CHAPTER 6
Economies of Scarcity or of Abundance?

We have come to an end of our explorations about the nature of the Earth ecosystem in relation to climate and discovered that it is far from a closed system. If we take into account the ubiquitous effects of temperature gradients, different kinds of motion, the combined effects of form and substances, the generation of etheric energy, a whole other view of Nature emerges. This realty shows the far more prevailing effect of water over that of CO_2. It highlights the deep alteration of the water cycle that is taking place under a materialistic view of Nature and under a ruthless neo-liberal economic model. To this we have given the name of planetary depletion, claiming that the name is more accurate because it points not just to the physical, more visible, consequences of the ecological crisis, but also to the undermining of the cycle of water and consequent depletion of the Earth's etheric field. Since this moves our attention to the living dimension of Gaia—something far from accepted in scientific circles—it appears a deep cultural reevaluation will need to precede a roadmap for change. The answer cannot come from computer models, which by definition completely exclude the qualitative element in Nature.

It is one matter to construct computer models and assume that Nature, and indeed even society and the human being, will behave accordingly. It is a whole other matter to look at Nature as a whole. This obliges us to integrate qualitative factors, as we have done so far, and penetrate with new thinking the continuous interplay of polarities of all sorts without which Nature simply isn't Nature, but a human construct, an unrealistic idea which may satisfy the computer's logic, but that alone.

With this second approach we will not be able to eliminate or master Nature's complexity and come up with models that give predictable outcomes, but we will be able to assess whether we can generate favorable outcomes that counter the seemingly irreversible changes in Nature, which have received the common overall designation of climate change. This is because we can include the qualitative element and recognize it even in quantitative measurements. Such would be the case of a holistic river regulation in which we are aiming at attaining and prolonging the length of positive temperature gradient stretches of river. With these we can predict the behavior of water with little margin of error. We can do more than remediate, we can regenerate. Once the qualitative element has been taken into account we can turn to quantitative measurements at the commensurate scale. In the example of river regulation we will be able to measure the length of the waterway in which we can maintain a positive temperature gradient, what kinds of reservoirs are needed, at which depth

to withdraw water from the reservoir in relation to the temperature downstream, etc.

If we fully penetrate the qualitative perspective of our natural world the results are twofold: on one hand we will find that the true state of affairs is even worse than what we think, and that the full truth is either ignored or carefully hidden and kept at bay, since it will hurt many established economic interests.[1] On the other hand we will find we can do much more than we are told.

Think what the impact would be of a full understanding of the effects of river regulation and modern forestry, and what enormous stakes are at play. An example would suffice. If we have understood the appalling consequences of monoculture forest plantations we can start to fathom the correlations between the decline of tree stands' quality and vitality, and overall ecosystem change, including shortened and accelerated water cycle and much lower resilience of the trees to external factors, all of which lead to local climate alterations. When news hit of devastating forest fires we will have a broader understanding of the factors at play. It is precise human choices in the realm of forestry that bring about ecological disasters. Many of the conifer single specie forests are, simply put, tinderboxes exposed to and defenseless against even minimal ecological stresses. A tree that should grow protected from direct sunlight, has grown unnaturally under the conditions of clearcutting. It has protected itself with branches down to the very base. Once the new stand fills in and the trees are shaded, all the lower growth dies back and dries out, presenting an enormous mass of easily inflammable dead wood. Single specie conifer plantations exploit only a very narrow superficial layer of available water. Under the conditions of new saplings exposed to the sun, the groundwater will inevitably recede, and the tree will only grow on rainwater and the scant nutrients it contains. A truly diverse natural forest would be otherwise resilient. When we hear of forest fires and know about the trees' natural behavior we will not be satisfied with an abstract and vague claim of climate change that can justify anything and everything without showing clear correlated dynamics.

At present climate change has gone from being a consequence of human choices to being used in our reasoning as a driving cause. Our actions, we are told, primarily at the energy level, have caused climate change. Now, every time we see an ecological problem, climate change is invoked as the cause in lieu of the human mismanagement that could offer a much more immediate, convincing and adequate explanation on the ground. At times climate change becomes a blanket statement and easy certainty in the

[1] A good way to put in words the initial experience of reading Schauberger is that of Wilhelm Balters: "You may have lived a calm and contented life—but from the moment you come face to face with the ideas of Viktor Schauberger, you will never again have peace in your soul." (quoted in Olof Alexandersson, *Living Water*, 15).

news. More rains, floods, fires, draughts, famine, human disasters? Don't think too hard; it's because of climate change!

Though this work advocates primarily changes in our scientific and cultural outlooks, it is encouraging to notice that existing and extensive initiatives within the technological and economic contexts, exhaustively outline that it is possible and necessary to question the impact of our present global economy on climate. Not only that; it is also possible to show how to reverse the course, as it has been rendered explicit by the proposition of the so-called "Blue Economy." Not surprisingly this new paradigm rests on something very similar to Schauberger's "Kapieren and copieren" through industrial processes that mimic natural processes using low temperature, low pressure and low energy inputs.

We will now turn to two radically different sets of solutions to the climate crisis: one within the prevalent view generated by climate models and their logic, the other turning this logic radically upside down.

Red and Blue Economies

Converging toward a more organic thinking new developments in combating climate change highlight how much humanity finds itself at an epochal divide in its understanding of Nature. On one hand economics that honors Nature's organic complexity, on the other one which reduces it to a mechanism. On one hand Nature can only be understood if we stretch and transform our thinking in order to grasp the workings of polarities in holistic units of greater and greater complexity. At the other end the issue can be simplified to the extreme and become merely technical, as we have seen in computer models and as we will see once more through an example.

In Steiner's words in the last of his letters to members "By far the greater part of that which works in modern civilization through technical Science and Industry—wherein the life of man is so intensively interwoven—is *not Nature at all, but Sub-Nature*. It is a world which emancipates itself from Nature—emancipates itself in a downward direction."[2] It is through the lens of sub-Nature that our planet Earth can be seen as a purely physical mechanism and a closed system.

What is true in the scientific realm is also visible in economic models. The dichotomy Nature / sub-Nature can be discerned clearly if we penetrate two distinct views of the economic response to climate change. They are clearly differentiated by their respective technologies.

Sub-Nature technological solutions go hand in hand with a sub-Nature economic system, which emphasizes large scale and centralization, bringing about systemic waste of resources and energy, environmental

[2] Rudolf Steiner, letter to the members *From Nature to Sub-Nature* of March 25, 1925 in *Anthroposophical Leading Thoughts*.

degradation, economic disparities and marginalization of whole sectors of the global population. A more natural economic approach goes hand in hand with decentralization and the creation of efficient economic ecosystems that save energy and resources, and meet the needs of people and ecosystems. We touch on this matter here because, while this is not the object of this book, leaving it completely aside would be like ignoring another big elephant in the room. Our economic system is the root engine of what we see as climate change, or planetary depletion to use the language of this work. There is yet another reason for adding this theme here. Schauberger has helped us to see countless technological innovations that can be used at a small scale, that ennoble matter and energy in the process. They are eminently fitted for a decentralized economy.

The question of how more naturalistic innovations would integrate a holistic economic system would have been a purely academic question until I approached the work of Gunter Pauli and ZERI (Zero Emissions Research and Initiatives) and the economic model they propose. We will outline here some of its hallmarks and send the interested reader to Appendix 1 for the larger picture that is possible from its premises. First we turn to new developments in the fight against climate change.

Mega-Facilities for Trapping CO_2

The world's largest carbon removal project, situated in Wyoming, speaks volumes for many similar attempts to purely technological solutions to the climate crisis. It is the so-called "Project Bison," the brainchild of the Los Angeles-based Carbon Capture Inc. and Texas-based Frontier Carbon Solutions.[3] This is not the first such operation, only one on a much larger scale, than the largest such plant already operating, the Icelander Orca, which captures some 4,000 tons of CO_2 per year.

Climeworks, the Swiss company, responsible for the Orca project announced a 10-year deal with Microsoft, which will allow the tech giant to offset 10,000 tons of its CO_2 emissions. For this purpose Microsoft tapped into its $ 1 billion Climate Innovation Fund.[4]

The Orca plant pales in comparison to the ambitions of Bison. The initial 12,000 tons of CO_2/year will accrue to an estimated 200,000 tons by 2026, and 5 million tons by 2030. The facility will be comprised of large arrays of modules, the equivalent of 40-foot shipping containers. The technology makes recourse to "reactors" acting as filters that extract CO_2 from the air. The gas is then pumped deep underground to be permanently stored in saline aquifers. Notice in passing that CO_2 will be needed in order to dispose

[3] Joseph Guzman, The world's largest carbon removal project will break ground in Wyoming, Oct. 01, 2022, available at https://thehill.com/changing-america/sustainability/climate-change/3669378-the-worlds-largest-carbon-removal-project-will-break-ground-in-wyoming/.

[4] See https://www.geekwire.com/2022/heres-a-look-at-the-worlds-biggest-carbon-capture-site-which-just-signed-a-10-year-deal-with-microsoft/

of … CO_2. Notwithstanding the lack of studies for the unintended consequences of such an operation, the sheer ambition of the undertaking should offer pause to think.

Adrian Corless, CEO of Carbon Capture, waxes ecstatic about the business possibilities: "So even with this project, we're still in the early days of what needs to become an industry about as big as the oil and gas industry is today." His are not empty words since in fact the support is there at the political and legislative levels. The Biden Administration's Inflation Reduction Act significantly increased the tax credits for carbon removal from $50/ton to $180/ton. And the even more recent Bipartisan Infrastructure Law allocated $3.5 billion to establish four similar projects for large-scale CO2 removal.

Project Bison will be soon followed by larger endeavors, such as Stratos, the world's largest Direct Air Capture (DAC) facility, planned in Ector County, Texas. Stratos will be the joint venture of Occidental (short for Occidental Petroleum Incorporated) and BlackRock, one of the largest multinational asset managers. Black Rock will invest $550 million in the initiative. Occidental is a multinational energy corporation based primarily in the United States, the Middle East and North Africa, and one leading producer in offshore Gulf of Mexico oil.[5]

Stratos is designed to capture 500,000 tonnes of CO_2 per year. Vicki Hollub, president and CEO of Occidental declared "We are excited to partner with Black Rock on this transformative facility that will provide a solution to help the world reach net zero." And she has reasons to be excited since she intends to direct Occidental to support over one thousand similar projects by selling the very lucrative direct air capture (DAC) technology and design expertise.[6]

That this will become the landscape of our future is very clear from the support of the autoritative World Economic Forum (WEF) and International Energy Agency. The WEF indicates "We cannot reach net zero without carbon dioxide removal (CDR) technologies – they are essential to delivering the 'net' in net zero. Of these technologies, direct air capture (DAC) has significant advantages over other CDR approaches."[7] The IEA's 2022 Direct Air Capture Report adds an idea of the dimension of such projects: "In the IEA Net Zero Emissions by 2050 Scenario, direct air capture technologies capture more than 85 Mt of CO_2 in 2030 and around

[5] See https://www.oxy.com/news/news-releases/occidental-and-blackrock-form-joint-venture-to-develop-stratos-the-worlds-largest-direct-air-capture-plant/
[6] See https://www.reuters.com/business/energy/occidental-ceo-sees-potential-license-1000-carbon-capture-plants-2023-11-08/
[7] See https://www.weforum.org/agenda/2023/08/how-to-get-direct-air-capture-under-150-per-ton-to-meet-net-zero-goals/

980 $MtCO_2$ in 2050, requiring a large and accelerated scale-up from almost 0.01 $MtCO_2$ today."[8]

Carbon credits are sold in so-called "carbon markets," self-regulated by non-governmental entities. Among the largest players in this market are megacorporations such as Microsoft, UBS, Airbus, Shopify, Swiss Re, and newly created "demand aggregators" like Frontier—a joint initiative of Stripe, Alphabet, Shopify, Meta and McKinsey, among others. Altogether they committed to buy $ 1 billion worth of carbon credits.

The view from Sub-Nature of here above exalts the perspective of the Earth as a closed system, the idea of an input-output model, that corresponds to certain physical and mathematical constraints, which we can direct and operate within a technologically monitored system. The above clearly illustrates how complex problems are been tackled with deridingly simple solutions that do not come from a real understanding of Nature. We can soothe our anxiety and consciences with the illusion of quick fixes, or come to accept that real change can only come from a restoration of Nature's fallen state.

A Blue Economy in Defense of the Planet

The examples given above form part of the view that Gunter Pauli calls the "Red Economy," in contrast to the Green Economy and Blue Economy. The Red Economy "borrows—from nature, from humanity, from the Commons of all—with no thought of repayment beyond postponement to the future. Insatiable economies of scale callously search for ever lower marginal costs for additional unit manufactured, making dismissive abstraction of all unintended consequences."[9] The prevailing global economy delivers a growing host of products aiming at satisfying a variety of artificially stimulated desires—through massive advertising—instead of solely addressing real needs. It then favors the growth of monopolistic corporations geared at creating economies of scale. This is the path that inexorably leads the global ecosystem toward growing pollution, environmental degradation, depletion of non-renewable resources, impressive generation of waste, loss of biodiversity and runaway carbon emissions.

A big challenge of the present global paradigm is waste, a really large proportion of everything that is produced in the present economic system. A few examples will suffice given their magnitude. Corn is only used for the seed; the process of brewing uses only the starch from barley and the rest is waste; coffee is only exploited for the berry. The production of sugar from cane uses only 17% of the plant, while the rest is burned—a systemic inbuilt and persistent contribution to the growth of CO_2.

[8] See https://www.iea.org/reports/direct-air-capture-2022

[9] Gunter Pauli, *The Blue Economy: 10 Years, 100 Innovations, 100 Million Jobs. Report to the Club of Rome*, xxix)

Coffee is the second most widely traded global commodity and one of the most wasteful farming practices. It generates waste at the source, the so-called "pulp" and a second post-consumer waste of grounds. This means that only 0.2% is enjoyed by the consumer, the rest is waste. The 2008 coffee consumption equaled 134 million bags (60 kgs/bag), which means 23.5 million tons go unused, just wasting.[10] After years of study Nestlé chose to burn coffee waste, which is 80% water, as its best environmental option, another energy-inefficient proposition and another contribution to global CO_2 levels. As if the above did not speak volumes, just keep in mind that the farmer hardly makes 0.1 cent on average out of $ 3.00 of what is charged to the customer for an espresso.[11]

The litany of waste in our economic system is endless. Paper manufacture gets rid of everything but the small amount of cellulose. The rest, the "black liquor," goes once more out in smoke and CO_2, since it is incinerated. Looking at the global system, just the waste generated by mining dwarves municipal solid waste by a factor of 71. Consider that in the US alone the cost of transporting waste to the landfill adds up to $ 50 billion. And this is nothing in comparison to the costs for collecting, hauling and disposing of the wastes from construction, agriculture, mining and industry, which reach a stunning $ 1 trillion.[12]

All in all we have an economic model built upon the premises of scarcity and leading to scarcity as its conclusion. It seems that in the present corrective measures for climate change we must control access to our resources and manage in the best possible way … the little that survives colossal waste. We must control the emissions from inefficient processes without questioning the very source of the problem.

Why not change the premise of the inevitability of waste of our present economic model? This is exactly what Gunter Pauli and ZERI, plus a multitude of economic agents, are attempting worldwide. Once more brilliant solution to the climate crisis are hidden in plain sight, but they are not seen and acknowledged because they correspond to a new paradigm, that of the "Blue Economy." Blue stands for the color of the planet seen from space, and as a further differentiation from so-called "Green Economy." We will see shortly that Blue Economy approaches are not only good for human well-being; they address climate change upstream, rather than remediating downstream.

The shortsighted thinking of the "green economy"—laudable as the intentions have been—has led to tinkering within the predominant economic model. Gunter Pauli was the founder of the well-known Ecover

[10] Gunter Pauli, *The Blue Economy*, 86.
[11] Gunter Pauli, *The Blue Economy*, 88
[12] Gunter Pauli, *The Blue Economy*, 6.

company, which produced palm oil-based biodegradable cleaning products. He was dismayed to realize over the years that the incentive to produce palm oil caused the destruction of vast swathes of rainforest. He painfully awoke to the drawbacks of the Green Economy and came to realize that biodegradability and renewability were pitted against sustainability in the market dynamics of the global economy. Add to this that the green economy has generally meant higher investment rates and higher costs to consumers. It is well-known that biofuels, besides using corn inefficiently, are driving up the cost of the staple upon which many depend.

Gunter Pauli has been a member of the Club of Rome for three decades. After creating half a dozen companies by the 1980s, he started a publishing company to render available the Worldwatch *State of the World* and *Vital Signs* to the European business community. Pauli's earlier disappointments gradually brought him to approaching an economy that eliminates the concept of waste and acts like a natural ecosystem.

In Nature nothing is waste; everything left behind by one kind of organism becomes the substratum for another organism. The realization spurred Pauli to undertake a three-year research project in cooperation with the United Nations Development Program (UNEP). It led to the founding of the ZERI foundation in Switzerland to spearhead the study of economic systems without waste and emissions, which generate jobs and social capital while being affordable. As part of the project he created an inventory of cutting-edge innovations inspired by natural organisms and systems. Out of a list of 340 technological innovations that met sustainability criteria he finally narrowed down to the 100 already enacted and feasible, or those that held the most promise and likelihood of success. The guiding criteria for selection were the ability to use efficiently nutrients and energy, moving them from one level of the economic system to another leaving little to no waste. The viability of these new technologies has been recognized by the executive director of UNEP, Achim Steiner thus "Many technologies are in commercial use. We are not talking about theory anymore; these are real results occurring in the real world and in the real market."[13]

Let us get closer to Pauli's vision. The Blue Economy purports to apply the achievement of ecosystems to economic systems. Moreover it is a "new economic model that is not only capable of responding to the needs of all but converts the artificial construct called 'scarcity' into a sense of sufficiency and even of abundance."[14] The focus lies not just on the finished product. The processes themselves must be energy-efficient and free of waste. Herein lies the major difference with the Green Economy. Notice in passing that the above is completely consonant with Schauberger's technological applications and a phenomenological understanding of biological systems.

[13] Gunter Pauli, *The Blue Economy*, 43.
[14] Gunter Pauli, *The Blue Economy*, xxx.

The Blue Economy moves past the need to replace something toxic or energy consuming with something less toxic or less energy consuming. It moves toward altogether more efficient and affordable processes. Many of the technologies used to strengthen the Blue Economy take their departure from imitating unusual processes in the natural world. Vortex technology is a very general one. Others take their departure from how animals achieve adaptation to extreme conditions and overcome natural obstacles with simplicity and little expense of energy, whereas we humans, confronting the same situation, have thus far expended great amounts of resources and energy.

Much of the Blue Economy rests on observations through which we can realize how minute shifts in pressure, temperature, and moisture content create outstanding products and processes. Instead of having recourse to the sub-Nature of oil and coal biochemistry or manipulating the biology of life, we can imitate the ways in which nature uses physics. Nature itself, when we mimic it, is showing us ways to eliminate energy-inefficient synthetic chemistry. A great number of new technologies, in addition to using minute shifts in pressure, temperature, most often just take advantage of gravity. Energy savings as well as reduced emissions are obvious if we can shift from high temperatures and high pressures of technological motion to processes using low temperatures and low pressures, whether this be with technological or planetary motion. In fact the Blue Economy is a great intermediary step in the direction of Viktor Schauberger's technical applications resting on planetary motion. Both are based on the tenets of "Kapieren and Copieren."

What renders the Blue Economy an ecological economy is the logic of "cascading nutrients and energy." The term cascading comes from the analogy with a waterfall, indicating an effortless movement from one level to the next, akin to gravity. An example is what happens in Nature where each realm feeds the next one. The minerals feed the plants, the plants the animals, and the waste of one is the nourishment of the other, closing the loop when dead plants and animals return to the soil. Industrial processes can now be designed to emulate this process of cascading. The Blue Economy can boldly claim that it "initiates a generative and regenerative cascade of implementable innovations leading to a sustainable product, sustainable manufacture and sustainable whole systems in order to create competitive products, competitive processes and competitive business models that go far beyond core business practice."[15]

In this alternative view of economics the ability to offer better and more diversified returns reduces the element of risk. An example: there are thirty-seven known commercial applications for the vortex. The company Watreco can help save energy in ice-making, speed percolation in golf

[15] Gunter Pauli, *The Blue Economy*, 74.

greens, descale pipes, pump air into fish tanks among other things. Since it can produce multiple cash-flows through multiple applications it helps reduce risk and increase the value of the intellectual property, raising interest in a variety of investors seeking differentiated outcomes. At times the Blue Economy offers the possibility of replacing high expenses of materials and energy purely and simply with nothing or with something infinitesimally smaller and completely different from the system it replaces, as we will see below.

Looking at solutions to the energy and climate crises we can be truly inspired by how much the Blue Economy has to offer, both by reducing energy consumption and by taking advantage of CO_2 itself.

Saving Energy and Turning CO_2 into a Resource

The new biotechnology of the Blue Economy envisions opportunities where traditional economy only sees limitations. We'll start with an example from a lowly insect, which most often society wants to exterminate. Who could fathom how much we have to learn from it? The termite is a highly skilled engineer. Its sophisticated mound architecture is such that it keeps a constant temperature of 86°F and a constant humidity of 61%.

Another source of inspiration in temperature control and ventilation is the deceptively simple zebra mechanism. The savannah animal takes care of her body temperature by creating wind micro-currents derived from the temperature differential between black (absorbing) and white (reflecting) skin surfaces. Higher air pressure moves from the white to the black areas allowing the zebra to reduce surface temperature by 17.5°F.

Using the termite and zebra's wisdom Anders Nyquist developed mathematical formulas to minimize or eliminate the need for heating or cooling systems through managing the right airflows. Examples of buildings using this technology are Daiwa House in Sendai, Japan, Las Gaviotas' hospital in Colombia, the Eastgate and Shopping Complex in Harare, Zimbabwe, the Laggarberg School in Timrå, Sweden. Several of these buildings completely eliminated the need for heating and cooling systems, others complemented them with the use of heat pumps.[16]

Elsewhere Young-Suk Shu and Tae-Sung Oh from Korea put to good use the wisdom of ants and termites, whose underground storage of plant debris, not only creates a natural compost for plants but warms the soil, thus protecting plants against freeze.[17] The two researchers transposed this idea to a greenhouse whose heating principle is to heat the roots, reducing or eliminating altogether the need to heat the air, and saving energy consumption by two thirds or more. In Japan the technology has been

[16] Gunter Pauli, *The Blue Economy*, 279.
[17] Gunter Pauli, *The Blue Economy*, 280.

adopted by tomato and strawberry growers. It can now further replace in unexpensive fashion the need for radiant floor heating.

With new kind of thinking the energy question can be placed in another context; it can be viewed as an opportunity. Can we be audacious enough to apply this new thinking to CO_2 itself? Could we possibly see it as a resource rather than a waste? The Swedish MRD Construction Company receives unusable recycled glass and processes it turning it into glass foam blocks used as structural building materials—at present in Belgium and Czech Republic. All that is added to the glass is CO_2.[18] The resulting product is lightweight, resistant to acids and mold and a good insulating material. It can be used instead of another four products in the market.

Canadians Normand Voyer and Sylvie Gauthier's innovation is a process that uses enzymes to capture carbonic gases and deliver CO_2 to produce calcium carbonate. Their venture, aptly named CO_2 Solutions, trades in the Toronto Stock Exchange. It is very adaptable since the raw materials can even be tapped from coal fired plants' smokestacks. Not only does it tackle the CO_2 problem at the source, it also reduces the need to mine calcium carbonate to manufacture cement.[19] Think of the further potential when you consider that the largest CO_2 emitters are cement factories themselves, upward of 10,000 of them globally. A variation of the above is the idea developed by Geoffrey Coates of Cornell University to convert CO_2 and CO to plastics and chemicals with the help of an enzyme that transforms CO_2 into polymers.[20]

Carbon dioxide could even become a source of energy with the help of algae due to their fast growth rate. The Minnesota Center for Biorefining estimated that algae produce up to 5,000 gallons of biofuel/acre/year, which compares favorably with 18 gallons for corn, 48 gallons for soybeans and even with the 635 gallons from palm trees.[21] Algae do not detract from an existing food source by driving its price up; on the contrary they generate multiple lines of value.

In Brazil this knowledge has been put to use in the cultivation of spirulina, yielding 2000 gallons/acre/year. Easily satisfied algae can be grown on marginal land in salt water and can even take advantage of the CO_2 from the retention basins of coal-fired power stations.[22] Sequestering CO_2 while producing energy is an amazing trade off.

The idea has now spread to different parts of the world. In Colorado the National Renewal Energy Laboratory has tested three hundred algae that

[18] Gunter Pauli, *The Blue Economy*, 210.
[19] Gunter Pauli, *The Blue Economy*, 280.
[20] Gunter Pauli, *The Blue Economy*, 175.
[21] Gunter Pauli, *The Blue Economy*, 172.
[22] Gunter Pauli, *The Blue Economy*, 172.

could produce biodiesel in the New Mexico deserts. On its side the Federal University of Rio Grande in southern Brazil set up a project geared toward food production at Mangueira Lake, one of the most alkaline lakes in the world, at Laguna Morin and in rice paddies in the area bordering with Uruguay. The harvested super blue-green algae serve as nutritional supplemental food for the local population at risk of malnutrition. Part of the yield will go to produce biodiesel. The algal membranes, if isolated, are formed of esters which can be turned into polyesters without need of sulfuric acid. As an ultimate example of a cascading process, after extracting food, biodiesel and esters, what is left can be converted into ethanol.[23] The whole cascading process amounts to what the Brazilian team likes to call a "whole photo-biorefinery."

Within an economy that uses energy efficiently, reduces the need for entropy-dissipating processes, gets rid of waste, the perspective of combating climate change effectively can be viewed with optimism. It is not far-fetched to claim that the Blue Economy "can provide a solid rationale for implementing the agenda of the Convention on Biological Diversity and the missions of organizations like UNEP and IUCN" as claims Achim Steiner, executive director of UNEP.[24]

Because there is so much more that the Blue Economy can offer to addressing the issue of climate change we have added extra information in Appendix 1. You will see not only a host of processes to regenerate the Earth, save energy, reduce and reuse waste. You will also discover that a whole island has been undergoing a radical process of economic change over more than twenty years, which can give us a taste of how the crisis of climate change can be turned around within a highly decentralized and participatory economy.

In Need of a Cultural Revolution

The view from Sub-Nature that we saw earlier on exalts the perspective of the Earth as a closed system, the idea of an input-output model that corresponds to certain physical and mathematical constraints, which we can direct and operate within a technologically-monitored system. Complex problems are tackled with deridingly simple solutions that do not come from a real understanding of Nature. We can soothe our anxiety and consciences with the illusion of quick fixes, or come to accept that real change can only come from a restoration of Nature's fallen state.

The dominating economic model is based on a perpetual flight forward. While we are generating worse and worse ecological, economic and financial crises we can wager that purely technical or future unforeseen solutions will appear on the horizon and offer stopgap solutions. While we are squandering resources, energy and whole ecosystems we have to

[23] Gunter Pauli, *The Blue Economy*, 174.
[24] Gunter Pauli, *The Blue Economy*, xviii.

predicate restraint on the global citizenry. Waste on one hand leads to scarcity on the other, and with it comes growing control mechanisms.
On the other hand Gunter Pauli has showed us that even in the economy we can think holistically and learn from Nature what is needed in order to return the Earth to its real state of equilibrium, one in which technology and economic activity insert themselves in a whole new human-made ecosystem that mimics natural ecosystems. Eliminating our colossal output of waste and using moderate energy inputs for processes at near ambient temperatures using low pressure will certainly address the problem of climate change at its source. So why do we keep this healthy thinking at arm's length?
Under the light of what we have discovered, coming to know the work of Schauberger has been sobering to say the least. On the other hand, we can understand from the Austrian genius that much is possible if we only think an octave higher. And we have seen what kinds of solutions are possible through a new economy, and how vastly they differ from any possible Bison or Stratos projects. Much of the path humanity is engaged upon is actually reversible. However, this requires a change of thinking and, I would argue, a tidal wave of cultural change.
We have come to the end of the exploration from the ground up as it were, from the perspective of Gaia as a living being. The work of Schauberger and a more Goethean scientific understanding of Nature has allowed us to ascertain what is the essence of today's massive ecological crisis. It has placed water, not CO_2, at the center of the issue. But the matter of climate hinges on much more than life on Earth. As we will see shortly planet Earth is not a closed system in relation to the Sun and solar system either. We must, as it were, consider a much larger ecology, a planetary/cosmic ecology, which has a paramount influence on climate.