

Non-Profit Organization
U.S. Postage
PAID
Falmouth, MA
Permit No. 6

Annals of Earth

Costa Rica: Pura Vida



Will Rapp

Annals of Earth

Annals of Earth is a publication of Ocean Arks International. It is a continuation and extension of the Annals of Earth Stewardship. Ocean Arks is a non-profit organization. It was incorporated in 1982 to disseminate the ideas and practice of ecological sustainability throughout the world. Annals of Earth seeks, through written communication to foster the emergence of a lasting planetary culture.

Contributions and inquiries regarding the contents of Annals of Earth

Annals of Earth
10 Shanks Pond Road
Falmouth, MA 02540

Statement of Publication/Ownership

Published by Ocean Arks International

Officers—Ocean Arks International:

John Todd, Ph.D., President
Nancy Jack Todd, Vice President

Acting Executive Director

John Todd Ph.D.

Board of Directors

The Very Reverend James Parks Morton
Samir Doshi, Ph.D.
Diane Gayer
Elizabeth Thompson
John Todd, Ph.D.
Nancy Jack Todd
Greg Watson
Tim White

To Receive Annals of Earth

Annals is available for contributions to Ocean Arks International (Foreign: International Money Order or U.S. dollar check).

BECOME A MEMBER. Ocean Arks International has been supported over the years by the generosity of local, state and federal agencies, private foundations, the philanthropy of individuals, and "Annals of Earth" subscribers. As the reach of the work extends, so does the need for funding. Please join with us. Your support is critical to our mission.

\$20 Student/Unwaged membership
 \$35 Individual membership
 \$40 Canadian, Mexican, Central American member
 \$50 Foreign member
 \$60 Family membership
 \$100 Supporting membership
 \$1000 Patron membership

To subscribe or make a donation:

Ocean Arks International
10 Shanks Pond Road
Falmouth, MA 02540

Contributions are tax deductible. O.A.I. is a 501(c)3 tax-exempt organization.

E-mail: info@oceanarksint.org

Web site: www.oceanarksint.org

NEW: Subscribe via www.oceanarksint.org; go to PayPal and enter credit card information.

MEMBERSHIP RENEWALS:

A heartfelt **THANK YOU** to those who responded to our last issue of Annals by renewing your membership so promptly. Those of you who have not yet done so, please seriously consider it now. Our honor system of renewal is not the most effective or efficient, but with a small and mostly volunteer staff it's the best we can do for now. Your membership support is critical not only to Annals but to the larger mission of Ocean Arks International.

OCEAN ARKS MEMBERS:

Please send us your e-mail so that we can contact you about various events and happenings that might be of interest to you.

Send your e-mail address, with your name, to: info@oceanarksint.org.

We will not give out this information.

Nancy Jack Todd

About Annals

Here and There

Page 3

David Kupfer interviews Ernest Callenbach

Page 8

John Todd

Here Comes the Sun:

The Birth of an Ecological Technology

Page 13

Fred Magdoff

Global Resource Depletion:

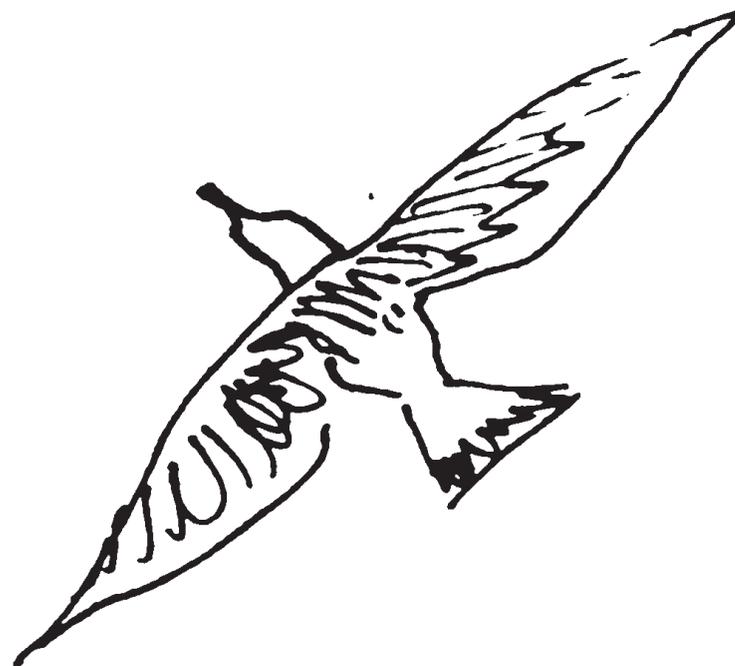
Is Population the Problem?

Page 15

Joan Pearlman

Turning Wastes into Vehicle Fuel

Page 22



Editor *Nancy Jack Todd*

Photos *Will Raap*

Cover Photo *Will Rapp*

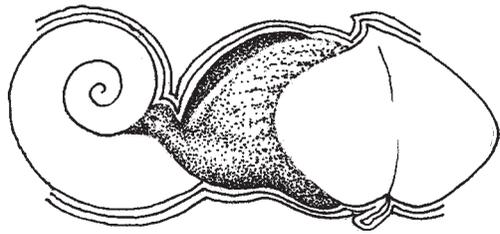
Banner Art *Jeffrey Parkin*

Design and Layout *Joanne Briana-Gartner*

Printing *Falmouth Publishing*

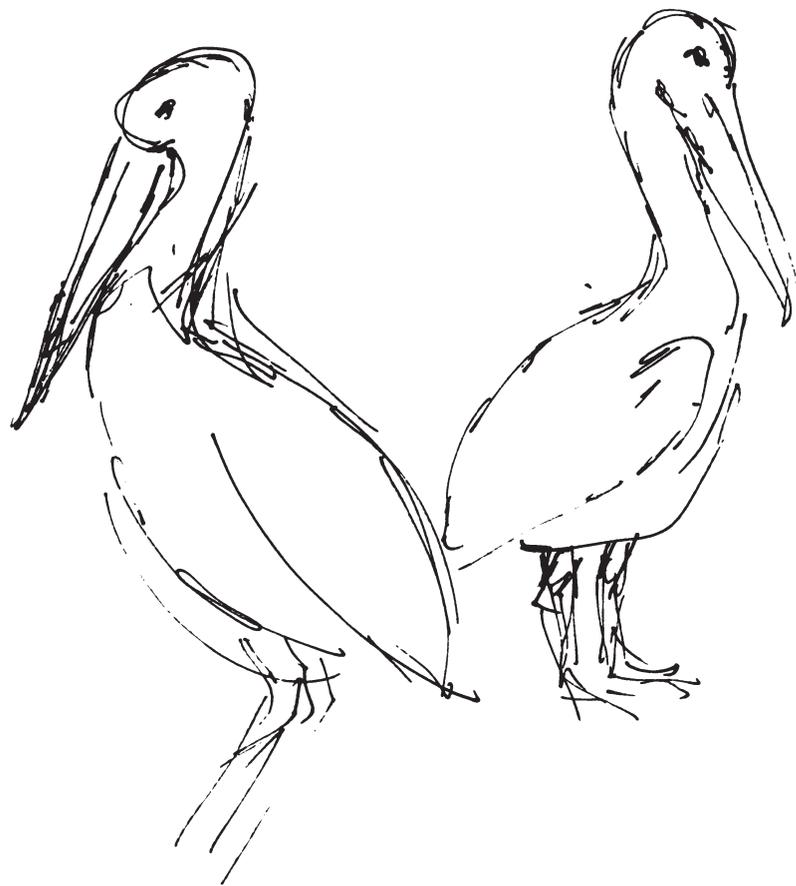
Drawings *Dorothy Todd Heuaut,*

Joanne Briana-Gartner



The rule of no realm is mine,
 but all worthy things that are in peril
 as the world now stands, those are my care.
 And for my part, I shall not wholly fail in my task
 if anything passes through this night
 that can still grow fair or bear fruit
 and flower again in days to come.
 For I too am a steward. Did you not know?

J.R.R. Tolkien



About Annals: Here and There

“Night clouds chase the rolling moon all across and down the western sky,” sang Canadian composer Ian Tyson in his song January Morning. “Cold shining down on you and I.” In our favorite corner of Costa Rica his description of night clouds sailing the sky in the wake of the moon holds true, although there are far fewer of them there. And it was the sun rather than cold that shone down upon us in northwestern Guanacaste province at that time of year. The same could be said for mornings in February and March. But by late April or May, when the rainy season begins, the elements become less predictable. Until then most mornings feature the brightest of blue skies and winds, turbulent at times, which swoosh through the leaves of tall trees and rattle palm fronds that dance and glint in the constant sunlight. Charmingly small doves, parrots, and kiskadees call. Vultures circle overhead. Bougainvillea flowers a blazing magenta. Other trees blossom in pink and yellow. Dragonflies dart, sometimes in swarms, as do humming birds.

It is a five minute walk to the west of where we stay to get to the sea. There the vast blue Pacific is bordered a broad swath of fine sandy beach that is largely empty even at high season. Inland, stretching toward the central plateau, lie dusty hills dotted with great trees and populated with farms, ranches, and small towns. Most of the houses are painted unimaginably bright colors and are surrounded by small cheerful gardens. We are based in the watershed of the Rio Andamojo which, beyond its plains, is flanked by dramatic cordilleras of steep sided hills. Many are forested. Others have been overgrazed by the omnipresent, slant-eyed Brahmin cattle and are subject to erosion. Enormous trees, like the giant Guanacaste, the strangler fig, and the cibo soar from the plains and pastures offering welcome havens of shade. As the dry season stretches on the wind strips many of the trees of their leaves, turns pastures and brown, and bronzes the waving Africa grasses. Then the parched landscape seems to cry out almost palpably for rain.

In our area the birds are notable in variety and number. Orioles, kiskadees, and tanagers go about their rounds, flashing by in yellow and orange and red. Blue jays, at least twice the size of their New England cousins sport absurd topknot curls as they dash and squawk among the trees. Even more omnipresent and opinionated are the wrens that appeared singly, in pairs, and small groups to comment loudly albeit musically on one’s doings. The parrots of assorted sizes are mostly kelly green with red accessories. They come and go but, like commuters, predictably return home just before sunset. They seem to realize they look particularly fetching among pale pink tree blossoms. Egrets also commute up the river valley but at slightly later hour.

At the shore the squadrons of pelicans are the most entertaining of the non-humans as they skim the cresting waves, ostensibly fishing but also, we suspect, showing off or just having fun. Higher over head soar frigate birds, wood storks and roseate spoonbills. In mid-air and more ominously hover the vultures. By the rivers, even more ominously, lurk the alligators – crocodillos – lounging on the muddy banks or hovering just below the surface of the water, often raising one sinister eye to monitor for possible prey.

As we have noted before, Costa Rica is one of the most stable democracies in Latin America. It is considered among the first in the area in protection of the environment and fifth in the world. In many other fields, issues that concern people and the media there are similar to those with which we grapple. There are, for example, ongoing debates about organic versus industrial agriculture and about the use of genetically modified organisms or GMOs. Genetically modified organisms are made by forcing genes from one species, such as bacteria, viruses, animals or humans into the DNA of a food crop or animal in order to introduce a new trait. The American Academy of Environmental Medicine reported, “Several animal studies have indicated serious health risks associated with genetically modified food. These include infertility, immune problems, accelerated aging, faulty insulin regulation,



Costa Rica is considered among the first in the area in protection of the environment and fifth in the world. In many other fields, issues that concern people and the media there are similar to those with which we grapple. There are, for example, ongoing debates about organic versus industrial agriculture and about the use of genetically modified organisms or GMOs.

and changes in the gastrointestinal system and other major organs.

In Costa Rica passionate opponents of GMOs have described them as “a modern-day form of colonization, through which corporations dominate countries by controlling the use of seeds.” With the exception of about a thousand acres, which are growing transgenic crops for research purposes, Costa Rica is essentially free of GMOs in its food supply. But quoting the Tico Times directly “The world’s most evil company, Monsanto, is once again trying to destroy this by quietly ushering in a variety of genetically modified corn that Costa Ricans have been working feverishly to block from being approved.”

The Times went on to report what they called “a massive public outcry against Monsanto’s genetically modified corn”. Apparently D & PL Seeds Limited, a subsidiary of Monsanto International, had first asked for permits to plant the corn last November. A subsequent protest by individuals and environmental and health groups, however, was successful in preventing the nation’s regulatory bodies from approving the planting of between two and five acres. Several weeks after delivering thousands of signatures opposing the planting, activists learned that the appropriate authority, the National Biosafety Technical Commission, was not prepared to grant the request at that time. It went on to recommend further studies on the impacts of transgenic corn.

This was not the only time that Costa Ricans have thwarted Monsanto’s plans. Back in 2004, again according to the Tico Times, they banded together to eject Monsanto from the country altogether. As reported by the organic consumers’ association at that time, public pressure was so intense that the corporation withdrew from the country voluntarily choosing rather to prey, as the Times put it, on others less opposed to GMOs. Now the threat has returned, Costa Ricans will have to redouble their efforts to keep the offending corporation out or, as has happened elsewhere, face the consequences of agricultural domination. The Times opined, “With its rich agricultural heritage, Costa Rica has much to protect.”

Of further concern is an effort to assure the stability of the national fishery. To do so officials have signed a decree calling for a ten year national plan. It recommends sustainable practices and promotes responsible fishing and the development of new research and training programs. Drafted by officials working closely with the fishing sector, it will be implemented in coordination with the efforts of President Laura Chinchilla’s cabinet level ocean commission. The plan also calls for cooperation with international organizations and governments to fund and enact sustainable management programs more broadly. It was emphasized that aquaculture projects should

protect the sea and restock and replenish resources. One official was quoted as saying, “If the seas are not healthy, people will suffer.”

It is to be hoped that such efforts would help preempt measures similar to those enacted in New England recently where limitations on the catch of cod have had to be imposed. For centuries the Atlantic cod was the mainstay of southeastern Canadian and New England fisheries. The name of the sea bound peninsula we call home attests to this. But by the early 1990s, a dramatic decline in cod stocks forced fishery managers to close some of these, the world’s most productive fishing grounds, to bottom fishing. By 1992 cod populations were down to one per cent of their original size. This had both ecological and economic results for coastal communities depending on the fishery which suffered widespread unemployment. According to the Gloucester Times, “The New England Fishery Management Council recently voted to cut the Gulf of Maine cod fishery by seventy-seven per cent for the 2013 fishing cycle and to extend similar cuts for 2014 and 2015. This dealt a dire blow to the region’s fishing industry.” The council also voted to cut cod allocation for the Georges Bank grounds by sixty-six per cent.

In the words of the administrator of the National Oceanic and Atmospheric Administration, John Bullard, “The day of reckoning has been decades arriving, and was brought about by the shortage of fish.” Exacerbating the problem, he went on to explain “is the fact that millions of lobster traps take large quantities of cod as a by-catch. Also seals feed on cod and herring eat cod eggs. There is not enough cod in the Gulf of Maine to sustain the fishery.” “The game is over,” another official announced, adding that it was “tough to support a motion that says the best we can do is to collapse the fishery.” Another argued that it would make more sense to shut down the fishery completely. This could dramatize the hardship in the hope that the Oceanic and Atmospheric Authority and Congress would acknowledge the crisis with disaster relief and realize the need to rethink its management. It is to be hoped that Costa Rica, with its new marine policies, will be able to avoid such drastic measures as well as the depletion of a much needed resource. It has been reported that other countries are beginning to protect sensitive marine and aquatic sources through similar environmental services programs.

When it comes to protecting Costa Rica’s natural resources ashore, it is widely agreed that the depletion of topsoil, groundwater reserves, forest and ocean productivity and genetic biodiversity must be halted and reversed. Toward this end, the country is a pioneer in programs that actually pay for environmental services. Such programs were first established in the 1990s through the creation of a national policy to provide land owners with finan-



cial incentives to protect their wooded areas. A recent study indicated that fifty-two per cent of the country is now forested. This represents an increase from twenty-one per cent in 1987. Costa Rica is the only tropical country able to make this claim. In collaboration with the national forestry fund, the government is also working with landowners to plant seven million trees on cattle and coffee farms.

There are also many non-governmental tree planting projects like those of Americans Bill McLarney on the Caribbean coast and Tom Peiffer and Dan Jansen in Guanacaste. Even along some of the beaches there is a goal to restore areas of barren coastline. Along the Pacific shore there is a stretch that had originally been cleared by ranchers. When developers subsequently

were considering turning part of it into a golf course, the government took over and incorporated it into the Ostional sea turtle reserve. The goal is to plant around two to three thousand trees there. The resulting shade will mean lower temperatures, which will enable more species of both plants and animals to grow in the area. It also serves to displace some of the invasive exotic grasses.

With a comparable goal of concern for the environment, in this country recently an estimated forty thousand people gathered in Washington in February for a demonstration entitled the "Forward on Climate Rally." Organized by climate activist Bill McKibben and his team at 350.org, the protest began on the National Mall. The participants then marched to the



White House to urge President Obama to take action on global warming and to reject the Keystone XL pipeline now under construction. They were encouraged by the fact that in his State of the Union Address President Obama had said, "We can choose to believe that hurricane Sandy, the most severe drought in decades, and the worst wildfires some states have ever seen were all just freak coincidence. Or we can choose to believe in the overwhelming judgment of science -- and act before it's too late."

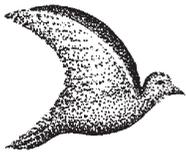
As we went to press in early April Republican lawmakers had met with President Obama and pressed him to approve the pipeline. Initial reports suggested he would do so but he did not then offer a definitive answer. The White House told the Huffington Post in an emailed statement that the president "had not indicated either way" if he would approve the pipeline and that the assessment is ongoing. According to the New York Times the executive director of the Sierra Club, Michael Brune, predicted that Mr. Obama would veto the seven billion dollar project because of the adverse effects the development of the Canadian oil sands would have on global climate. "It's rare that a president has such a singular voice on such a major policy decision," he said. "Whatever damage approving the pipeline would do to the environmental movement pales in comparison to the damage it could do to his own legacy." So far, Mr. Obama has been able to balance his promises to promote both energy independence and environmental protection, by allowing more oil and gas drilling on public lands and offshore while also pushing auto companies to make their vehicles more efficient. But the fate of the pipeline will be decided by the president himself and defies easy compromise.

The organizers of 350.org with the Sierra Club, and the Hip-Hop Caucus in addition to denying the permit for the pipeline were urging the president to limit greenhouse gas emissions and to make the transition to renewable energy. Frances Beinecke, the president of the Natural Resources Defense Council argued, "In the wake of President Obama's comments, we want him to know that when he takes these bold actions to stabilize the climate, the American people will support him every step of the way." Certainly Robert Kennedy Junior did. He was arrested for protesting the pipeline.

Reporting on their Forward on Climate Rally, 350.org supporters enthused, "What a day! Over forty thousand people poured into the streets of Washington to urge President Obama to take the nation forward on climate and to say no to the pipeline. Our team at 350.org had expected a crowd, but this was massive. Volunteers from around the country organized a hundred and thirty buses to get people there and it worked. There were people of all ages from Florida to Wisconsin to California. Students especially showed up in force. Many of them are hard at work running fossil fuel divestment campaigns on their own campuses. This generation of the climate movement is just as comfortable negotiating in board rooms as they are marching in the streets."

The speakers that day represented the full diversity of the movement, from indigenous leaders from across the United States and Canada to clean energy investors, environmental leaders, and civil and voting rights activists. According to a statement from the Sierra Club, another rally in Los Angeles organized by a coalition of over ninety groups was expected to be the largest climate change rally ever staged in that area.

Such activism seems to be having an effect. Wind capacity in this country has doubled since 2008. Subsidies aside, according to a Sierra Club report, wind power is the most economical way to generate electricity -- besting both coal and natural gas. According to the International Energy Agency, in



the last six years we have cut our emissions more than any other, bringing them down to 1992 levels. Nationally, the wind industry employs an estimated seventy-five thousand people. Iowa is the leading state in this field and second only to Denmark the world leader. This is worth noting in our town of Falmouth where there is been considerable resistance to several recently installed turbines. Among the wide ranging claims are that they cause a variety of health problems -- some entertainingly imaginative -- from weight gain to herpes. The Massachusetts Department of Environmental Health, the Oregon Health Authority and the Environmental Health Journal disagree, however, and report that they have found no scientific evidence to support such claims.

Back in Costa Rica officials tackling another aspect of climate concern have announced the goal of achieving carbon neutrality by 2021. Not long ago President Chinchilla also signed an executive order for the country's electricity institute to buy the cleanest and cheapest energy available. The state-owned Costa Rican Electricity Institute has reported that their organization will grant permission to six private companies to develop four new wind farm projects and two hydroelectric projects. Collectively they are predicted to generate a hundred and thirty-seven megawatts, which will supply the average consumption for more than two hundred thousand households. The electricity so provided will help meet energy shortages during the dry season and reduce the use of oil-generated energy. A row of wind turbines already rings one of the peaks of the volcano Miravalle.

It is thought that the most likely way for Costa Rica to achieve its goals of reducing carbon emissions is by initially focusing on the public transport sector. As part of that program, new hybrid buses have been brought into service. They carry a hundred and twenty passengers and emit fifteen per cent less pollution than the traditional buses that run on liquefied petroleum gas or diesel. Company owners predict the new buses will allow them to lower operating costs by thirty per cent. Private companies like Toyota are considering offering more competitive prices on cleaner technology vehicles to taxi companies. According to a cost benefit analysis of the industry the most profitable alternative for taxi companies is natural gas. The second-best option, as discussed by Joan Pearlman elsewhere in this issue, is liquefied petroleum gas. A third choice is electric or hybrid systems that combine natural or liquefied petroleum gas with diesel. Officials are devising further economic incentives in the transport sector and are negotiating with national banks to offer financing for clean technology vehicles at better rates. The national oil refinery also is working to improve fuel standards. Officials already have eliminated damaging and harmful additives such as sulfur from national fuel supplies. Consumers can contribute by choosing zero-emission taxis and buses. Should Costa Rica achieve carbon neutrality by 2021 it will be the first country to do so. 2021 is the country's two hundredth anniversary.

Another arena crucial to climate change is agriculture. Here the biggest contributors to carbon emissions are cattle ranches and plantations growing crops for export like pineapple, bananas and coffee. Other phases of Costa Rica's carbon neutral plan are improvement in water treatment, more investment in renewable energies and newer technologies for waste disposal. Administration officials plan to develop a more efficient electricity transmission and distribution grid by 2018.

There is a sense of optimism in the environment ministry as well as at the universities participating in the research to analyze the country's emis-

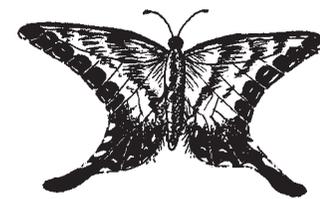
sions and to set realistic goals in doing so. The numbers indicate that this is a genuine possibility. Based on data from the World Bank, Costa Rica is already showing excellent results in the amount of carbon dioxide produced per unit. Despite economic and population growth, this output has decreased considerably over the past few years. Further efforts to achieve carbon neutrality and sustainability include stabilizing population growth and prioritizing the education of girls and the empowerment of women.

Finally, even as the debate over guns continues to be waged here twelve thousand people are murdered with guns every year, Costa Rica maintains its commitment to being a country that since 1947 has maintained a policy of "no guns, no army, and no war". According to former United Nations Secretary-General Kofi Annan, "The death toll from small arms dwarfs that of all other weapons systems — and in most years greatly exceeds the toll of the atomic bombs that devastated Hiroshima and Nagasaki. In terms of the carnage they cause, such guns indeed could well be described as 'weapons of mass destruction'." Hand guns are used to kill as many as a thousand people each day. Millions more are wounded, or their lives are upended when access to development aid, markets, health, education and human rights is disrupted by people with guns."

Although people in the private sector in Costa Rica do own guns, it remains true that since 1947 there have been no army and no war. As a farmer, a campesino in a remote rural area once told us with quiet pride, "We are a people of peace."

NJT





David Kupfer interviews Ernest Callenbach

In the following interview Bay area author and activist David Kupfer questions his long time friend and mentor, noted Bay area author and activist the late Ernest Callenbach. As most of us read and were influenced by his writing, particularly his most famous book, Ecotopia, it is interesting to know more about what influenced his thinking and ideas and what made him such an effective spokesman for the environmental movement. The interview was originally published in July 2012 in Bay Nature Magazine.

NJT

The late Ernest Callenbach was the author of ten books and worked as an editor at the University of California Press. He was also the originator of the concept of Ecotopia, Ernest "Chick" lived in Berkeley for many years but was brought up in the Appalachian country of central Pennsylvania on ten acres in the small hamlet of Boalsberg near Penn State where his father was a professor of Poultry Science. A self-ascribed country boy at heart, he attended the University of Chicago where he studied the then emerging movement of film as an art form. After spending six months at the Sorbonne in Paris where he sometimes watched four films a day, he returned to Chicago to earn a Master's degree in Communications and English. He moved to California in 1955 with his first wife and got a job at University of California Press where he was a staff member until 1991. He edited their *Film Quarterly* for thirty-three years as well as their natural history guides. He also taught film at the University of California and at San Francisco State University. After Earth Day in the 1970s he began to study and subsequently write about the linkages between environmental issues and their connections to human values, social habits, and life style choices. He subsequently wrote the books *Ecotopia* and *Ecotopia Emerging*, both fictional, which attained a cult like status nationwide and helped to dream, frame and inspire the growing appropriate technology, sustainability, and green life style movements of the seventies and eighties. Berkeley's Heyday Books reissued the book in 2005 to celebrate the thirtieth anniversary of his opus and recognize its continuing legacy.

Ecotopia described a visionary, utopian nation living in ecological harmony with the environment that developed advanced social enlightenment that was created by the secession of Northern California, Oregon, and Washington from the United States. The book's timely articulation, dream, and hope for a greener, more sustainable future tapped a vein of idealism and, for many years it remained on college syllabi and bookstore shelves. The novel set San Francisco as the capital of Ecotopia. In it Market Street is a creek and there are eco-efficient style trains and free bicycles. Skyscrapers have been converted into housing and marketplaces. Citizens gather on corners to picnic, play, barter, and banter, in a sort of continuous urban green Renaissance Fair.

Ecotopia challenged the usefulness of a corporate-driven social and political structures. It further anticipated and conveyed bold visionary ideas in forestry, energy efficiency, video conferencing, and worker-owned enterprises. It postulated radical transformation in approaches to education and an enlightened political system led by women. The social effect this had on the individuals described was seen as enviable giving them an inspirational level of confidence, personal empowerment, and a

He emphasized personal rather than impersonal interaction,

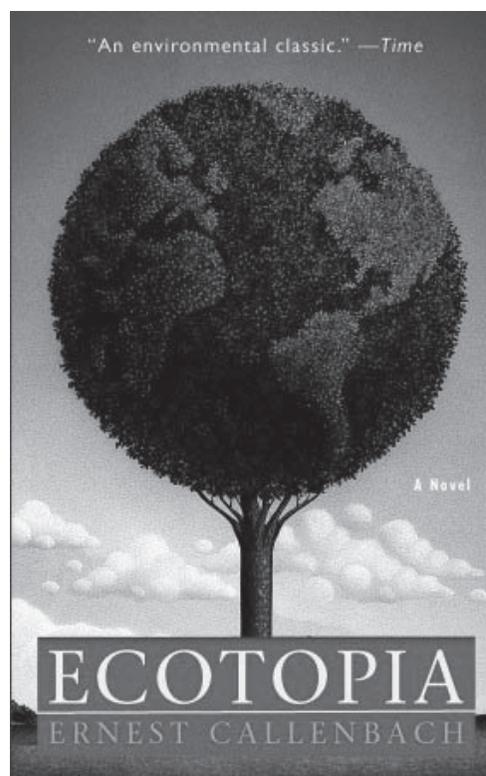
Ernest Callenbach's ten books include *Living Poor With Style* from 1972, which was updated in 1993 and again in 2000. *Ecotopia*, which was published in 1975, sold nearly a million copies. It was translated into ten languages, most recently Chinese. His other works included *Ecotopia Emerging* and *The Ecotopian Encyclopedia* in 1981, *Ecology: A Pocket Guide* in 1998, and *Bring Back the Buffalo!: A Sustainable Future for America's Great Plains* in 2000. In 2009 the University of Freiburg in Germany, a city that has been entitled a green utopia and has a burgeoning solar energy industry awarded him an honorary doctorate

When we last met, Ernest Callenbach, who was then eighty-three, conveyed a glowing, vibrant youthfulness. He remained interested, engaged and involved in the Bay Area environmental movement. Despite a stellar health regime, in his last year lung cancer invaded his life and body but for a time he won out over that challenge. I was gifted to know Chic as a friend, mentor, and writing colleague for more than three decades. Through the years he was consistently good humored, didactic, interested in learning, and willing to listen. He had compassion for, and partially tamed my ongoing rants on the lameness of western society. One sunny autumn day last year we sat over tea in his living room in North Berkeley and spoke of his views of his life in the Bay Area and the green movements here.

DK

DK: You've made the Bay Area home for decades. When and how did you get out here?

CC: I came out here to live in 1955, but I actually first visited earlier when I was only seventeen. When I went to college at the University of Chicago because they'd let you in without having finished the twelfth grade, I met a guy from Los Angeles. He was singing the praises of California, saying you've got to come out west. All of us were easterners and couldn't believe anything he said. He invited us out to spend the summer in L.A. His parents said they'd put us up for a little while and I went and got a summer job. But it really all starts with a book because when I was in the eighth grade I read the book *Storm* by George R. Stewart. This



strong sense of place.

In the utopian fiction of Callenbach's *Ecotopia*, environmental dangers are used as levers to advance social change, which parallels the curious American tendency of looking backward into the future. Callenbach suggested that *Ecotopia* is brought about through a process of self-organization comparable to the concept of "dissipative structures" in disequilibrium physics. His truly messianic intensity and his profound exaltation of woman may preclude some readers from participating in the reconstruction of his utopian paradigm. Callenbach's *Ecotopian* view is not exactly Luddite in that he does not reject high technology, but rather his fictional society did show a conscious selectivity about technology.

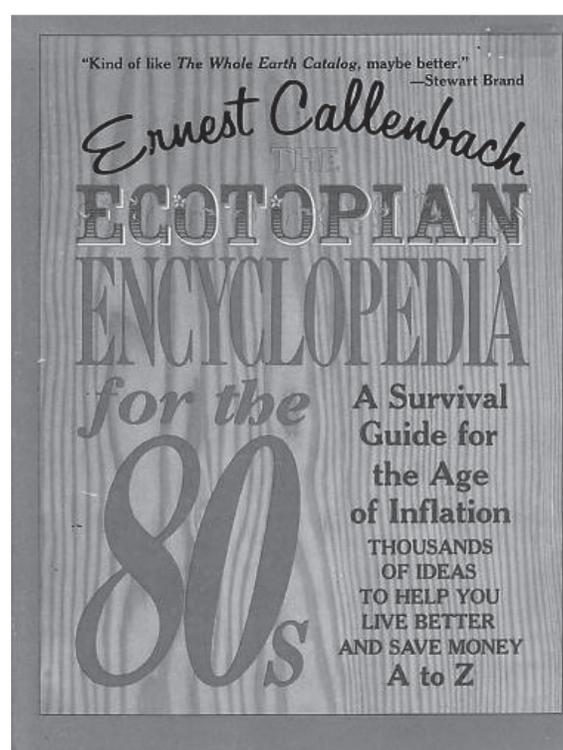
converted me to wanting to be a meteorologist and in particular to being fascinated with the coast of California because Storm takes place in the central part of the California coast. Once in L.A. I realized that I could call in sick to my job and get Friday off. So I did. One of my errands was to visit with George R. Stewart, who was also a professor at UC Berkeley. I'd written him some fan letters and he was willing to have me come for a visit. I caught the over night bus. My very first memory of the Bay Area is of coming through the Livermore Hills at dawn on what we now call highway 580 and those curved wonderfully sensual hills just absolutely blew my mind. I was still half asleep and I thought, 'are these really hills?' It was July so they were nice and brown. I couldn't believe that any landscape could actually look like that. I thought 'Wow! What am I getting into?' I had a friend in Berkeley I stayed with and I walked around the campus. The thing that got to me was the air.

I'd been living in Chicago and earlier in Pennsylvania. When I got out and walked around, it was one of those perfectly breathable Bay Area days when the air is cool enough to be comfortable yet not really cold. It feels like the air of paradise, just what we were meant to live in, and I thought 'Wow! This is a place where you could do some important work' because it was inspiring just to breath! It made a tremendous impact on me. I had a little interview with Mr. Stewart and looked around Berkeley and San Francisco and decided that I ought to come back one day. That this was a place that I could really feel at home, a place to put down some roots and settle down. So some years later, in 1955 after I'd gotten married and we wanted to settle down some place other than New York or Chicago, I persuaded my wife then to come out here. We arrived and I've been here ever since. It really did feel like home, that's the weird thing, and the air is still very important. Ecotopia, if you go back to the Greek root, means home place. I didn't actually understand that until I was about to send it off to the printer, I thought it meant just ecological utopia, but decided to look it up and was glad I did!

DK: What it was like growing up in the Pennsylvania countryside?

CC: It was really part of Appalachia which

extends into central Pennsylvania. I grew up among subsistence farmer hillbilly kids. Everybody was really poor but there was a strong sense of community and that made a lasting impact on me. But it was very boring. It was deep country and people were profoundly republican. They voted republican during the depths of the New Deal when they needed help probably more than anyone else in the country. But they all hated and voted against Roosevelt. So I was not exactly surrounded by intellectual companions.



When I got away from there to the University of Chicago, it was like finding friends I could talk to. It was a very intellectual environment.

We were doing a great books program in the college at that time. That is probably what made me an editor because the emphasis was very strong on analyzing the text of great works from the past, and trying to figure out how they could prove what they were saying. That's what an editor needs to do. You look at something an author has produced and you try to make it as strong, appealing, and air tight as possible. That was very useful to me in later days. Today Penn State is a major university, not just a football team with a science department attached

as it was back in my day. It was fairly isolated, the only radio station we could get was the CBC from Toronto where they played classical music and had some intelligent discussion of politics. But we couldn't get any of the New York or Philadelphia stations. It was a real backwater.

DK: Can you explain the derivation of your adopted name Chic?

CC: My father was a professor of chicken raising and I was his first hatched. Some grad student came by and remarked and the name stuck. My family runs to crazy nicknames. Chic and Ernest evens it out, it's nice to have one serious and one non-serious name.

DK: How has living in the Bay Area for half a century motivated or inspired your work, writing, and life?

CC: There is some kind of internal openness and excitement about the Bay Area which I have never understood. When I arrived it was much more separate from the rest of the country, in fact when I first self published *Ecotopia*, which I had to do because so many publishers in New York rejected it, I was thinking of putting on the back cover "Cost is slightly higher east of the Sierras" because California was a separate province in those days. You had a strong sense that things going on here kind of independently from the nerve centers of New York and Washington DC. It was very stimulating because you felt you were part of something that had a kind of independent spirit and was going its own way and the rest of the country wasn't paying too much attention. That was just fine. As years went by, there grew a great openness to initiatives in literature, music, art, design, politics, and a lot of other things too. It's no accident that Silicon Valley is here. We have this large community of very smart and daring people doing astonishing things. As time goes by I think that entrepreneurial spirit will make itself felt on the green side of life. It already is. The bulk of current venture capital going into new energy technology is coming from here. We're lucky to have a lot of very rich people who are willing to put money into some pretty chancy things.

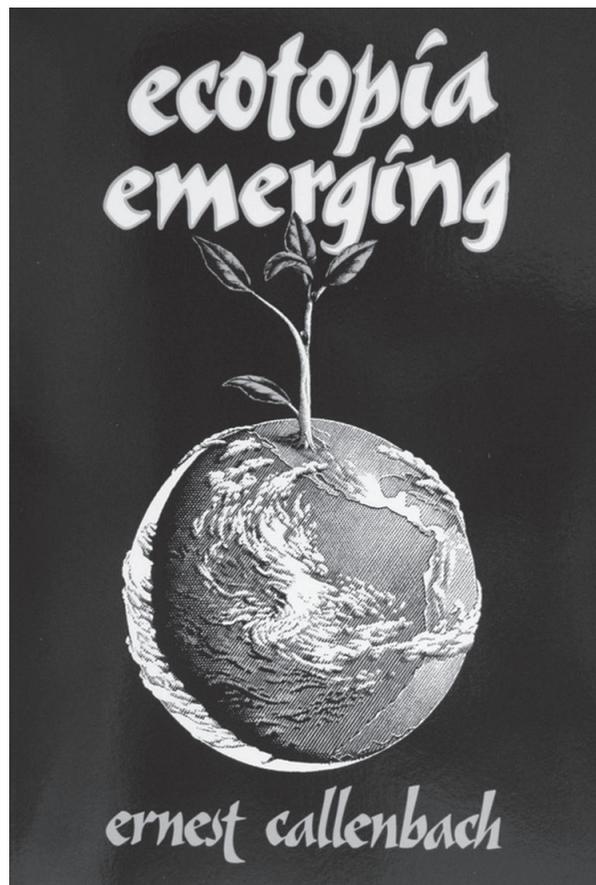
DK: Why do you suppose so very many environmentally consciousness movements, ideas and institutions have taken root here in the Bay Area?

CC: That's a mystery but part of it has to do with the Bay, the beating ecological heart around which all the other organs of the Bay Area have their place. You can't live here without being conscious of the Bay, maybe fearful for the Bay in various ways. Then you have the surroundings with easy access to quite wild ares. Not only the East Bay Regional Parks, which are an astonishing achievement started in the depths of the depression, but also the wild lands in Marin, on the San Francisco Peninsula, and down towards Santa Cruz. There are extensive areas which are insulated from development and that is part of your consciousness if you live here. If you get out at all, and a lot of people do because of the benign climate than you might if you lived in other parts on the country. I think it reinforces the sense that people are nested in nature here which you tend not to get in other metropolitan areas even though we have got close to seven million people living here, twice the number as when I arrived. But you still have a sense you are close to nature natural processes, even for those who live in a concrete city, you still feel it out there. Another lucky factor is due to historical accidents. The Save the Redwoods League, established in 1912 by a bunch of rich republicans who liked to take motor car picnics in different places like the one now called Big Basin State Park near Santa Cruz. They realized that their playground was about to be denuded and, being rich, they decided to save it by buying it as Ted Turner has done recently. That was one of the earliest actions of the Bay Area Conservation Movement. Another historical accident was that John Muir settled here. Just our luck! Dave Brower was born and spent his life here in Berkeley. There's been a continual outpouring of people who care. I look into the work of the Greenbelt Alliance or any of these organizations doggedly devoted to preserving things and wonder, where they get their energy, persistence, tenacity from? How do they raise the money? It is just astonishing! I am in awe of these people.

DK: Where are some of your favorite spots for outdoor recreation in the Bay Area?

CC: All the places I like returning to are wallowing in water. One of my favorite places for going on a walk is Cesar Chavez Park here in Berkeley. When I came here it was the site of the Berkeley dump. I used to go down there and throw stuff in and salvage other things. That's a very nice stroll for people who don't walk terribly strongly like me. I'm very fond of the outer beach in Bolinas where the reef is off to

your left and the beach runs north. I actually set one of the scenes in *Ecotopia Emerging* out there. I like that spot because it is sticking out in such a brave and wonderful way into the Pacific and it is thrilling to be there. Another place that I am particularly attached to I found as a consequence of working at the University of California Press in downtown Berkeley. Across the street you could walk a little way onto campus and there was a part of Strawberry Creek that was quite wild. I would take my bagged lunch and go there and sit on the bank of the Creek.



I grew up next to a creek in Pennsylvania and have always loved creeks for some reason. The University of California building mania has not for some reason come to that area - it's still a relatively natural and protected zone. I am very fond of a few secret spots like that. I think creek restoration is very spiritually nourishing. I noticed the other day down by the freeway near Target near El Cerrito Creek there is a marsh with cattails and blackbird by the thousands -- a little secret restored corner of the world that works.

DK: What do you feel the impact of Bay Nature Magazine has been?

CC: Bay Nature dramatically conveys the incredible richness and beauty of where we are, it is an abundant source of information made available to ordinary people about so many places, some really unsuspected. It is a rich abundance of information

that some die hard hikers in the Sierra Club probably knew, but they weren't easily accessible to ordinary people. Now if you subscribe to Bay Nature every issue is going to bring you some place and you'll say, "my, I really have to get out there and look at that!" People themselves do not necessarily have the time to research them, so Bay Nature makes it easy for us, and that's a very big public service.

DK: Can you speak to the genre of eco-fiction that you have so very much contributed to? Who has followed in your footsteps?

CC: I am an enormously great admirer of Ursula LeGuin, who is probably the most important American writer of the twentieth century and so far of the twenty-first century. I am particularly fond of her book *Always Coming Home*, which is an astounding ethnography of the people that we might become. It is set three and a half thousand years in the future after industrial consumerism has run its course and vanished and takes place in what we today call the Napa Valley. It is a masterpiece. A local author Dorothy Bryant wrote *The Kin and Atta Are Waiting for You* which is a mystical ecological novel that expands on the idea that negating dreams has an impact on the real world. Marge Piercy wrote some eco fiction, a year after *Ecotopia* appeared she published *Woman in the Edge of Time*, another utopia dystopia, and in it she makes clear that in the future we can either live in a decentralized, socially and environmentally advanced community or a toxic, soulless, bloody empire. She is saying that we have the chance to create utopias only if we are willing to fight for them. Starhawk's *The Fifth Sacred Thing* takes considerable leaps beyond what I did in *Ecotopia* and I was impressed with her writing as well.

DK: Who has been influential in your work and career?

CC: George R. Stewart was really critical to my life in so many ways. I have very filial feelings towards him like he was an intellectual father. I'm still enormously fond of his book *Storm*. He taught me a way to think about regions that we now call bioregions although the term had not been invented then. He looked at central California as a functioning organism. This was a new form of novel, a new way of looking at how we lived on the land. He wrote in this slight purple style that made my hair stand up on my neck. It's really beautiful writing and that's how I learned that writing and culture and the environment were all part of the same piece. Later on, when I came to write *Ecotopia Emerging*, the structure of that is kind of a multi-stand story where things interact in ways that you don't appreciate

until later on. I was consciously trying to imitate the way that Stewart structured his writing.

DK: How have you seen environmental themes and ideas become woven into present American society? And where we are headed?

CC: I sense that ordinary people, especially technological ones, who at one time might have had gotten engineering degrees and have gone on to build stuff out of concrete, are now beginning to understand that the biological side of anything we do is very important. It has to be thought about from the beginning. That is now pretty widespread in our culture. In the nineteen seventies German businessmen began saying things like “without sustainability there will be no profits”. That is something that American business as a class hasn’t really gotten through its head. But there are a lot of people out there who understand that sustainability is more than quarterly profit taking and that they’ve got to think that if they want their company to continue in the long term, they’ve got to change a lot of the ways that they do business. That is where the rubber has to hit the road in the long run. When we are talking about longterm ecological change, it’s everything having to do with the metabolism of the society. That means where we get our materials and how much they are recycled, what our distribution system is like, how we consume things and what we do with them afterwards in terms of the waste. It also involves how and what we eat. One of the most encouraging aspects of what has been going on is a large number of Americans have begun to understand that our diet is not good for us, and that is worrisome. It gets under people’s skins. That is a big change for which we have a lot to thank Michael Pollan for, I think he has been a tremendous influence there.

DK: You mentioned you are less optimistic today than when you wrote *Ecotopia* thirty-eight years ago. What you perceive is happening nationally in the nation politically, culturally and environmentally?

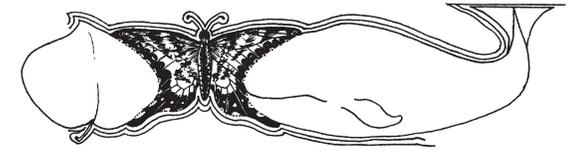
CC: I think what’s happened nationally and has caused a lot of people despair is that the federal government has been pretty thoroughly captured by the money people. It has always been corrupt and comical but it is now as bad as it ever was back in the nineteenth century. People in individual states still have problems, ecological and otherwise, that they’d like to do something about, and are going to have to work through their state governments which is going to be possible in the coastal, so called blue states but very difficult for those inland.

I think we are going to see is a de facto secession movement because the underlying brutal reality is

that the prosperous blue states along the seaboards are subsidizing the backward religious so called red states in the middle and sooner or later people are not going to appreciate that. I think this is an issue that underlies a lot of what’s going on. The general paralysis of American politics between the two parties is a big part of it too. The republicans about twenty years ago decided that intransigence would gain them big political rewards. They hate Obama, a lot of them I think for concealed racist reasons and they basically think that if the country was misguided enough to elect a black president that they would just as soon see it go down the drain.

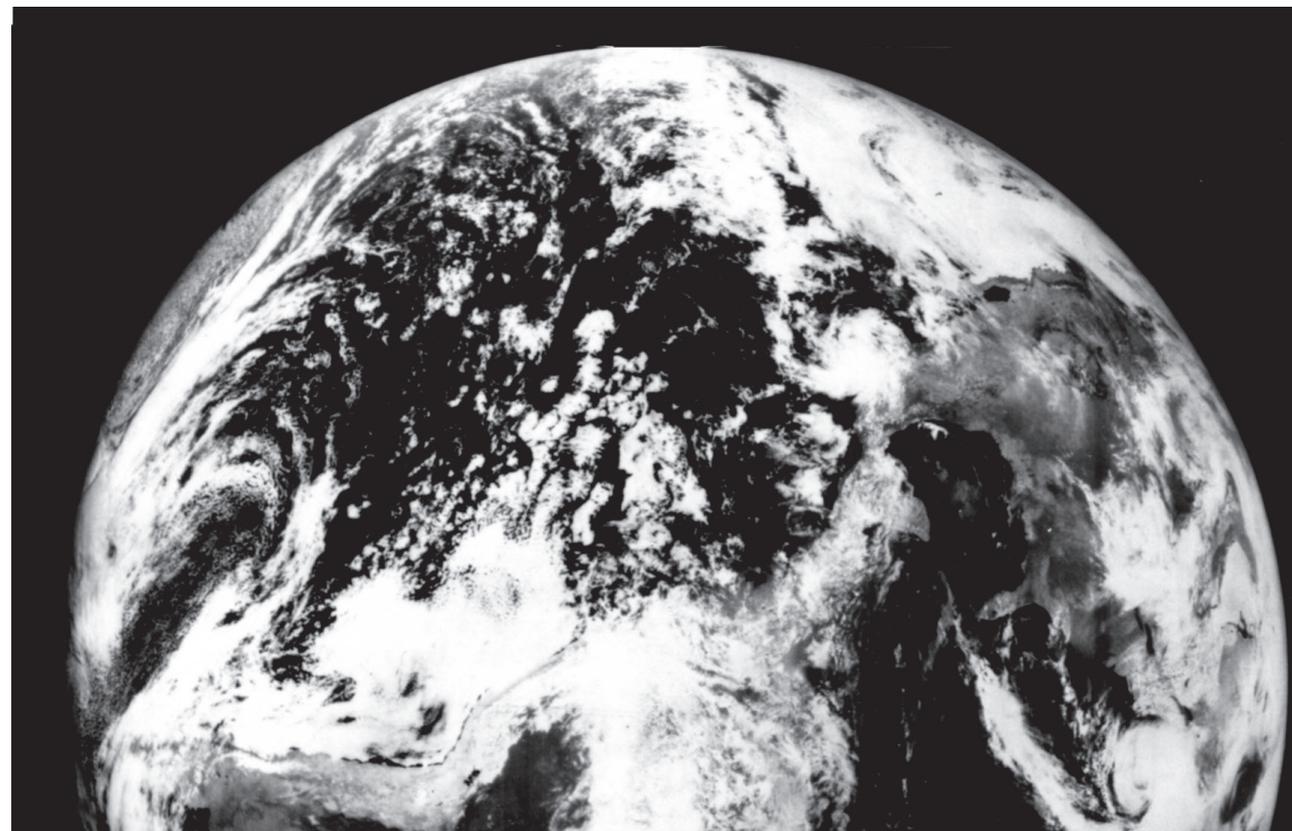
We see these global economic forces tending to hollow out the former colossus of American industry and most of the institutions that we have prized as achievements of our culture are in grave danger. They are already shrinking and they are probably going to shrink a lot more. So it’s hard to be optimistic about the future of the American society, a lot of Americans agree, it is on the downgrade, that we are on the wrong track, on the downside of the nation’s history. It’s not a happy scenario. I’m eighty-two years old and not in great health. I figure that I have lived through the glory days of this nation, but I have five grandchildren and looking ahead to what they are going to go through is not a very cheery prospect.

On the other hand you have twenty million people unemployed and disaffected, including large segments of the educated middle class and things are probably going to start happening. We have no idea what they are going to be. When the Occupy Wall Street Movement started a large number of



people said “Yeah! It is about time to start talking about economic injustice. We are suffering and we want to do something about it. That is a big change from just talking about the debt ceiling. Movements always come from below, the civil rights movement did not come into being because a bunch of white liberals decided racism was a bad idea. It came about because you had a substantial educated black student generation coming along who agreed with the Declaration of Independence and the US Constitution who said “Hey something has got to change here!” The Anti-Vietnam War movement was not founded because a few wonks in Washington DC decided it was not such a hot idea. It was because millions and millions of people thought it was a stupid, stupid war for which they were being drafted and killed. I think that whatever happens now is going to have that character, it is going to well up from below. We don’t yet know what form that is going to take. These things are always a surprise, and the media don’t believe it, I think it took them about a month to notice that the Occupy Wall St. actions were happening. Sooner or later they are forced to notice. It is exciting times ahead, you know the Chinese curse may you live in interesting times? Well, we are living in interesting times. We just have to see what we can do to make new things happen.

DK: Finally, as you’ve made reference to it, what are some of the lessons learned as a consequence of the present health challenges you find yourself facing that you might share?





Earth's Ten Commandments

Thou shalt love and honor the Earth for it blesses thy life and governs thy survival.
 Thou shalt keep each day sacred to the Earth and celebrate the turning of its seasons.
 Thou shalt not hold thyself above other living things nor drive them to extinction.
 Thou shalt give thanks for thy food to the creatures and plants that nourish thee.
 Thou shalt limit thy offspring for multitudes of people are a burden unto the Earth.
 Thou shalt not kill nor waste Earth's riches upon weapons of war.
 Thou shalt not pursue profit at the Earth's expense but strive to restore its damaged majesty.
 Thou shalt not hide from thyself or others the consequences of thy actions upon the Earth.
 Thou shalt not steal from future generations by impoverishing or poisoning the Earth.
 Thou shalt consume material goods in moderation so all may share Earth's bounty.



© 1990 by Ernest Callenbach

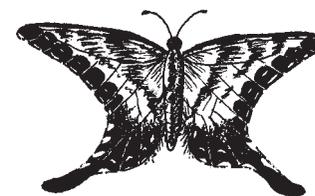
CC: Well I've been one of the lucky ones, I have lived a long and healthy life. I have been able to do constructive and positive work in the culture, not only writing *Ecotopia* but founding and running the Film Quarterly and publishing a lot of books for UC Press including the natural history guides for a while. So I feel like I have done my part. I come out of a protestant ethic, and I feel like I have carried my share of the load. I don't have any new writing projects except an epistle to the Ecotopians which will be some words of advise and comfort as to how are people going to get through coming hard times. What are the attitudes and shared social skills needed? How do we help each other get through this difficult epoch where we find ourselves? Because it may go on for a hundred years, nobody knows how long hard times will persist. But people are very persistent and ingenious and people in real catastrophes behave really nobly. They even give each other their food. The old idea that we are like nature red in tooth and claw is simply wrong. We are astonishingly cooperative. If we are encouraged at all, human beings are a pretty okay species, and we've got to learn to emphasize that instead of the type of behavior that rampant capitalist greed

encourages. I think most ordinary Americans are pretty sensible people. They understand that the Wall Street thing is off the rails and something has to change. So we will see.

DK: And on a personal level, what lessons about your life and your body have you learned through the challenge that you've been faced with these past few months?

CC: One of the first realizations I had when I was diagnosed with lung cancer, which usually means the end is not terribly far off, is that when I had passed my eightieth birthday a couple of years prior, I recalled thinking to myself, you know, that's getting to be pretty old. One of these days something is going to get you. I am reliant on my body, which has been a wonderful body to live in for all these years, and I didn't feel any bitterness, that's the really weird thing about it. You know, sure, there are things I would like to do that I will not be able to do, particularly centered around my darling wife Christine and our life together. But I am doing my best to have a good prolongation. In the end, and I suppose it is a green thing to say, we are all

recyclable. Gary Snyder put it another way when he wrote that we are all edible, which is literally true. Of course your bodily parts get recirculated by the fungi in the long run, like everything else that lives, and I guess as an ecological thinker, I am willing to accept that. When it happens it will happen. I am a little Buddhist about things in general and Buddhism is a very ecological religion. Buddhist thought patterns and ecological thought patterns run on parallel lines to an astonishing extent. So I carry on, doing what I can. I help young writers, giving consultations about various things, and I like to be interviewed, so thank you David.



Here Comes the Sun: The Birth of an Ecological Technology

By John Todd

In the article below John Todd describes the problems and experience that led to his invention of the ecological technologies originally known as Living Machines, now called Ecomachines, that are now being applied to solve problems of polluted water in North America and around the world. This piece is excerpted from John's forthcoming book A Designer's Guide to Thinking Ecologically.

NJT

Twenty-eight years ago I was confronted with what seemed like an impossible challenge. Two of my friends had prematurely died of cancer and I began to wonder if their deaths could have been environmentally induced. I was determined to find out more about carcinogens in the environment and what, if anything could be done about them. One day I visited a landfill in a small nearby town on Cape Cod. In the center of the town dump was a series of lagoons that were filled with a fetid waste that had been pumped from septic tanks into tank trucks and brought to the site for discharge. I later learned the liquid came from household septic tanks or cesspools and from a wide variety of sources including a diversity of small businesses such as gas stations, machine shops, stores, veterinary clinics, assisted living complexes and even medical facilities. The list of sources was long.

The lagoons themselves were dug into Cape Cod's coarse sand and left unlined. The liquid, or leachate as it is called, would percolate down into the ground leaving the solids behind. The solids were buried later when the lagoons were filled back in. I subsequently learned that the lagoons contained most of the Environmental Protection Agency's top fifteen priority pollutants, mostly carcinogens or suspected carcinogens. (Photo #1)

The travesty did not end there. The lagoons were dug in coarse sand that was very porous to the liquid migrating through them. The problem was compounded by the fact that they were situated directly above the ground water that was used by the town for drinking. I was appalled by the potential of the lagoons to contaminate the ground water and subsequently the thirteen-acre pond and a stream below the landfill. The practice of holding wastes in unlined ponds has now been stopped, but for most of the twentieth century such insidious contamination of the ground water went on unabated. This is not an isolated story.

I began to enquire why these wastes were not treated and learned that they are typically forty to one hundred percent more concentrated than sewage. As a consequence waste treatment plant operators do not normally want to handle it because it is so toxic and can interfere with sewage plant operations. Further, there did not seem to be a cost effective technology on the market to treat such waste and most communities could not afford much in the way of treatment. There was a technological gap that needed to be filled somehow.

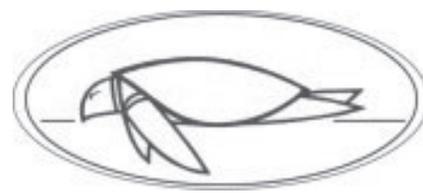
The question became where I should turn for inspiration to develop such a technology. I am an ecologist. My bias was and is that nature needs to inspire design. There is a very pragmatic reason for this. Over the past three plus billion years nature through

trial, error and adaptation has experimented with an unimaginable diversity of problems and stresses. It "knows" how to cope with most of the toxins in the environment by using complex systems comprised of members of all the kingdoms of life to solve its problems. Life has evolved this way.

On Earth the sun sustains life. Sunlight is the primary energy source for almost all of the primary ecosystems on the planet. I decided that our natural systems technology should be based upon solar power. It was a clear break with tradition as most conventional waste treatment technologies do not use photosynthesis in the purification of contaminated water.

The basis of the design was cylindrical tanks made from a thin fiberglass material that allowed sunlight to penetrate the sides as well as the surface. This created a three dimensional solar effect and the walls of the tanks supported vibrant algae based communities. These tanks were connected in series to create a facsimile of a flowing "river." (Photo #2.)

My next pivotal decision was to introduce a great diversity of life forms into the solar algae



tanks. My reasoning was that only through introducing thousands of different species of organisms would we find the right ones for creating biological communities capable of dealing with all of the toxic compounds in the wastes. To achieve this end, my colleagues and I gathered living organisms from over a dozen ecosystems. They included local salt marshes, streams, ponds, vernal ponds, wet spots in the woods and even a pig wallow on a local farm. We introduced the organisms into the tanks. The water within was then recycled to distribute the diversity of species throughout the whole system before adding the waste.

Once the waste was added the system very quickly self-organized and self-designed itself into completely new ecologies that were specifically adapted to its contents. The system went even further. It created unique ecologies for each stage in the transformation of the waste stream. Each tank in the series was slightly, and sometimes very different from the one before it (Photo #3).

Lynn Margulis, in my opinion, one of the greatest biologists of the twentieth century, and her students at the Marine Biological Laboratory in Woods Hole



Photo 1



Photo 2

studied the communities that developed in the tanks. She recognized the various contained life forms but, to her great surprise, the communities that had formed on the walls of the clear-sided tanks were completely new and unique. The possibility that this kind of ecological invention could actually happen had been predicted by the ecologist H.T. Odum in his visionary book *Environment, Power and Society* published in 1972.

More by accident than design I had inadvertently included representative species of all of the kingdoms of life in the systems. It would be years before I began to appreciate the significance of this strategy. I would also learn that a diversity of organisms from a variety of parent ecosystems could produce systems with a meta-intelligence that had a highly specific ability to self organize, self design, and self replicate. They were capable, in fact, of existing through long periods of times, possibly centuries, with minimal human support.

I also started to design analogs of different parent eco-systems directly into the technologies themselves so that they have equivalents of a marsh, pond, and stream stages that were interconnected. The combination of organisms from different parent ecosystems and the analogs of the ecosystems within the technology itself produced the meta-intelligence mentioned above. This is profoundly important in part because it carries within it a legacy of vast reaches of evolutionary time. I was seeing the potential for totally new kinds of technologies such as eco-machines in which humans were the junior partners in the endeavor. Ecological design was destined to become a new kind of design science. That said, we still have much to learn about how these ecomimetic systems work as they do.

Our test and demonstration technology at the landfill performed incredibly well. The waste traveled through the system in ten to eleven days. By the time it reached the end it was crystal clear (photo #4). The quality of the water was very good and met drinking water standards for heavy metals. We subsequently learned where the metals were stored. The bulk of their mass found their way into the algae dominated communities on the walls of the tanks near the upstream end of the process. The priority pollutants or toxins in the system were removed to levels that were below detection in the water at its point of discharge. Only a trace amount of one of the chemicals, toluene, was detected and it had been removed by ninety-nine point nine per cent. We ran the prototype eco-machine from spring through the summer and into the fall.

The project also took on an ironic twist. The pilot study was funded by the Massachusetts Foundation for Excellence in Marine and Polymer Sciences. Nevertheless a regulatory entity, the Massachusetts Department of Environmental Protection, decided to fine me thousands of dollars for carrying out the experiment. I was shocked and bewildered when my name and organization appeared on the front page of the *Boston Globe*. I was declared a scofflaw. It turned out that in Massachusetts a scientist is not allowed build a pilot waste treatment facility. Only a civil engineer who has a PE signifying a profes-

sional engineer after his or her name can do so.

William Reilly the Administrator of the US EPA in Washington subsequently heard about my plight and sent one of his experts to look over the facility and the experiment. The expert declared it *bona fide*. The EPA subsequently honored me with the first Chico Mendes Memorial Award for the project and the lawsuit against me was quietly dropped.

Later a more permanent facility was built on the site. It was housed within a greenhouse so that it could be operated year round (Photo #5). For several years the facility was subject to intense scrutiny.

It performed well and the technology was eventually permitted by the State.

I cannot describe my joy that first summer at seeing the waste transformed into clean water. The experience gave me the confidence to explore new problems and do so widely throughout the world. With this first eco-machine we learned that it is possible to do good things in bad places. Harmful chemicals can be treated. We continue to explore the number of chemicals that living technologies can render harmless.



Photo 3



Photo 4



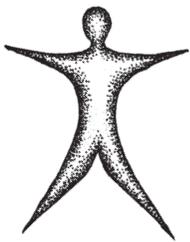
Photo 5

Global Resource Depletion: Is Population the Problem?

by Fred Magdoff

The author of the following article on the very real problem of resource depletion, and its relation to population issues, Doctor Fred Magdoff, is a professor emeritus of plant and soil science at the University of Vermont. He is also a regular contributor to Monthly Review, a publication an independent socialist journal established in 1949. In addition Dr. Madoff is a coauthor with John Bellamy Foster of What Every Environmentalist Needs to Know About Capitalism published by Monthly Review Press in 2011.

NJT



Environmentalists and scientists often refer to the two different ends of the environmental problem as sources and sinks. Thus the environmental limits to economic growth manifest themselves as either shortages(1) in the sources or taps of raw materials/natural resources, and thus a problem of depletion, or (2) as a lack of sufficient “sinks,” to absorb wastes from industrial pollution, which overflow and cause harm to the environment.¹ The original 1972 Limits to Growth study emphasized the problem of sources in the form of shortages of raw materials, such as fossil fuels, basic minerals, topsoil, freshwater, and forests.² Today the focus of environmental concern has shifted more to sinks, as represented by climate change, ocean acidification, and production of toxics. Nevertheless, the problem of the depletion of resources used in production remains critical, as can be seen in discussions of such issues as: declining freshwater resources, peak (crude) oil, loss of soil fertility, and shortages of crucial minerals like zinc, copper, and phosphorus.

In conventional environmental analysis the issue of a shortage or depletion of natural resources has often been seen through a Malthusian lens as principally a problem of over population. Thomas Malthus raised the issue in the late eighteenth century of what he saw as inevitable shortages of food in relation to population growth. This was later transformed by twentieth-century environmental theorists into an argument that current or future shortages of natural resources resulted from a population explosion overshooting the carrying capacity of the earth.³

The following analysis will address the environmental problem from the source or tap end and its relation to population growth. No systematic attempt will be made to address the sink problem. The tap and the sink are connected however because the greater use of resources to produce goods results in greater flows of pollutants into the sink during extraction, processing, transportation, manufacturing, use, and disposal.

In approaching the source or tap problem, we have to recognize there is a finite planetary quantity of each nonrenewable resource that can be recovered economically. In theory, it is possible to calculate when the world will run out of a particular resource, given the knowledge of the existing amount of that resource, and the necessary technology, costs, and likely demand although the various factors are often so uncertain as to make firm predictions difficult. The amount that can be extracted economically increases however, when the price of a particular resource increases or new technology is developed. It then becomes economically feasible to exploit deposits that are harder to reach or of less purity and more costly to obtain.

An easier question to answer is whether we are using a given resource in a sustainable manner. For renewable resources, such as water, soil, fish, forests, this means that use cannot exceed the rate of regeneration. For nonrenewable resources, as with fossil groundwater, fossil fuels, and high-grade minerals, this means that the rate of use can be no greater than the rate at which renewable resources, used sustainably, can be substituted as the sustainable use

of nonrenewable resources is dependent on investment in renewable resources that can replace them. For pollutants the sustainable rate of emission is determined by the degree that they can be absorbed and rendered harmless in the environment.⁴

There are some examples of renewable resources being substituted sustainably for nonrenewable ones, but most have had limited impact. For some that are part of modern life—such as many of the metals—there are no foreseeable renewable substitutes. These need to be used at relatively slow rates and recycled as efficiently as possible. Nonrenewable resources are required to manufacture equipment for renewable energy like wind and solar power. By far the largest example of renewable resources being substituted for nonrenewables is in the use of agricultural products such as corn, soybeans, sugarcane, and palm oil to produce ethanol and biodiesel to replace gasoline and diesel fuels. But the limited energy gain for most biofuels and the use of nonrenewable resources to produce these renewable resources in addition to the detrimental effects on people and the environment are so great as to make the large scale production and use of biofuels unsustainable.⁵

Resource Depletion and Overuse

There are many examples of justified concern over the depletion and unsustainable use of resources, at least, those that are easily reached and relatively cheap to extract. A little discussed but very important example is phosphate. It is anticipated that the world’s known phosphate deposits will be



What is important is that the environmental damage and economic costs mount as corporations and countries dig deeper in mining for such resources and use more advanced technology sometimes in more fragile locations.

exhausted by the end of the century.⁶ The largest phosphate deposits are found in North Africa in Morocco and in the United States, and China. Although phosphorus is used for other purposes, its use in agricultural fertilizers may be one of the most critical for the future of civilization. In the absence of efficient nutrient cycling in the form of the return of nutrients contained in crop residues and farm animal and human wastes to the fields, routine use of phosphorus fertilizers is critical in order to maintain food production. Today much of that phosphate fertilizer is being wasted, leading to excessive runoff of this mineral which is inducing algal blooms in lakes and rivers and contributing to ocean dead zones. Both are sink problems.

We could discuss many other nonrenewable resources, but the point would be the same. The depletion of the nonrenewable resources that modern societies depend upon, such as oil, zinc, iron ore, bauxite for making aluminum, and the “rare earths” used in many electronic gadgets including smart phones as well as smart bombs is a problem of great importance. Although there is no immediate problem of scarcity for most of them, that is no reason to put off making societal changes that acknowledge the reality of their finite limits. So called “rare earth” metals are not actually that rare. Their increase in price in recent years has been caused by production cutback in China, which accounts ninety-five per cent of world production. As it tries to better control the extensive ecological damage caused by extracting these minerals. Production of rare earths is starting up once again in the United States. A large facility is planned for Malaysia, where it is being bitterly opposed by environmental activists. The main current issue with rare earth metals is not scarcity at the tap end but rather pollution associated with mining and extraction—again a sink problem.

What is important is that the environmental damage and economic costs mount as corporations and countries dig deeper in mining for such resources and use more advanced technology sometimes in more fragile locations. Mining companies are using new technologies such as robotic drills and high-strength pipe alloys to drill deeper after surface deposits are depleted. Seafloor mining is another approach used to deal with declining easy-to-reach deposits. In the

beginning of what may well be a major effort to exploit seafloor mineral resources, a Canadian company has signed a twenty-year agreement with the government of Papua New Guinea to mine copper and gold some fifty kilometers off the coast.

Still another way to deal with depleted high-quality deposits is to exploit those of lower quality. In highlighting this development, the CEO of a copper mining company explained: “Today the average grade—the grade is a measure of the amount of copper you can turn into material—is half of what it was twenty years ago. To get the same amount of copper from a deposit, you have to mine and process significantly larger quantities of material, and that involves higher cost.”⁷ This mining approach creates larger quantities of spoils to pollute air, water, and soil.

The exploitation of the Canadian tar sands is an example of high prices for oil inducing the exploitation of a deposit that is both costly and ecologically damaging. However much damage this extractive operation may do to the environment, it will significantly extend the period that the resource is available albeit at higher prices.

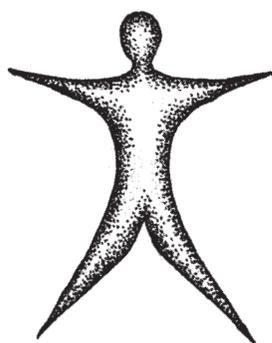
There are important exceptions to new harder to reach deposits driving or keeping prices higher. For example, with ecologically damaging hydraulic fracturing combined with horizontal drilling for oil and gas extraction from shale deposits, so much natural gas is being produced in the United States that its price has plummeted. This, however, reflects an extreme undervaluation of the ecological and social costs of fracking, which are immense and dangerous to both human beings and local and regional ecosystems.

One of the most critical actually occurring resource tap problems facing the world is a lack of fresh water. Normally fresh water is considered a renewable resource. However, there are ancient fossil aquifers that contain water that fell literally thousands of years ago. These aquifers, such as those in Saudi Arabia and in North Africa, need to be viewed for what they are—nonrenewable or fossil water. There are also aquifers that are renewable, but which are being exploited far above their renewal rate. Aquifers in the U.S. Great Plains like the Ogallala aquifer, and in northwestern India, and northern

China are all being exploited so rapidly relative to recharge rates that water levels are falling rapidly. This means deeper wells must be drilled and more energy used to raise the water greater distances to the surface. Drilling deeper wells is clearly only a temporary solution. In addition, there is so much water taken, mainly to irrigate crops, that China’s Yellow River, the Colorado River in the United States and Mexico, and the Euphrates and Tigris Rivers in the Middle East rarely reach their normal outlets to the sea. Thus, the situation with water as with the ocean fisheries makes it clear that even a renewable resource can be overexploited with detrimental consequences. China is engaged in a costly and ecologically questionable effort to bring water from the headwaters of the Yangtze River in the south to the increasingly parched northern regions.

Another current critical resource problem is agricultural soil. This is related to a number of other issues, including water availability. It takes between five hundred and a thousand pounds of water to grow one pound of grain causing water short countries to search for other regions and make land grabs, to grow food for their people. With the neoliberal emphasis on free trade as a cure-all, it might seem that all a country with a food shortage needs to do is to purchase food on the so called free international market. But with the severe pain caused by the rapid rise of food prices on international markets in 2007–2008 and again in 2011, and to a lesser extent in 2012, a number of countries are trying to protect their people by having food grown abroad specifically for them.⁸

Sovereign wealth funds and private capital purchase or lease can land under long-term agreements.⁹ Spikes in food prices over the last five years have encouraged major importers to bypass international markets to buy needed food and to assure supplies by obtaining land in other countries. Governments like those of China, the United Arab Emirates, South Korea, Egypt, India, and Libya) and those with private capital have been buying up or leasing a truly astounding amount of agricultural land in Africa (mainly), southeast Asia, and Latin America under very favorable terms. The amount involving some seventy million hectares or about a hundred and seventy million acres. It is estimated



that since 2000, five per cent of Africa's agricultural land has been bought or leased under long-term agreements by foreign investors and governments.¹⁰ Such land grabs are partially an issue of water. Land purchases and leases include the implicit right to use water that, in some cases, may actually exceed the quantity available locally.¹¹

Saudi Arabia, now a significant participant in the land grabs, decided to use some of their oil to power pumps to irrigate large areas of desert land. After 1984 fossil water represented more than half of all the water used in the country. At its maximum use in the mid-1990s, more than three quarters of the water used was mined from prehistoric deposits.¹² As a result, for some years the country was self sufficient in wheat, growing enough to feed over thirty million people. But by 2008 the fossil aquifer had been nearly mined out, and now the country must import all its wheat.

There are other reasons for the growth of global land grabs. They range from the use of land to grow biofuel crops to the greater consumption of meat that invokes growing corn and soybeans to feed animals to weather-related crop failures and to commodities speculators driving up prices when shortages occur. Private capital, with British firms leading the charge, has been especially interested in controlling land in Africa to produce biofuels for European markets.¹³ All such land grabs displace people from their traditional land holdings, forcing many to migrate to increasingly marginal land or to cities. The results are greater hunger, rising food prices, expanding urban slums and, frequently, increased carbon dioxide emissions.

In his important book *The Land Grabbers*, Fred Pearce writes: "Over the next few decades I believe land grabbing will matter more, to more of the planet's people. The new land rush looks increasingly like a final enclosure of the planet's wild places, a last roundup of the global commons. Is this the inevitable cost of feeding the world and protecting its surviving wildlife? Must the world's billion or so peasants and pastoralists give up their hinterlands in order to nourish the rest of us? Or is this a new colonialism that should be confronted—the moment when localism and communalism fight back?"¹⁴

The general problem of rapid resource depletion

in poor countries is frequently a result of foreign exploitation and not because of a country's growing population. The exploitation of the Democratic Republic of the Congo's natural resources by shady means, "opaque deals to acquire prime mining assets" organized through shell companies by British and Israeli capital is an example of what can happen.¹⁵ As Duke University ecologist John Terborgh described following a trip to a small African nation:

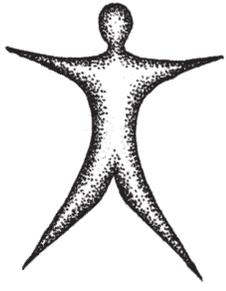
Everywhere I went, foreign commercial interests were exploiting resources after signing contracts with the autocratic government. Prodigious logs, four and five feet in diameter, were coming out of the virgin forest, oil and natural gas were being exported from the coastal region, offshore fishing rights had been sold to foreign interests, and exploration for oil and minerals was under way in the interior. The exploitation of resources in North America during the five-hundred-year post-discovery era followed a typical sequence—fish, furs, game, timber, farming virgin soils—but because of the hugely expanded scale of today's economy and the availability of myriad sophisticated technologies, exploitation of all the resources in poor developing countries now goes on at the same time. In a few years, the resources of

this African country and others like it will be sucked dry. And what then? The people there are currently enjoying an illusion of prosperity, but it is only an illusion, for they are not preparing themselves for anything else. And neither are we.¹⁶

Thus, both renewable and nonrenewable resource problems are real and are only going to get worse under the current political-economic system. Everywhere both renewable and nonrenewable resources are being used unsustainably. In some countries high population relative to available agricultural land as well as a lack of dependable quantities of exports to purchase food internationally creates a very precarious situation. The general resource depletion and ecological problems at the global scale as well as within most countries and regions, resource problems, however, are primarily the result of the way capitalism functions and economic decisions are made. Central to this is the continuing exploitation of the resources of the poor countries by corporations and private capital. Maximizing short-term profits trumps all other concerns. What happens as resources are in the process of being ruined or depleted? There is a scramble, frequently violent, for control of remaining resources. But what will hap-



The general problem of rapid resource depletion in poor countries is frequently a result of foreign exploitation and not because of a country's growing population.



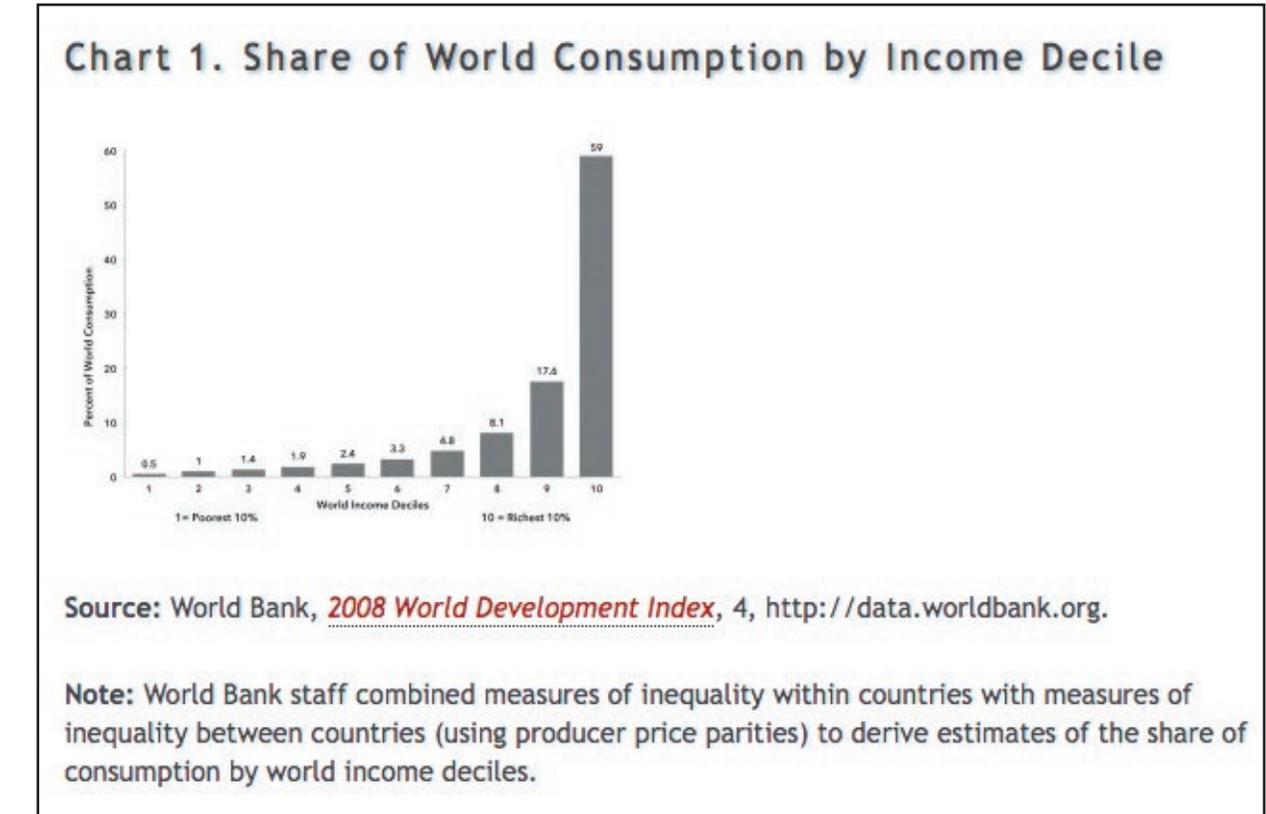
pen, what is the “game plan,” after even the hard to reach, expensive, and ecologically damaging deposits are fully depleted? Capital has only one answer to such questions, the same as the one attributed to Louis XV of France: “Après moi, le deluge.” What other conceivable response could it give?

The Accumulation of Capital is the Accumulation of Environmental Degradation

The root of the problem lies in our mode of production. Capitalism is an economic system that is impelled to pursue never-ending growth. This requires the use of ever greater quantities of resources. When growth slows or ceases, such a system is in crisis and the number of people unemployed and suffering expands. Through a massive sales effort that includes a multi-faceted psychological assault on the public using media and other techniques, a consumer culture is produced in which people are convinced that they want or “need” more products and new versions of older ones. This stimulates the economy, increasing resource depletion and pollution. It creates a perpetual desire for new possessions and to envy those with more. Such manufactured desire affects the poor, who aspire to the so-called “middle-class” standard of living depicted on television and in the movies.¹⁷

Because it has no other motivating or propelling force than the accumulation of capital, capitalist production has negative social and ecological side effects, usually referred to by economists as “externalities.” In reality these are in no way external to production. Rather they are social costs imposed on the population and the environment by private capital.¹⁸ In its normal functioning, the system creates fabulous wealth for a certain few—now referred to as the one per cent, although the zero point per cent would be more accurate—and very great wealth for the richest ten per cent, whose consumption is responsible for much of the ecological damage and resource use in the world. At the same time capitalism also results in a significant portion of the population whose basic needs are not being met.

There are a number of people and organizations that feel that we must reduce the population drastically because we will soon run out of nonrenewable resources. Behind the difficulty in tapping resources lies the fact that too many people have access to them. Some maintain that resources per capita are already scarce and, thus, the resource crises and resource wars are with us now. There is no need to look very far to find evidence of frictions, conflicts, and even some wars over access to resource, especially oil and gas, water, and agricultural land. The wars in Iraq and Afghanistan and the American military bases and support provided to local governments in the Middle East and Central Asia have been about access to or control, of oil. Such actions



and relations are not about over population but are a continuation of capitalist colonial and the imperial history of exerting influence in resource rich regions. A small minority of the world population in the rich countries dominating large parts of the world and robbing them of their resources is basic to the structure of globalized capitalism.

The productive aquifers on the Palestinian West Bank, for example, must be factored into understanding Israel’s reluctance to end the occupation and return to its borders prior to the 1967 war. In weaker countries without a ruling class in firm control, internal conflict and even civil wars may arise as a result of efforts to profit from the exploitation of resources.

A host of countries, including China, Vietnam, the Philippines, Malaysia, Brunei, and Indonesia are in conflict over ownership of yet to be discovered, but promising oil deposits and other potential resources under the sea floor in the South China Sea. There are also disputed sea floor boundaries in the eastern Mediterranean, where Israel has discovered a large deposit of natural gas. Additionally, there is the potential for conflict over the Caspian basin petroleum deposits.

Recently, the melting of sea ice is opening up the Arctic waters to oil exploration, creating an “Ice Cold War,” as it has been called, involving the United States, Canada, Russia, Denmark, and Norway.¹⁹ Michael Klare, in his book *The Race for What’s Left*, argues that “the world is entering an era of pervasive, unprecedented resource scarcity.”²⁰

Usually such conflicts are treated as byproducts of growing population and international competition but a closer analysis demonstrates that capitalism and the incessant drive for expansion that it inculcates, as well as its imperialist tendencies are mainly at fault. Attempts to reduce the environmen-

tal problems to the so called population bomb are therefore frequently crude and distorted. A variety of side issues and straw persons are put forward that divert attention from the heart of the matter. As a result, it is important to clarify a number of such issues and get potential stumbling blocks, related to population specifically, out of the way before continuing with this part of the discussion. Our starting points should be:

- All people everywhere should have easy access to medical care, including contraceptive and other reproductive assistance.

- As living standards rise to a level that supplies family security, the number of children per family tends to decline. But, depending on the circumstances, there may be good reasons for poor women and men to have fewer children even before they have more secure futures and for individual countries to encourage smaller families.

- There are poor countries where overgrazing, excess logging of forests, and soil degradation on marginal agricultural land are caused by relatively large populations and the lack of alternate ways for people to make a living except from the land. This problem may be worsened by the low yields commonly obtained from infertile tropical soils. But we also need to recognize that these problems are not only an issue of population density. Displacement of farmers by large-scale farms causes some to seek new areas to farm and graze animals—using ever more marginal or ecologically fragile land.

Some countries have populations so large relative to their agricultural land that importing of food will be needed into the foreseeable future. One of the largest of these nations is Egypt, with a population of over eighty million people and arable land of only four hectares which is less than one tenth of an acre per capita. Such countries are condemned

to suffer the consequences of frequently occurring rapid international market price hikes and of having to maintain significant exports to be able to get sufficient hard currency to import food. There are other countries, such as Saudi Arabia, the United Arab Emirates, Oman, and Qatar have larger populations than can be sustained by available water and food resources. Each of them, however, can currently use oil or other commercial income to obtain sufficient food for their populations. Similarly, a rich developed country like the Netherlands is able to draw unsustainably on resource taps and dispose of its environmental effluents in waste sinks at the expense of much of the rest of the world.

- All else being equal, which of course it never is, larger populations create more potential environmental problems. So population is always an environmental factor though usually not the main one, given that economic growth generally outweighs population growth and environmental degradation arises mainly from the rich rather than the poor.

- If we assume that all people live at a particular standard of living, there is a finite carrying capacity of the Earth, above which population growth will not be sustainable because of depletion of too many resources and too much pollution. For example, it is impossible for all those currently alive to live at a western middle class standard for to do so we would need more than four Earths to supply the resources and assimilate the pollutants.

There are currently approximately seven billion people in the world and, given current trends, the population is expected to be around nine billion in 2050, and over ten by 2100.

One of the main approaches taken by people whose primary concerns are resource use and overpopulation is to promote birth control efforts in poor countries, mainly through programs aimed at contraceptive use by women. Since these are countries in which populations are growing at fast rates with growth in sub-Saharan Africa the most rapid, it initially seems to make some sense to concentrate on this issue. But when looked at more deeply, it is clear that this is not a solution to the real problems of global-scale nonrenewable resource depletion and environmental degradation that so concern these people.

David Harvey has explained the problem of concentrating on population issues as follows: “The trouble with focusing exclusively on the control of population numbers is that it has certain political implications. Ideas about environment, population, and resources are not neutral. They are political in origin and have political effects.”²¹ One of the peculiar things about those so very concerned with overpopulation and the environment is that they do not seem especially interested in investigating the

details of what is actually happening. There is little to no discussion of how the economy functions or of issues involving economic inequality. Also there is apparently no interest in even thinking about an alternative way for people to interact with each other and the environment or how they might organize their economy differently. (There are important and interesting examples of local efforts at different ways of relating/organizing such as cooperative stores, worker-owned businesses, community supported agriculture farms, transition communities, and co-housing. Although these examples are very important because they are concrete demonstrations of alternative ways of people interacting with each other and the environment—they do not add up to a new economy or new society that operates with a completely different motivation, purpose, and outcome than capitalist society.

It is only common sense that the more wealth a person or family has, the more they consume and, therefore, the more resources they use and the more pollution they cause. But the almost unbelievable inequality of wealth and income at the global level has striking effects on the consumption patterns (see Chart 1).

What is immediately apparent from Chart 1 is that the ten per cent of the world’s population with the highest income, some seven hundred million

people, are responsible for the overwhelmingly majority of the problem. It should be kept in mind that this is not just an issue of the rich countries. Very wealthy people live in almost all countries. The wealthiest person in the world is Mexican, and there are more Asians than North Americans with net worth over a hundred million dollars. When looked at from a global perspective, the poor become essentially irrelevant to the problem of resource use and pollution. The poorest forty per cent of people on the Earth are estimated to consume less than five per cent of natural resources. The poorest twenty per cent, about one point four billion, use less than two per cent of the natural resources. If somehow the poorest billion disappeared tomorrow, it would have a barely noticeable effect on the global use of natural resources and pollution. It is also the poor countries with high population growth that have low per capita greenhouse gas emissions.²²) However, resource use and pollution could be cut in half if the richest seven hundred million lived at an average global standard of living.

Thus when considering global resource use and environmental degradation we are forced to conclude that there really is a population problem. But it is not too many people, and certainly not too many poor people, but rather too many rich people living too “high on the hog” and consuming too much.



Thus birth control programs in poor countries or other means to lower the population in these regions will do nothing to help deal with problems of global resource use and environmental destruction.

Population Declines and Capitalist Economies

As Marx wrote, “in different modes of social production...there are different laws of population growth.”²³ Capitalism has its own laws in this respect. Because growing populations help stimulate economies and provide more profit opportunities, capitalist economies have significant problems when their populations do not grow, do not grow fast enough, or actually decline. A growing population produces the need to build more housing, sell more furniture and household goods, cars, etc. Germany is an interesting example. Its population has been shrinking since 2005. Its labor force also has been slowly decreasing, reaching about forty-three million people in 2012. Over the next half century, it is predicated that Germany’s total population will decrease by some twenty 20 percent, by seventeen million out of a population of eighty-three 83 million. You might ask, if zero population growth is so difficult for a capitalist economy, then why is Germany weathering the current economic crisis better than its European brethren?

Part of the answer lies in the fact that during the early 2000s, Germany sought to increase profitability of its businesses by enhancing capital’s power over labor. Former Chancellor Gerhard Schroeder explained, “We have restructured the labor market to enhance its flexibility.... With our radical reforms of the country’s social security systems, most notably health care, we have paved the way for the reduction of non-wage labor costs.”²⁴ This change has given Germany an edge, especially with respect to other EU economies, and has helped lead to a resurgence of exports—much of these going to other EU countries. Another reason for Germany doing rela-

tively well is that the country is the second largest exporter in the world, with some one point five \$1.5 trillion dollars in exports in 2011, which is well over fifty per cent of its gross domestic product (exports from the United States amounts to about fifteen per cent of its GDP). It has had a positive current account balance for a decade, over the last eight years it has been greater than four per cent of its GDP. Thus, through exports, an economy can grow even in the absence of the economic demand that would come from a growing number of households. But this outlet of being a net exporter is not available to all countries. Practical problems make this so and it is also, of course, mathematically impossible for all countries to be net exporters.

And then what happens when labor shortages occur in Germany? Labor can be imported. Germany in fact has relied heavily on imported labor, with some 4.5 million foreign relatively low-skilled “guest workers” between 1960 and 1973. Germany is now importing fully trained labor, mainly from the European Union. Without having to bear the costs of education and training, Germany is getting quite a bargain. A recent Los Angeles Times headline stated: “As EU migrants flood Germany, some nations fear a brain drain.”²⁵

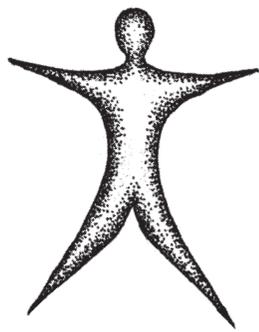
So this is how capitalism deals with zero or negative population growth within a country—the country exports as much as possible and imports the

labor it needs when it runs into labor shortages as its population ages and as economic upswings require more workers. With regard to the issue of Germany being a net exporter, clearly if some countries export more than they import there must be other countries that import more than they export. Thus if population were to decline in all countries at the same time, neither of the avenues that Germany is pursuing in increasing net exports and importing labor as needed can possibly be open to all countries simultaneously.

Although partly as a result of such means the German economy has done better than others in the European Union, there are reasons to think that trouble lies ahead, not only because of the recession that has engulfed Europe. One of the ways that capital deals with the slow potential for growth in the home country is to invest abroad by exporting capital. “Since the millennium, net investment in Germany as a share of GDP has been lower than at any time in recorded history, outside the disastrous years of the Great Depression. The German corporate sector has invested its more than ample profits, but it has done so outside the country. The effect of this flight of private money has been compounded by Berlin’s campaign to enforce balanced budgets, which has prevented meaningful investment on the part of the public sector.”²⁶ This does not point to the continuation of the so called German jobs miracle.

Notes

1. Donella H. Meadows, Dennis L. Meadows, and Jørgen Randers, *Beyond the Limits* (London: Earthscan, 1992), 44–47.
2. Donella H. Meadows, Dennis L. Meadows, Jørgen Randers, and William W. Behrens III, *The Limits to Growth* (New York: Universe Books, 1972).
3. Malthus was not himself an environmental theorist, concerned with the environment, but an economic theorist developing an argument for subsistence wages. Nor did he point to scarcity of raw materials, arguing that raw materials “are in great plenty” and “a demand...will not fail to create them in as great a quantity as they are wanted.” Thomas Malthus, *An Essay on the Principle of Population and a Summary View of the Principle of Population* (London: Penguin, 1970), 205. See also John Bellamy Foster, *Marx’s Ecology* (New York: Monthly Review Press, 2000), 92–95.
4. Donella Meadows, Jørgen Randers, and Dennis Meadows, *The Limits to Growth: The 30-Year Update* (White River Junction, VT: Chelsea Green Publishing, 2004), 54.
5. Fred Magdoff, “The Political Economy of Biofuels,” *Monthly Review* 60, no. 3 (July–August 2008): 34–50.
6. David A. Vaccari, “Phosphorus Famine: A Looming Crisis,” *Scientific American* (June 2009): 54–59.
7. Tatyana Shumsky and John W. Miller, “Freeport CEO on Mining an Essential Metal,” *Wall Street Journal*, June 19, 2012, <http://online.wsj.com>.
8. Fred Magdoff, “The World Food Crisis: Sources and Solutions,” *Monthly Review* 60, no. 1 (May 2008): 1–15.
9. Fred Magdoff and Brian Tokar, eds., *Agriculture and Food in Crisis: Conflict, Resistance, and Renewal* (New York: Monthly Review Press, 2010). See also two reports of the Oakland Institute on Understanding Land Investment Deals in Africa, 2011, <http://oaklandinstitute.org>.
10. Claire Provost, “New International Land Deals Database Reveals Rush to Buy Up Africa,” *Guardian*, April 27, 2012, <http://guardian.co.uk>.
11. Mark Tran, “Africa Land Deals Lead to Water Giveaway,” *Guardian*, June 12, 2012, <http://guardian.co.uk>.
12. Walid A. Abderrahman, *Groundwater Resources Management in Saudi Arabia*, Special Presentation at Water Conservation Workshop, Khober, Saudi Arabia, 2006, <http://sawea.org>.
13. Damian Carrington and Stefano Valentino, “Biofuels Boom in Africa as British Firms Lead Rush on Land for Plantations,” *Guardian*, May 31, 2011, <http://guardian.co.uk>.
14. Fred Pearce, *The Land Grabbers* (Boston: Beacon Press, 2012), x.



Japan is another country with a shrinking population. For historical and cultural reasons, although it does import some, it is not as open to importing labor as Germany. The stagnating economy has been kept afloat through exports and huge amounts of government deficit spending on infrastructure. Japan's national debt is the highest in the world at over two hundred per cent of its GDP. This is about twice the proportion of U.S. debt and even higher than Greece's debt relative to its GDP. Except for government spending, exports have been the only area of strength in the Japanese economy for years. And there has been a close link between exports and GDP growth since 1990. That's why the government in early 2010 began a campaign to spur exports of infrastructure goods such as bullet trains and nuclear reactors.²⁷ As with Germany, the options in the case of Japan like prolonged government deficit spending for infrastructure and increased exports that are used to sustain even modest growth in a situation of stable or declining population are open to only a few countries.

Rapid population aging—due to low or no population growth—confronts many of the wealthy countries and some not-so-wealthy ones. As Richard Jackson, the director of the Global Aging Initiative at the Center for Strategic and International Studies in Washington, explains: “Japan may be on the leading edge of a new economic era, an era of secular

economic stagnation, which certain other fast-aging developed countries will soon enter.”²⁸ Indeed, such stagnation is already an endemic problem (though not simply, or even mainly, for reasons of aging populations) in the triad of the United States/Canada, Western Europe, and Japan.²⁹

Combating Pollution and Resource Depletion/Misuse

The comprehensive 2012 report, *People and the Planet* by the Royal Society of London, included as one of its main conclusions that there is a need “to develop socio-economic systems and institutions that are not dependent on continued material consumption growth”³⁰ In other words, a non-capitalist society is needed. Capitalism is the underlying cause of the extraordinarily high rate of resource use, mismanagement of both renewable and nonrenewable resources, and pollution of the earth. Any proposed “solution”—from birth control in poor countries to technological fixes to buying green to so-called “green capitalism” and so on—that ignores this reality cannot make significant headway in dealing with these critical problems facing the Earth and its people.

Within the current system, there are steps that can and should be taken to lessen the environmental problems associated with the limits of growth: the depletion of resource taps and the overflowing of

waste sinks.³¹ Our argument, however, has shown that attempts to trace these problems, and particularly the problem of depletion of natural resources, to population growth are generally misdirected. Although population growth remains a secondary factor, the economic causes of depletion are issues that must be vigorously addressed. The starting point for any meaningful attempt to solve these problems must begin with the mode of production and its unending quest for ever-higher amounts of capital accumulation regardless of social and environmental costs with the negative results that a portion of society becomes fabulously rich while others remain poor and the environment is degraded at a planetary level.

It is clear then that capitalism, the present system of the accumulation of capital, must go sooner rather than later. But just radically transcending a system that harms the environment and many of the world's people is not enough. In its place people must create a socio-economic system that has as its very purpose the meeting of everyone's basic material and non-material needs, which, of course, includes healthy local, regional, and global ecosystems. This will require modest living standards, with economic and political decisions resolved democratically according to principles that are consistent with substantive equality among people and a healthy biosphere for all the Earth's inhabitants.

15. Simon Goodley and Julian Borger, “Mining Firms Face Scrutiny Over Congo Deals,” *Guardian*, May 8, 2012, <http://guardian.co.uk>.

16. John Terborgh, “The World Is in Overshoot,” *New York Review of Books* 56, no. 19 (December 3, 2009): 45–57.

17. See Fred Magdoff and John Bellamy Foster, *What Every Environmentalist Needs to Know About Capitalism* (New York: Monthly Review Press, 2011), 77–83.

18. K. William Kapp, *The Social Costs of Business Enterprise* (New York: Asia Publishing House, 1963).

19. Scott Borgerson, “An Ice Cold War,” *New York Times*, August 8, 2007, <http://nytimes.com>.

20. Michael Klare, *The Race for What's Left* (London: Macmillan, 2012), 8.

21. David Harvey, “The Political Implications of Population-Resources Theory,” May 23, 2010, <http://climateandcapitalism.com>.

22. David Satterthwaite, “The Implications of Population Growth and Urbanization for Climate Change,” *Environment and Urbanization* 21, no. 2 (2009): 545–67.

23. Karl Marx, *Grundrisse* (London: Penguin, 1973), 604–8.

24. Gerhard Schroeder, “The Economy Uber Alles,” *Wall Street Journal*, December 30, 2003, <http://online.wsj.com>.

25. Henry Chu, “As EU Migrants Flood Germany, Some Nations Fear A Brain Drain,” *Los Angeles Times*, March 12, 2012, <http://articles.latimes.com>.

26. Adam Tooze, “Germany's Unsustainable Growth,” *Foreign Affairs* 91, no. 5 (September/October 2012): 23–30.

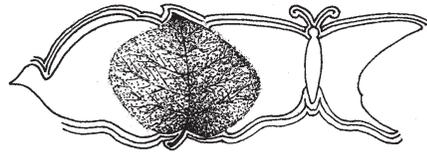
27. A. Gary Shilling, “As Japan Stops Saving, a Crisis Looms,” *Bloomberg*, June 6, 2012, <http://bloomberg.com>.

28. Yuka Hayashi, “Japan Raises Sales Tax to Tackle Debt,” *Wall Street Journal*, August 11, 2012, <http://online.wsj.com>.

29. See John Bellamy Foster and Robert W. McChesney, *The Endless Crisis* (New York: Monthly Review Press, 2012).

30. Sir John Sulston, Chair of the Working Group, *People and the Planet*, The Royal Society (Britain), <http://royalsociety.org>.

31. See discussion in Fred Magdoff and John Bellamy Foster, *What Every Environmentalist Needs to Know About Capitalism*, 124–31.



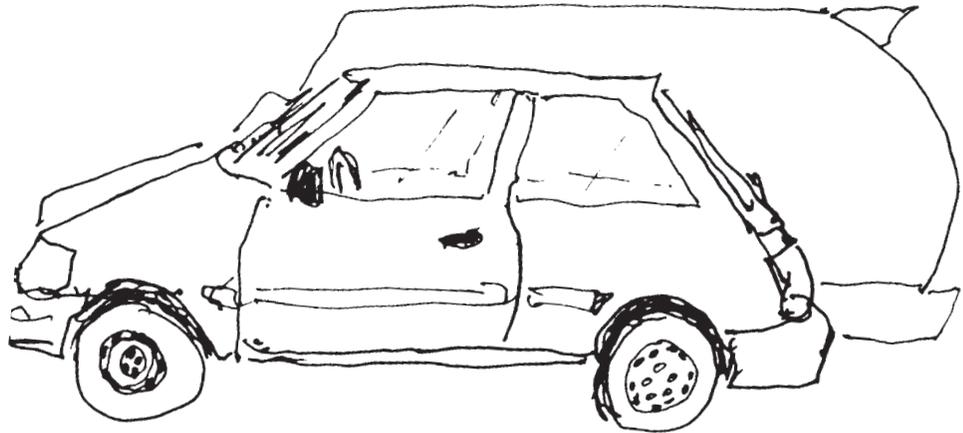
Energy Vision is a national non-profit organization that analyzes strategies for a sustainable transportation future, educates the public and policymakers about the options for change, and works with policymakers, businesses, and municipal governments to develop clean fuel initiatives at the local level. Its mission is to analyze and promote ways to make a swift transition to pollution-free renewable energy sources and to the clean, petroleum-free transportation fuels for the future.

*The material in this article is from an Energy Vision report entitled *Renewable Natural Gas: The Solution to a Major Transportation Challenge*. It also includes other material written by Joanna Underwood, the organization's president. The full report can be obtained in print form from Energy Vision at 138 East 13th St., New York, NY 10003, or can be read and downloaded gratis from their website at www.energy-vision.org. The author of the article, Joan Pearlman, is an award winning photographer, a board member of Energy Vision and of Professional Women Photographers.*

NJT

Turning Wastes into Vehicle Fuel

by Joan Pearlman



Suppose our country's vast flow of municipal organic wastes that amount to some seventy million tons a year, even more considering those from businesses and farms, could be collected and turned into a vehicle fuel like fossil natural gas?

Suppose this gas fuel could be produced without drilling, was virtually free of soot and had close to a zero carbon footprint? Further assume that a new industry producing this could fuel result in the creation of two hundred thousand new sustainable, non-exportable jobs?

We already have such a fuel in the form of renewable natural gas. It is the cleanest alternative fuel to date. It is made from organic waste and could free millions of buses and trucks from reliance on oil. It is comparable to the fossil natural gas we drill for but better. It is sustainable because it is made from wastes. It is free of health-threatening soot and has close to zero net carbon impact. It requires no drilling like hydro fracking or any other such technology.

Turning Wastes into Vehicle Fuel

What if our country's vast flow of municipal organic wastes (some 70 million tons a year) plus even more from businesses and farms, could be collected and turned into a vehicle fuel just like fossil natural gas?

- What if this gas fuel could be produced without drilling, was virtually free of soot and had close to a zero carbon footprint?

-What if a new industry producing this fuel resulted in the creation of 200,000 new sustainable, non-exportable jobs and : Communities and Businesses can be the "Game-Changers"

Well, now there is such a fuel. Renewable Natural Gas (RNG), the cleanest alternative fuel to date. It is a fuel made from organic waste, and it can free millions of buses and trucks from reliance on oil. It is just like the fossil natural gas that you have to drill for, but better. It is sustainable since it is made from wastes, is free of health-threatening soot, and

has close to zero net carbon impact. It requires no drilling. Repeat: It requires NO drilling using hydrofracking or any other drilling technology.

There are large quantities of organic wastes for making renewable natural gas in cities and rural areas coast to coast. They include wastes in landfills, at sewage treatment plants and those from homes and businesses, food processing plants, and agricultural and dairy operations. There are one thousand seven hundred and fifty large landfills that are regulated by the EPA. Five hundred and four of these sites convert biogas to power and heat. Only five, however, make vehicle fuel. Another five hundred and one sites are good candidates for energy projects, and other smaller sites could so become as small-scale technologies develop. There are also seventeen thousand municipal waste water treatments plants, several thousand of which qualify. There are also well as over eight thousand large dairy, hog farms available.

There are no technological hurdles to converting these organic wastes turned into fuel. It involves collecting the biogases emitted wherever organic wastes are decomposing. In an air-less environment, such as a landfill, or in a specially designed anaerobic digester renewable natural gas production is the most efficient way to convert biomass to fuel. It requires less incoming energy for each unit of energy produced than any other fuel made from biomass including ethanol and biodiesel.

Digesters can be built next to landfills or at sewage treatment plant sites or any place that meets the following two criteria. They must be accessible to waste carrying trucks to dump their loads of organic materials at less than twenty miles. Once the biogases are refined into fuel, they can refuel the infrastructure on the sites where the truck fill their tanks, or be transported by pipeline or tanker truck to refueling stations elsewhere.

Processing organic wastes in digesters is highly beneficial from an environmental perspective. Since the organic wastes are collected separately, unlike

mixed wastes that go to landfills, once the biogases are removed the bio-solid materials are remain can be used for fertilizers or soil amendments. Renewable natural gas has the same molecular make up as conventional natural gas. It is made up is methane, and is composed of one carbon atom and four hydrogen atoms. Both kinds of natural gas can be transported through the same pipelines and can refuel vehicles using the same filling tanks, taking advantage of the same natural gas engines

The ten million trucks and buses on our roads are the best first markets for this fuel. Natural gas engines for virtually all these heavy vehicles are commercially available. Such buses and trucks provide essential services to every community in the country. Trucks transport goods worth nearly seventy percent of our gross domestic product. These buses and trucks make up just a fraction or only four per cent of our two hundred and sixty million vehicles. They use almost a quarter of all highway fuel, however, primarily high-carbon diesel produced largely from foreign oil. Investment in converting these fleets offers a handsome profit. In the future, another option for such fleets may be to combine the use of such clean fuel and hybrid engines so the fuel is used even more efficiently.

It comes as especially good news that renewable natural gas can be made in commercial quantities now. Using today's technologies, the wastes thrown away daily in every city or region can be converted into enough fuel to displace sixteen percent of all the diesel fuel consumed in the country. Renewable natural gas may soon be able to displace much more. Thermal gasification technologies, now on the horizon, will process tough forest wastes and energy crops. Through anaerobic digestion and thermal gasification, renewable natural gas could displace almost half of the thirty-eight billion gallons of diesel fuel used in transportation annually. With federal and state incentives, the contribution of renewable natural gas could be even greater.

The American economy sends nearly eight hun-

dred million dollars a day abroad to buy forty-five per cent of the oil to meet our needs. A hundred and ten million of this goes for oil needed in diesel production. Most of it goes to the Middle East and elsewhere where priorities are not allied with our own. The fluctuating and steadily rising price of this oil destabilizes our economy and upsets the budgets of local communities. By using locally produced renewable natural gas, essential fleets for sanitation, road repair, emergency and resident transportation would be protected from unpredictable diesel price swings.

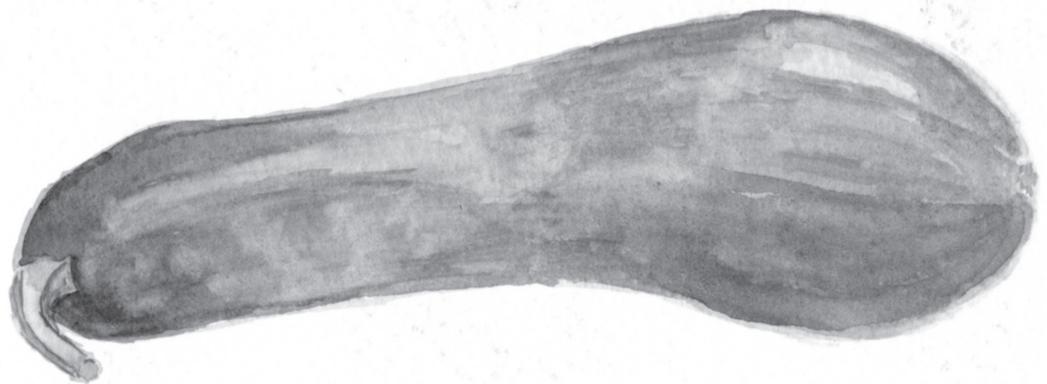
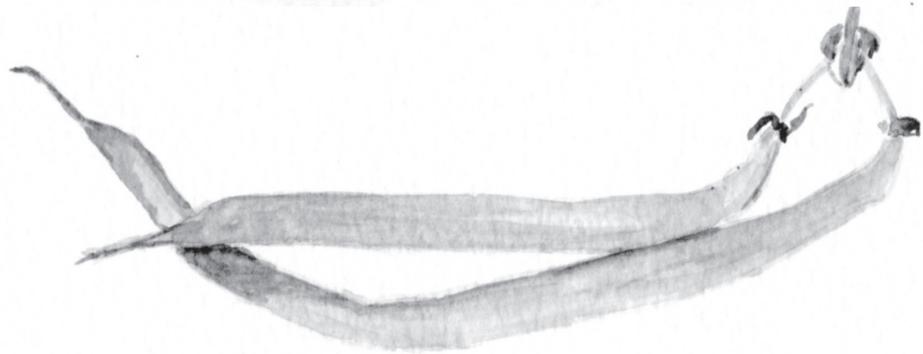
A question could be raised as to why it is advisable to use waste biogases for vehicle fuel when they can also be used to generate power or to heat homes. While it is true that they can be used for all these purposes, as can conventional, because the fuel is so clean, other renewable energy sources like wind, solar, geothermal can be used for power generation and home heating. Renewable natural gas and fossil gas are the only fuels, however, that can displace significant amounts of oil in transportation while they safeguard national security and strengthen our economy while they provide health and climate benefits.

Energy Vision's full report includes profiles of eight of the first renewable natural gas initiatives underway in the country as well as a list of the obstacles hampering its production and use as vehicle fuel. For the exceptional contribution that this fuel could make in moving our country toward an environmentally and economically sustainable future, government incentives helping overcome these obstacles would be a wise investment.

The Energy Vision report belongs in the hands of every town, city, state or regional planning agency, since studying and harnessing the kinds of local wastes needed to make renewable natural gas fuel. This should happen at the local level. The report also provides an overview of the exciting prospects for renewable natural gas from a national perspective. This spring Energy Vision will publish this a step-by-step guide for communities on how to explore and develop local renewable natural gas initiatives.

You can review Energy Visions' report is on its website at: <http://energy-vision.org/publications/reports/energy-visions-publications/>

Matt Tomich, Energy Vision's Research and Outreach Associate, can be contacted at (tomich@energy-vision.org or 212 228-0225 for any feedback or questions



Upcoming Courses in Ecological Design by the Todds



June 28th to 30th at the Omega Institute at the Rhinebeck, New York campus as part of the Omega Program in Ecological Literacy. www.omega.org.



September 23rd to 27th at Schumacher College near Totnes in Devon in the UK. www.schumachercollege.org.uk.