this can happen now

by Peter Fend

The island of Socotra becomes a global model for methane-powered economies.

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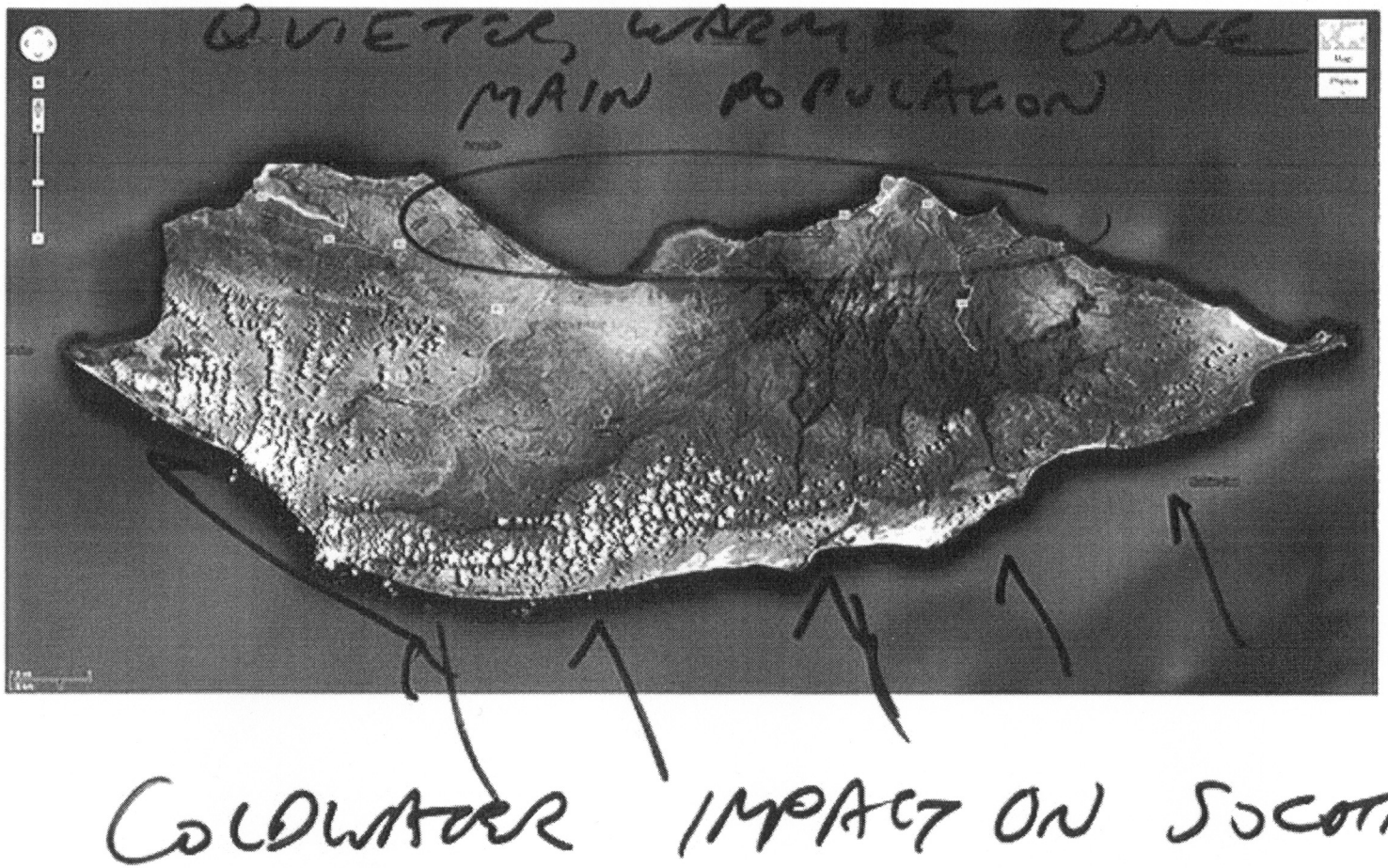


"Socotra receives a constant stream of cold, nutrient-rich water from Antarctic upwellings."

Introduction

Socotra

Societies today depend on hydrocarbons—mostly coal, oil, and gas, which are becoming harder and more costly to extract. Energy companies want to extract all that can be found, whether from the Arctic, or tar sands, or deep offshore, or shale. They want to do this regardless of the fact that using fossil reserves causes global warming. But there are also renewable hydrocarbons, from living sources.

Off the coast of Somalia sits an island called Socotra, populated by 40,000 people and strange, beautiful plants and animals that exist nowhere else on earth. A territory of Yemen, Socotra was once the location of a Russian naval base, and now a US air base. In recent years, Socotra has become dangerous to approach by sea due to pirates. My proposal is to make Socotra into a model of ecological development—beyond petroleum, beyond nuclear, beyond industrial farms, and full of healthy savage beasts.

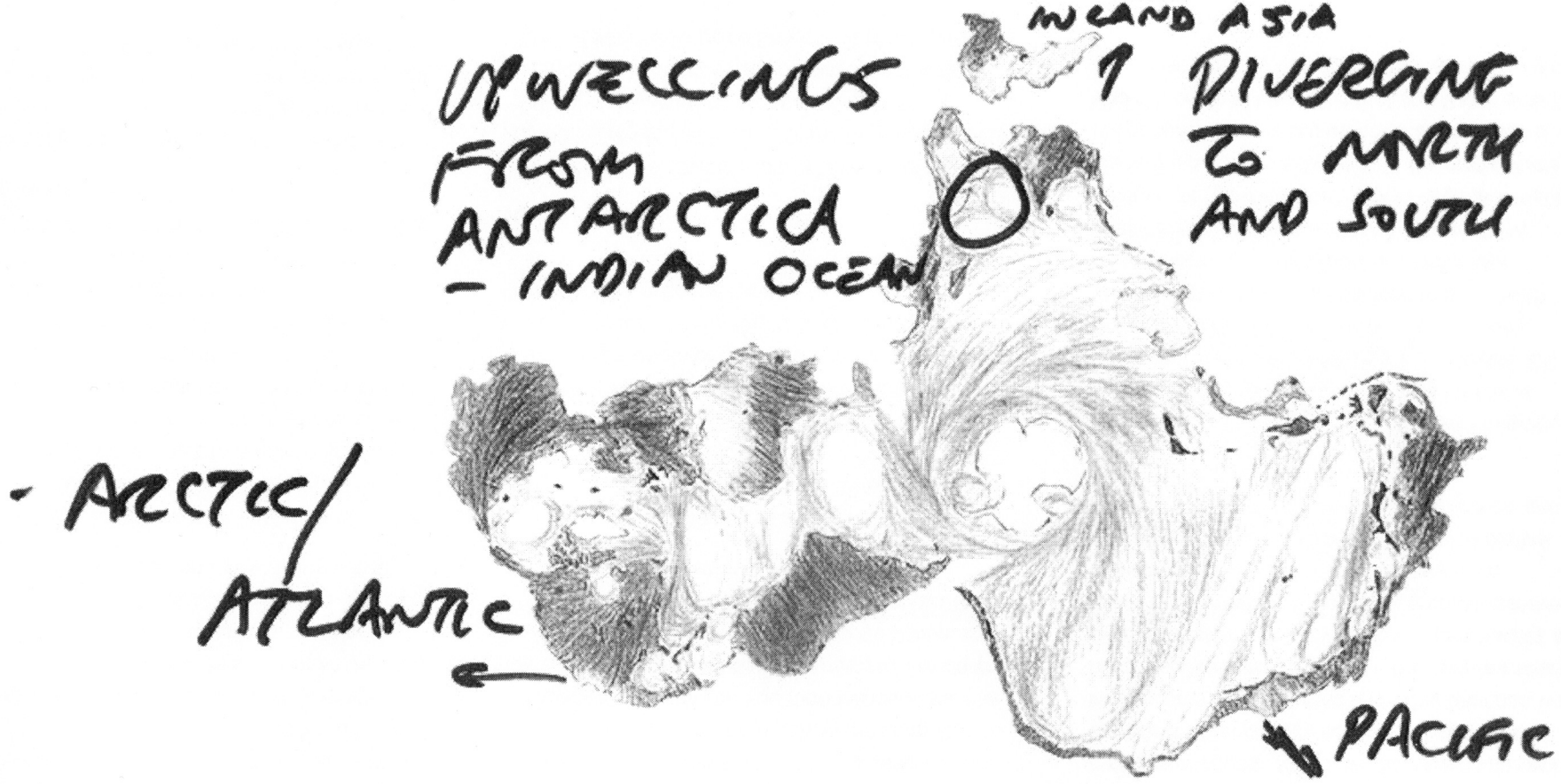
In Socotra, biological fuel, and then hydrocarbons, could be generated using the renewable resource of marine algae. Socotra receives a constant stream of cold, nutrient-rich water from Antarctic upwellings. Additionally, the island is near the equator, and so the sun shines brightly almost every day. This combination yields unending bioproductivity. Fish thrive. Shellfish, on rocks and in pools, thrive. Birds thrive. So does seaweed—a variety of bladder kelp that normally can be found only in the polar and temperate waters of the Southern Hemisphere. The algae's bladders float near the surface of the water; due to the sunshine, the bladders build tissue, and thus produce carbon, doing so at a faster rate than any other plant on earth.

I first recognized the potential of Socotra in 2010, while explaining an Antarctica-centered map of the world to someone in a newsroom in New Zealand. Given Socotra's position on the globe, I could tell that its environment was ideal, and that its remoteness would enable its entire energy economy to become local, including its auto-fuel market. This island can change the game.

Ocean Earth

I am one of five stakeholders in Ocean Earth, a company registered in the US and New Zealand that has been researching new environmental technologies for decades. I propose that Ocean Earth stakeholders go to Socotra, in coordination with ecological scientists, in order to build a hydrocarbon economy based not on petroleum but on biofuel—and not on any biofuel, but on biomethane. We could be the first to establish a *methane economy*. Moreover, Socotra could become the world's first *biology economy*. The methane would come from seaweed and other biomass, not from fossil reserves. Because it has very few roads, very few inhabitants, very few cities (or villages), and a very rich biological base, Socotra could achieve market saturation, which is necessary for a successful conversion from fossil fuel to biofuel. One hundred percent of the vehicles, homes, and even aircraft could run on methane.

I founded Ocean Earth in 1980. Coleen Fitzgibbon joined me, and soon after so did Eve Vaterlaus, Wolfgang Staehle, Paul Sharits, Taro Suzuki, Bill Dolson, Joan Waltemath, and Jonathan Crary. Sharits, Fitzgibbon, and I decided to begin with satellite monitoring of global hot spots. We considered satellite observation a form of civil defense, or "Space Force," a "well-regulated militia" alerting the public to dangers. In the next decade, major contributions came from Dolson, Staehle, and two newcomers, Ingo Guenther and Sante Scardillo. We began working primarily in Europe, where the



"I first recognized the potential of Socotra in 2010, while explaining an Antarctica-centered map of the world."

firm could act on its New York corporate charter to produce and sell "media services" (such as satellite imaging for mass media) and "architectural components" (such as earthworks, megastructures, and lightweight-architecture elements for eco-efficient cities).

Following many battles with government authorities, the company was re-formed in 1994 as Ocean Earth Development Corporation. In 2008, it was turned into a firm consisting of five director-stakeholders: myself, artist Eve Vaterlaus, and architects Kevin Gannon, Heidi Mardon, and Catherine Griffiths. Along with Bernie Dent, I am also the principal stakeholder in a subsidiary organization, Ocean Earth NZ Limited. The offshore techniques described in this proposal were developed by Griffiths, Vaterlaus, and Mardon, who in 1994 secured a site in New Zealand where we could implement our work with bladder kelp, which was the reason for Ocean Earth's incorporation in that country. When I was invited to exhibit in New Zealand in 2008, I turned the occasion into a three-year collaboration with Mardon and others. We acquired substantial hands-on experience in growing and harvesting algae.

The goals of Ocean Earth are a revival of those defined by Leon Battista Alberti in his *Ten Books on Architecture* (1452).

(1) Clean air: hence, biomethane as the main fuel.

(2) Living waters: hence, structures to restore rivers and streams.

(3) Circulatory space: hence, buildings, pipes, and roads that interfere little with the native animals and plants, while allowing access.

(4) Defense: hence, gathering knowledge of incoming threats through the use of satellites.

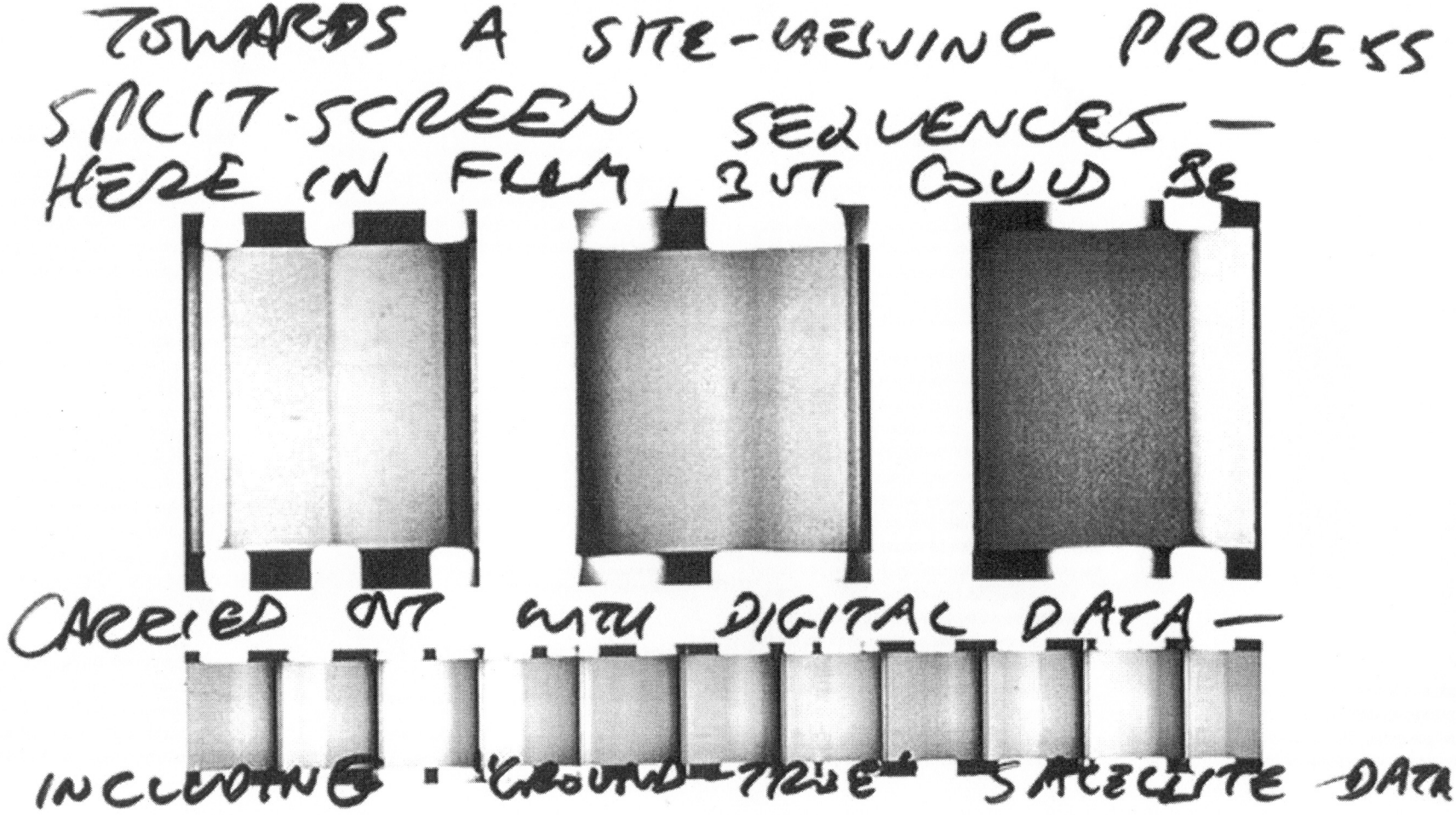
We discovered Alberti more than one decade after Ocean Earth was formed, but all along, the company was addressing all four goals of architecture as Alberti defined them—what architects are supposed to do, but generally don't at all. And these goals can now be pursued on the island of Socotra.

Earth Art

All the actions being proposed here come from art. Specifically, they come from an art practice that originated in the 1960s and 1970s. I draw on works by only a few artists. Since I believe in contracts, property sharing, and percentages, I have endeavored to enter into formal agreements with these artists. In 1988, I signed a contract with Dennis Oppenheim to realize several of his uncompleted projects. After meeting with Paul Sharits in 1981, Ocean Earth developed plans to pursue his ideas for rapid sequencing and flickering colors in order to create what he called "abstract narrative." I have also received an OK to realize unfinished works of Gordon Matta-Clark, from his widow. Additional artists whose work Ocean Earth has looked toward for architectural, structural, or ecological purposes are: Robert Smithson, Michael Heizer, Walter De Maria, Carolee Schneemann, Richard Serra, Claes Oldenburg, and Joseph Beuys. Architects who have provided important inspiration for Ocean Earth are: Paul Rudolph, Richard Le Ricolais, Yona Friedman, Merete Mattern, Moshe Safdie, and Glenn Small, all mega-structuralists.

"Art," as Edmund Spenser wrote, "is that by which Nature makes more Nature." If this is true, then despite what the art world wants, art must effect changes in nature, or allow nature to do so itself. Otherwise, art is sterile, and nature languishes.

So, Ocean Earth makes an actionable use of art. When in a natural setting such as Socotra, art should be "that by which Nature makes more Nature." If Voltaire could write, "Il faut cultiver notre jardin," we could respond, "Il faut activer une île." The earth artists, notably Dennis Oppenheim, spoke of "activating" sites. How would one "activate" the entire island of Socotra?



"Ocean Earth developed plans to pursue Paul Sharits's ideas for rapid sequencing and flickering colors in order to create what he called 'abstract narrative.'"

SUCH A STRUCTURE, IF INSTALLED IN JORDAN JUST EAST OF THE ZARQA RIVER, WOULD EXPAND THE DRAINAGE AREA OF THE DEAD SEA SEVEN-FOLD.

WE LEARNED THIS POTENTIAL WHEN VIEWING SIMILAR-FORM GIANT CUTS IN DESERT IN THE IRAN-IRAQ WAR ZONE.

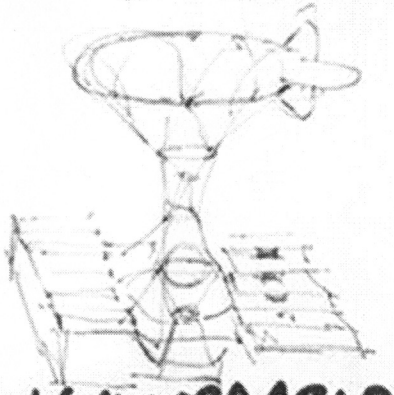
TO DO AGAIN...

"Additional artists whose work Ocean Earth has looked toward for architectural, structural, or ecological purposes include Michael Heizer."

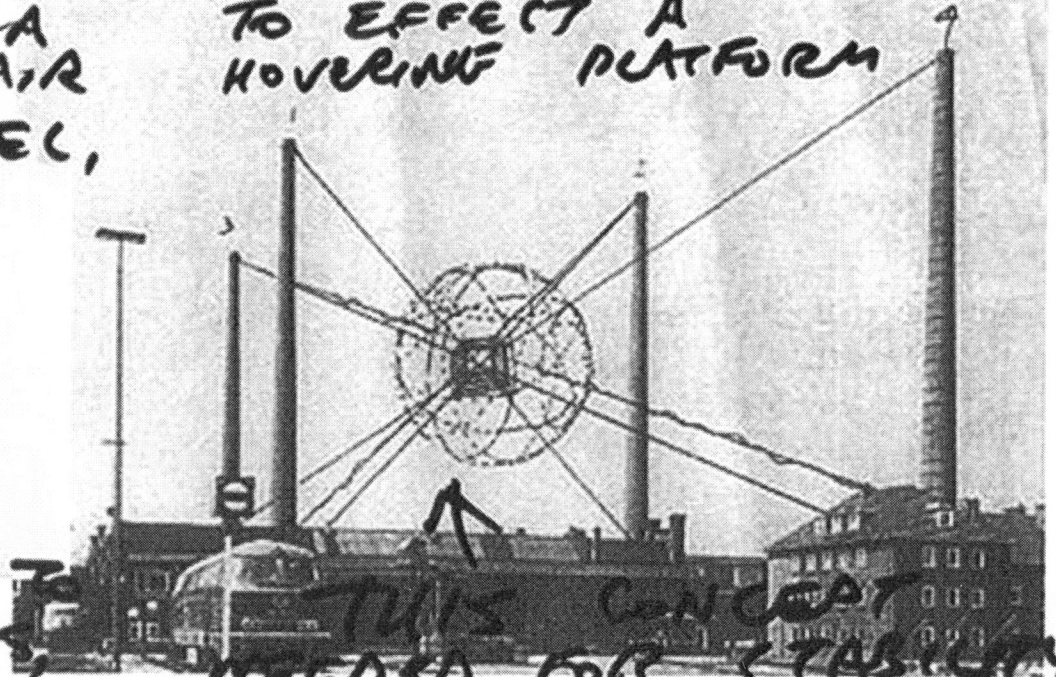
BOTH PROJECTS WERE NEVER ATTEMPTED

INITIAL DOCUMENTA PROPOSAL =
CIRCUMLATERAL TETHERING
TO EFFECT A
HOVERING PLATFORM

LATER: TO USE A
LIGHTER-THAN-AIR
(BUOYANT) VESSEL,



BUT VULNERABLE TO
LATERAL FORCES,
E.G. WIND



THIS CONCEPT
NEEDED FOR STABILITY

"I have also received an OK to realize unfinished works of Gordon Matta-Clark, from his widow."

Proposal

Promotion and Preparation

Cooperation is social. For Socotra to become a model biology economy, its 40,000 inhabitants must want the change. Progress depends more on our personalities, our ability to bond with unlike peoples, than our technologies. We must be ready to negotiate (particularly when it comes to property rights). So Ocean Earth would first make site visits, armed with images, plans, and write-ups, not knowing what the outcome might be.

The goal of our preliminary work would be to prepare the island for an all-methane economy. All heat, electricity, vehicles (except, perhaps, some relying heavily on diesel), and airplanes must eventually run on methane—or on power generated using methane-rich biofuel.

Ocean Earth learned in New Zealand that an abundance of seaweed will never provide the basis for a methane economy if the surrounding infrastructure depends on oil. Everything must be retrofitted for methane. This is quite feasible on Socotra, so long as there's support from one or all of the natural-gas-producing countries strung along the same bird-migration flyway: Qatar, Iran, Turkmenistan, Kazakhstan, and Russia. That support needs to be about $100 million. Qatar is the right partner for this undertaking, since it has the largest gas reserves of any country accessible to the West; has significant influence on Arab and world politics; has an interest in Western art and architecture; and would like to see the world run on methane. Once there's a methane infrastructure, it's easier to introduce gas from renewable, living sources.

Stage One: Groundwork

Infrastructure

Before producing methane from marine biomass, Socotra would need a means of distribution. The island's population is small enough, and sufficiently concentrated in a few cities, that methane could be efficiently distributed by boat or truck in CNG ("compressed natural gas") containers. There might be a few gas-main systems in the cities, like Hadibou, but these in turn would require CNG transformers to compress the gas in order to make it useable in vehicles.

Transport Infrastructure

Qatar and Iran are exchanging technical information

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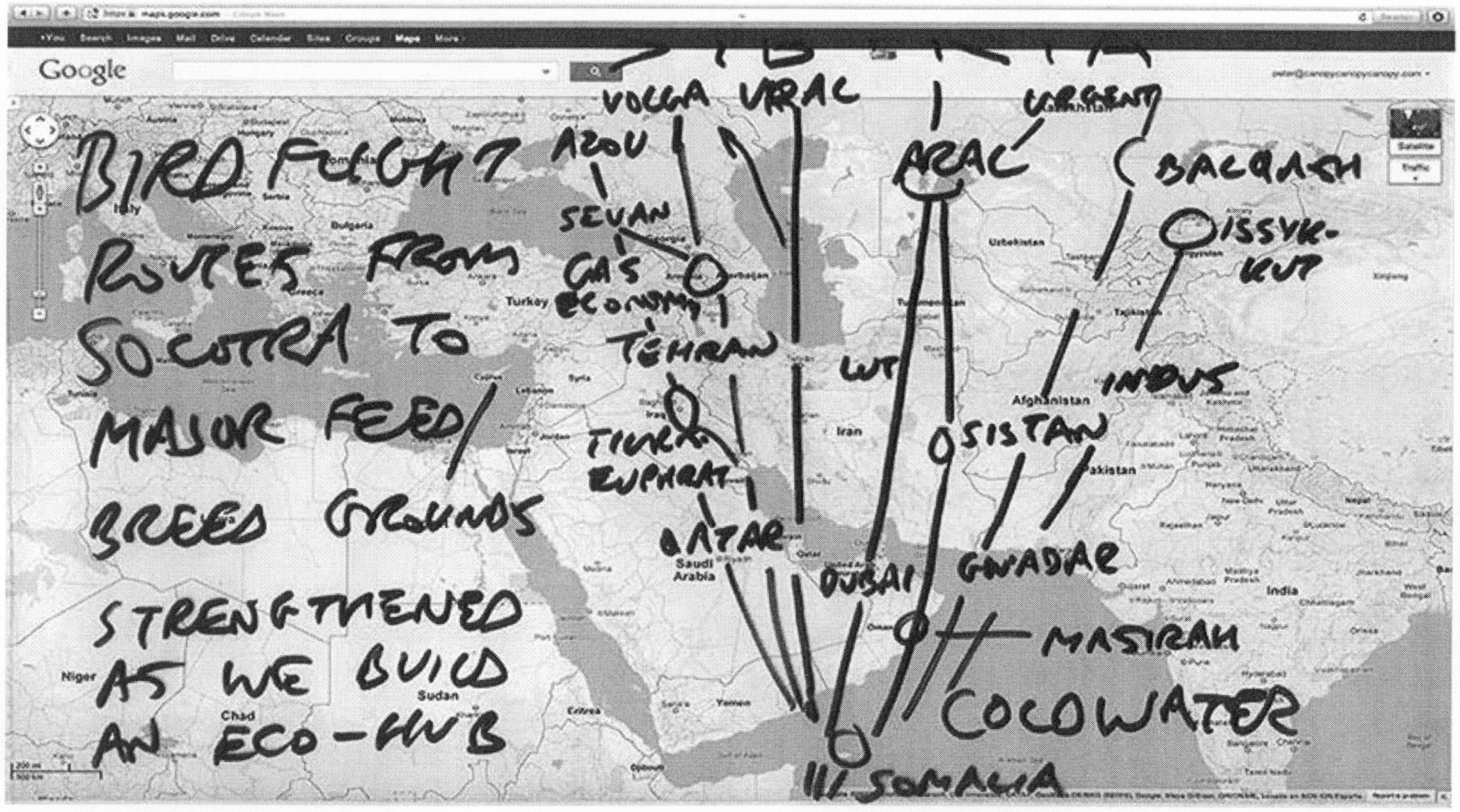

"Support is needed from one or all of the natural-gas-producing countries strung along the same bird-migration flyway: Qatar, Iran, Turkmenistan, Kazakhstan, and Russia."

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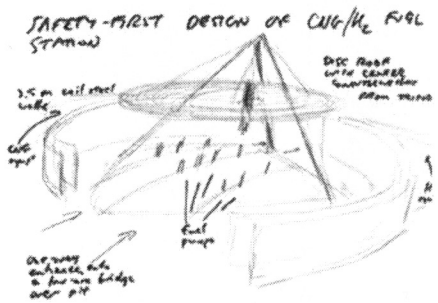


"These fuel stations would be based on work begun by Ocean Earth in 2000, designs, developed by architects and artists, that prioritized safety, cost efficiency, and the capacity to convert gas into multiple forms of energy, such as hydrogen and electrical current."

for developing CNG-powered vehicles, including pumps, stations, tanks, and vehicle engines. For an estimated cost of $50,000,000, knowledge gained from this cooperation could be extended to Socotra by Qatar. Equipment, technicians, and local gas-main supplies could be one-ship delivered to Socotra. For an additional $20,000,000, we could transfer enough equipment for twenty methane-fuel stations. These fuel stations would be based on work begun by Ocean Earth in 2000, designs, developed by architects and artists, that prioritized safety, cost efficiency, and the capacity to convert gas into multiple forms of energy, such as hydrogen and electrical current.

Vehicles

Ocean Earth would supply CNG or electric vehicles for the island. This would include both heavy equipment and public vehicles: ten thousand cars and one thousand heavy-duty vehicles (Total cost: $20,000,000). Ocean Earth would encourage a diversity of suppliers, bringing in dealerships of CNG or electric vehicles from Honda, Toyota, Peugeot, Renault, Ford, VW, Volvo, Fiat, and Daimler. Socotra would become a marketing test-site for the manufacturers. Building on their experience there, these companies could then expand into larger markets for CNG vehicles: Argentina, Pakistan, India, Iran, Italy, and Armenia. Even in Argentina, the market share is below 20%, with just under two million CNG cars in a relatively small population, of forty million. What could it become?

Ships, Heavy Equipment

By establishing the rule that only methane or electricity can be used as a power source, Socotra would become a proving ground for large equipment and all manner of ships operating without diesel.

Aircraft

Most civilian flights to Socotra's airport are from Sharjah, of the United Arab Emirates, and Raif Airport, which is located on the Yemeni coast. Through Ocean Earth's initiative, supported by Qatar or the UAE, all three airports would be able to fuel airplanes with a jet-grade, methane-oxygen mix. The planes flying between Socotra and these nearby airports would have the same fueling setup at takeoff and landing. Additional routes could be established gradually, with fueling facilities at each end. Qatar Airways could set up a nonstop round-trip from Qatar to Socotra.

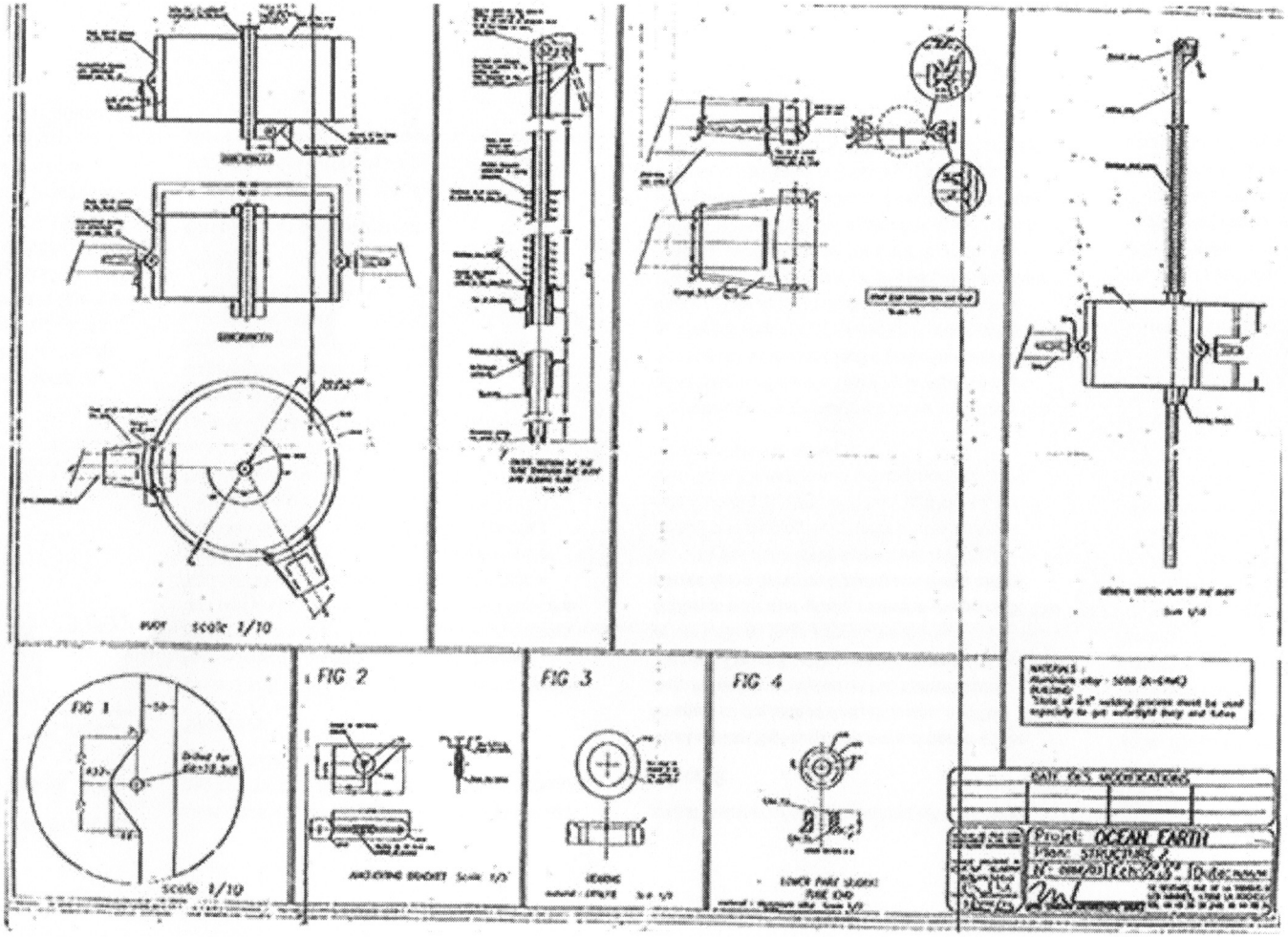
The necessary technology for these flights has been developed by Russia's Tupolev, Europe's Airbus, and the US's General Electric (with France's CFM). In an artwork shown at the New York gallery White Box in 2012, Ocean Earth demonstrated how some fifteen Airbus 340 aircraft in the fleet of Aerolíneas Argentinas could run on methane for long-haul routes. The principle for expansion would be hub-and-spoke, as with FedEx and most airlines today: We would focus not on supplying all planes, but only on supplying each end of specific routes and the aircrafts used.

Additional Industries

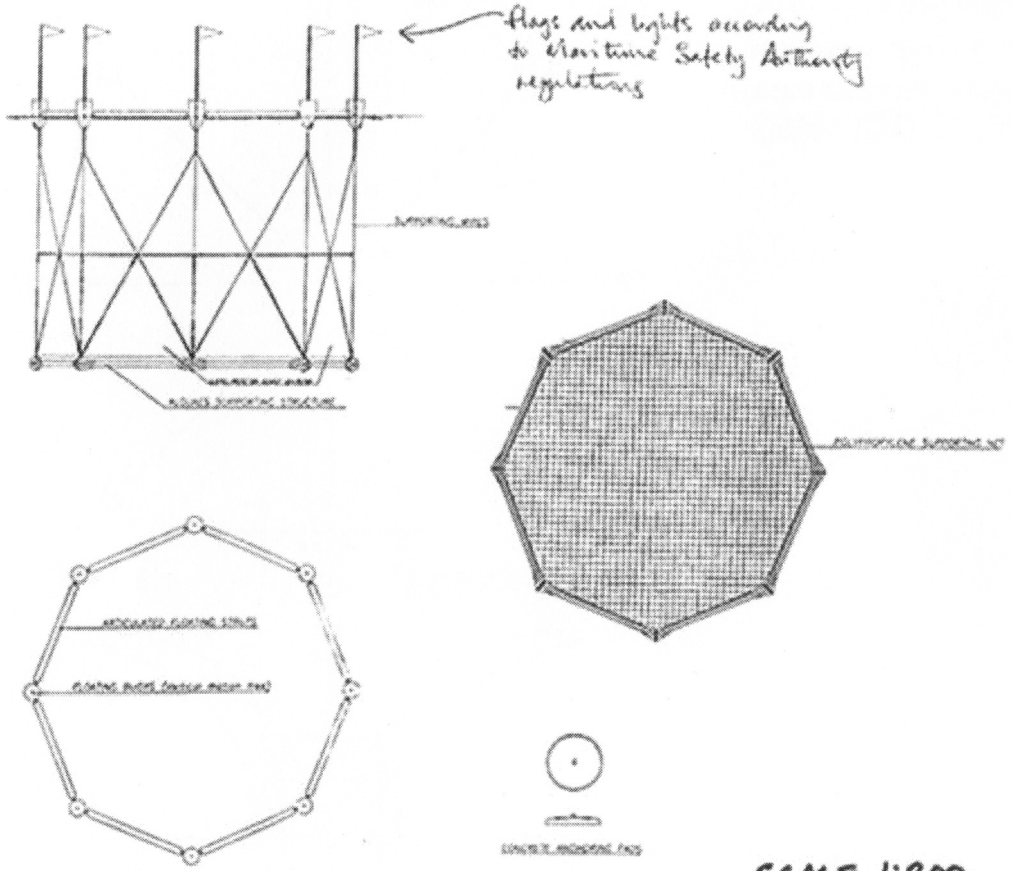
If Socotra is to become a true model for future methane economies, it needs a bigger industry than ecotourism built around quaint fisheries. How can we introduce a much bigger consumer of energy, like manufacturing, to Socotra? The climate conditions, like pure air, are well suited for electronics manufacturing. The location may be ideal for fish packing, since there are so many nearby markets. If we can establish industries in Socotra that are sustainably fueled by methane, the island would move from being a high-profile demonstration to a model for the world, the first all biologically sourced methane economy.

Stage Two: Production

Once reliance on methane is secured, we will be able to shift to producing the local fuel. Borrowing a convention from the oil industry, we describe all the steps between collecting marine algae and yielding raw biogas as "production." The sequence in oil drilling, however, is extractive, not productive. Rather than increasing an asset, drilling depletes it. By contrast, the removal of marine algae could, if done right, enhance its growth. Instead of depleting a resource, we could increase it. With certain



"To get more algae, we can deploy more holdfasts. Ocean Earth has designed holdfast rigs for harvesting from both above and below."



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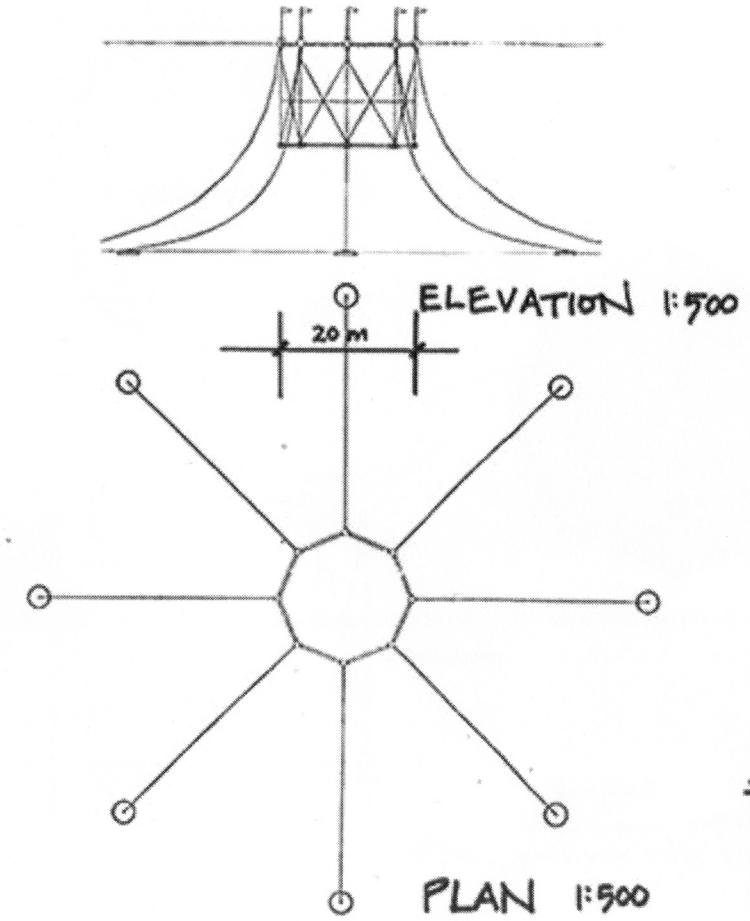

"To get more algae, we can deploy more holdfasts. Ocean Earth has designed holdfast rigs for harvesting from both above and below."

cropping methods, we could even invigorate the whole ecosystem, achieving new levels of productivity, or bioproductivity.

Ocean Earth would use a method of cultivating algae that employs offshore holdfasts. This avoids the biological instability inherent in the common industry practice of growing algae in self-contained pools. (The results over time are dire: Mutations, invasions or other biological deviations occur, causing a production collapse; this confirms the ecological truism that life requires diversity and complexity for stability.)

We would work first with the entire ecosystem, then with the material that can be trimmed away while maintaining that ecosystem's overall vitality.

Offshore Holdfasts

Macroalgae must attach to something hard. If the algae is brown, as bladder kelp is, its presence improves the ecology overall by providing cover and food for fish. To get more algae, we can deploy more holdfasts—hard surfaces for the plants to attach themselves to, such as rope meshes, cages, and materials salvaged from wrecks. Ocean Earth has designed holdfast rigs for harvesting from both

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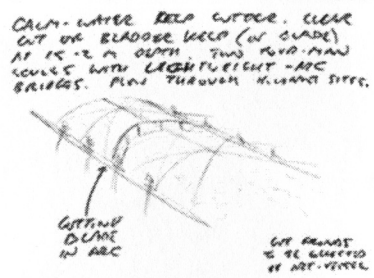

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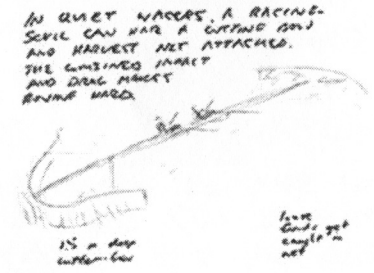

"We propose industrial rowing for harvesting and hauling macroalgae, with single or several-hulled rowing sculls."

above and below. Clearing away algae from above allows faster regrowth, as it reduces competition for sunlight. Cutting away algae from below allows uninterrupted growth effort. There is never the calm of a full canopy; instead there is continuous striving for sun and absorption of nutrients, including carbon, in tissue.

Ocean Earth could deploy these holdfast structures, possibly in the tens of thousands, and trim the algae daily. To date, Ocean Earth has been working with the noted naval architect Marc Lombard, of La Rochelle, France; with new investment, we can expand this effort.

Industrial Rowing and Free-Diving

Near the shore, all harvesting and clearing would be done by hand. "Clearing" in a forest is the removal of dead wood, tinder, twigs, and remnants; "harvesting" in a forest is more the removal of big plants—or, with macroalgae, parts of the plants. Both actions affect the microhabitat, and should be done with thinking eyes and hands. This flies in the face of technological doctrine, which calls for motorized equipment. But we are not here in the "energy business." We are in the ecosystem business. That means we must protect a huge diversity of animals and plants. Propellers and big-lift scoopers do not promote diversity. (Consider the damage done by "modern" fishing techniques.) So, handwork will be necessary.

We propose industrial rowing for harvesting and hauling macroalgae, with single or several-hulled rowing sculls. Nowadays, rowing is seen as a sport, mostly for elite universities. But rowing could also be an industrial practice. Ocean Earth has designed sculls outfitted with blades to cut the algae, but this idea still must be tested.

Operating alongside the boats (and possibly with larger collecting vessels, like low-submergence submarines) would be individuals free-diving to cut and prune the macroalgae. In Otago Harbor, NZ, Ocean Earth tested knives for this work, and found short, curved ones to be best. Equipment would be minimal, small, and inexpensive.

Conversion to Methane or Other Chemical Products

Leading biochemical engineers are now competing to achieve the most efficient conversion of marine or aquatic biomass to methane. The process calls for two large chambers, one for each stage of conversion: first, breaking down and acidifying the collected biological material; second, releasing

methane gas. Ocean Earth recognizes that this industry is less like petroleum refining than like brewing, since brewing uses similar equipment and involves an extended-duration production process. There can be many brewing sites. Each site can be specific to the types of water plants, or other biomass, of that bay, that cove, that coast. An island like Socotra could have a half-dozen fermentation sites. Investment for the global algae-to-gas industry could come from giant firms with similar know-how, like Anheuser-Busch InBev. Thus one can rival, and replace, the oil industry.

"Ocean Earth would employ many of the innovations that have long been called earth art."

Next Steps

Once the world's first all biologically sourced methane economy has been established on Socotra, we can turn to a second vital task: water production.

Socotra is a desert island. It lacks clouds, fog, and rain. Therefore, it lacks freshwater. The dryness has become worse in recent decades, reportedly due to climate change. Ocean Earth aims to reverse this by restoring wetlands, river flows, and vegetation, and restarting the cycle of evapotranspiration. We would achieve this goal not by planting, but by building a habitat for wild animals. As environmental engineer Alice Outwater argues in *Water: A Natural History* (1997), the presence of higher animals, ranging from birds to large grazing ungulates, improves the circulation of water and augments the surrounding vegetation. To make sure there is an abundance of water, make sure there is an abundance of higher animals. In order to effect the necessary changes in the landscape, Ocean Earth would employ many of the innovations that have long been called earth art; the precise position and extent of this construction will be decided after a thorough site visit to the island.

In this proposal, I have discussed how Ocean Earth will meet the requirements set by Alberti for clean air, a first step toward creating a viable habitat. In a text to be published elsewhere—part 2 of this proposal—I will discuss how the circulation of living waters inland can be increased. Through the actions proposed in parts 1 and 2, Ocean Earth can achieve the prerequisites for any settled area, any city, any Socotra: clean air, through non-polluting energy; and living waters, through an abundance of wild animals. Work on this can start immediately.