Excerpt: “Carbon-Negative Communities”

From The Biochar Solution by Albert Bates

THE DESIGN OF COMMUNITIES WILL CEASE, fairly soon, to resemble something plucked from old science fiction magazines or the world’s fairs of the 20th century. The bankruptcy of the Dubai World runs deeper than its accounting ledgers. To build cities in the desert with the world’s largest shopping malls, highest skyscrapers, and an indoor, air-conditioned ski resort required more than hubris, whimsy, or nearly infinite petrodollars. It required raw ignorance of nature at a previously unimagined level. The future will be different. What changes for ill in one location may help a change for the better occur somewhere else. The changes needed for humans are adaptive: We need to be able to discern the direction of local and regional trends and to alter our behavior appropriately. From Diamond’s list of collapse factors, “societal responses” may turn out to be the most critical. As the British historian Arnold Toynbee said, “Civilizations die from suicide, not by murder.”

Approximately half of greenhouse-gas emissions in the industrial world are due to buildings. The low-hanging fruit of retrofits and revised building codes could yield immediate reductions of 60 percent, which translates to 1.35 GtC, equivalent to the savings pledged by governments at the 2010 climate summit in Copenhagen.

In the world to come, the premium will be on buildings and settlement patterns that conserve energy and water; provide food, livelihood, and safety from violent events (natural and man-made); require little or no nonrenewable resources to build and operate; and are not just carbon-neutral, but carbon-negative. Some of the more daring thinkers in the architectural world are already there.

Long before concepts like “green building” and “sustainability” were fashionable, the husband-and-wife team of Pliny Fisk and Gail Vittori envisioned a future in which architectural design and renewable resources worked together. The nonprofit Center for Maximum Potential Building Systems, which they co-direct, has collaborated on projects as wide-ranging as the eco-friendly renovation of the Pentagon and the development of a model village in Szechuan Province, China. Sitting under the shade of an oak on the grassy mall outside the Smithsonian Institution, Fisk handed me a cement brick. “It absorbs carbon from the air,” he said. It was AshCrete, an innovative building material Fisk had developed from seawater and the waste fly ash generated by coal-fired power plants and aluminum smelters. Most cement-making is a carbon source — about 25 billion tons of carbon have gone to the atmosphere from cement kilns, and production is still growing. Replacing carbon-positive concrete buildings with carbonnegative counterparts is revolutionary.

Peter Harper is head of Research and Innovation at the Centre for Alternative Technology in Wales, UK, where he pushes the frontiers of energy policy, sustainable lifestyles, ecovillages, alternative sanitation, landscape design, organic horticulture, and composting. His colleagues regard him as a loose cannon often at odds with green orthodoxy. His friends think of him as an agreeable-enough nerd, if occasionally prone to go on long rants about proper compost. With a talented group of fellow nerds such as Paul Allen, Tim Helweg-Larsen, and Jamie Bull, Harper co-founded the Wales Institute for Sustainable Education (WISE) and articulated an island-wide energy strategy called ZeroCarbonBritain.

ZeroCarbonBritain predicts that because of the demands of peak oil, financial collapse, and climate change, “by 2027, all Britain’s agriculture will be broadly, if not literally, ‘organic’.” The reasons are fairly obvious. Fifty-four percent of the atmospheric footprint of British agriculture is attributable to nitrogen fertilizer, a potent source of nitrous oxide. The other main components of chemical fertilizer, phosphate and potash, are nonrenewable mineral resources that are quickly depleting. Moreover, the British diet, which favors livestock, is likely to change under a strict carbon-emissions regime. "Despite historical preferences, Britain's citizens are unlikely to spend their entire carbon allowances on beef, mutton, and cheese," the report says.

Harper believes that where space permits, food production will be in and around towns and cities, on allotments, and in private gardens. Sewers will be redesigned to return human wastes, suitably composted, onto the land. The need for more farmland, closer to population centers, will result in what town-planners term "offset density," with areas best suited for agriculture and forestry carved out from suburbia, and residential buildings migrating into tighter clusters. Passive solar technologies such as rooftop water heaters, shading, natural ventilation, greenhouses, and thermal storage walls will join newer concepts such as "bioclimatic" buildings with living roofs, earth berms, and geothermal heat transfer. Fifteen years ago, !omas Harttung converted his family farm in Denmark to organic community-supportive agriculture (CSA).

Within four years, he was delivering 45,000 boxes of produce to subscriber homes in Denmark, Sweden, and Germany. In 2005, the CSA went carbon-negative with the installation of a CHP burner, pyrolysis kiln, and Stirling engine that supplied 100 percent of needed heat, 50 percent of electricity, and abundant biochar for expanding operations. In 2007, Jeff Wallin, a green project developer, hired a talented group of environmental consultants to survey some property in Tennessee and draw plans for a sustainable community. His consultants — a new generation of permaculturists, bioregionalists, green engineers, and soil food web cognoscenti led by MaryAnn Simonds —

proposed not just a forested subdivision, but a plan for the first carbon-negative eco-community in the world.

The heart of the design consisted of a district heating plant that could be tweaked to maximize production of biochar, biofuels, electricity, or a combination of products, such as activated charcoal, solvents, and chemicals. For the sake of carbon neutrality it would have produced 32,000 tons of biochar per year—58000 pounds per hour. Around the outskirts of the village were planned continuous-harvest, mixed-species, uneven-aged forestry and fields of switchgrass, elephant grass, and bamboo (fertilized with biochar). The project also planned to earn tipping fees from local governments by relieving them of woody biomass that otherwise would have gone to landfills to burn or decompose. Had credits for carbon sequestration been available, Wallin and Simonds' model community would have banked those as well.

Sadly, Wallin and team, EcoTechnologies Group, were forced out of the project by its financier after delivering the business plans and engineering partnerships to make the project a go, and soon after that the Securities and Exchange Commission suspended the project, accusing the financier of defrauding investors.

Wallin was undeterred. He started a new relationship on the island of Kauai in Hawaii, where the group partnered with a business entrepreneur who was reforesting degraded sugar plantation lands. Wallin and partners designed a carbon-negative, zero-waste business model. The principal product will be rare Hawaiian mahogany. Culled "nurse trees" and specialized grasses will be chipped and turned into biochar, heat, and electricity, which will power a cooling facility selling ice, fish, meat, and cold storage. Some of the heat will also go to dry the wood chips and cure finished lumber. Biochar will be sold, used to invigorate the forest, or go to gardens on site. A portion will be fed directly to cattle, horses and fish, to increase the health of the livestock and improve resistance to disease. The project has pre-sold 130,000 verifiable tons of carbon offsets annually from nitrogen fixing mahogany trees, not even counting the biochar.

Forty percent of the land area of Japan is called “satoyama,” the area between human habitat and wilderness. It is a mosaic of minimal intervention, where farmers, foragers, hunters, and others foray, take a little out, and leave it alone to regrow. Satoyama is a mixture of grasslands, hardwood, softwood, bamboo, and semi-wild copse. In recent years, it has become a nuisance, because as farmers have abandoned the countryside, the bamboo groves have overgrown and wild boars have begun rampaging rice patties. Now a new idea, “cool farming” cooperatives, has emerged to reinvigorate the rural economy and restore the satoyama ecosystems. Bamboo is being harvested for biochar, the biochar returned to the farms for soil health and carbon credits, and the produce is sold as carbon-negative “cool food.” In 2009, the first “cool” cabbage was processed into slaw by a supermarket chain, sold at a premium price and it sold out. Cool Slaw and other carbon negative products may represent a new way to revive rural economies while redeeming ecological services.

Well before the crisis of 2008 struck the economy of Ireland, a group of young Dubliners began looking to the countryside for a place to shelter from the peak oil storm. Criteria: good farmland, a safe water supply, a railroad connection, and a friendly culture. After narrowing the candidates, they chose Cloughjordan in County Tipperary. Cloughjordan Ecovillage is both a novel experiment and a prod to the older village of Cloughjordan to evolve itself into a cooperative, self-reliant community from the bottom up. The 67-acre development now includes 132 households, community gardens, and an extensive area being returned to woodland. A CSA provides groceries produced to demand, and neighboring farms are sowing fields of grasses that will supply pellets for the central heating plant that will not only warm the ecovillage in winter, but replace coal and peat burning in much of the older town.

Design and planning involves all ecovillage members and is guided by permaculture principles. Going carbon-negative, while not imagined in the first phase, is now within easy reach, requiring only the addition of a pyrolyzing kiln to the pellet heater, and management of the woodlands through step-harvest and Pioneer Forest techniques. These examples of carbon-negative communities are from the industrial world, where the distance to go is farthest and the carbon debt greatest, but examples of similar lifestyle and built-environment change can also be found in the global South, from Auroville in India to Gaviotas in Colombia. Welcome to the future. If our grandchildren survive the 21st century, this will be their world.

In 1902, British master planner Ebenezer Howard published a small tome entitled Garden Cities of To-Morrow, which argued that by the end of the 20th century the factory metroplexes of England, smelling of burnt coal and horse manure, would be replaced by medium-sized “garden cities” designed to fit into their landscapes and supply their own food while nourishing the souls of their inhabitants with clean air, tree-lined sidewalks, and convivial apportionment of urban space. It was fully a century later that archaeologist Michael Heckenberger discovered Howard’s garden cities not in London but in the central Amazon, where Orellana’s expedition had reported them. Depending on how you reckon it, Howard was off by either 50 or 500 years.