrating energy generation infrastructure into buildings and open spaces.

Smart Grids: Microgeneration works in combination with improved end-user efficiency and "smart" demand loading curves. Merging information technology and energy networks creates informed energy consumers. This can reduce the city's reliance on large-scale exurban power plants (which are predominantly nuclear or fossil-fuel based), and help to mesh base load demand with intermittent supply-side generation.

Green Economy: Clean-tech research, development, and implementation can bring new jobs to the city, and cities with "green" reputations attract more tourism and investment.

The Land Art Generator design brief addresses these cross-cutting topics within its requirements, and responses to the brief have proposed innovative solutions to these ends.

[3] Bill McKibben. "Global Warming's Terrifying New Math." *Rolling Stone* 2 August, 2012, 52.

[4] "Unburnable Carbon: Are the world's financial markets carrying a carbon bubble?" published by the Carbon Tracker Initiative and based on the Potsdam Climate Institute Methodology.

[5] Ibid.

[6] International Energy Agency (IEA) estimate.

[7] One well-constructed example of a scenario in which we can avoid exceeding the 2° Celsius warming threshold is spelled out in the 2011 book, *Reinventing Fire*, by Amory Lovins and the Rocky Mountain Institute (Chelsea Green Publishing).

[8] According to the IPCC Fourth Assessment Report, even if we stay at 2° Celsius warming, we could see an average sea level rise of up to 18 inches—already placing many coastal cities at high risk. Allowing this number to go up to 4° Celsius would likely result in at least 24 inches of sea level rise. This is to say nothing of the other climate change effects such as ocean acidification, severe weather events, crop failure, drought, loss of biodiversity, and the resulting global economic distress.

[9] **https://fundrise.com** is one example of successful crowd source funding of high value development projects.