

UNIVERSITY OF NEW MEXICO

FUSED HORIZONS: BROADENING THE CONTEXT

TWO LONGER-TERM APPLICATIONS IN YUNNAN PROVINCE, PEOPLE'S REPUBLIC OF CHINA

PROGRAM: THESIS PROJECT FOR THE MASTER'S IN ARCHITECTURE

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A NOTE ON FORMAT

The legal construct of Intellectual Property is inimical to the dissemination of ideas and techniques promoting longer-term solutions for a shrinking world. By a similar token, the best designs are collaborative, the very best rid of ego. Accordingly, this text is accompanied by a compact disk containing both technical and design images in high- and screen-resolution. Explore the CD, browse the Screen Rez directory, reproduce the high resolution images at will, deconstruct the DWGs — most important, steal these ideas and improve on them.

Common title to the future and the fusion of horizons depends on the wholesale poaching of territory, mind, and spirit.

PowerPoint presentation added 8/20/02.

PURPOSE

*Catch only what you've thrown yourself, all is
mere skill and little gain;
but when you're suddenly the catcher of a ball
thrown by an eternal partner
with accurate and measured swing
towards you, to your centre, in an arch
from the great bridgebuilding of God:
why catching then becomes a power –
not yours, a world's.*

Rainer Maria Rilke

As is so often the case with coined expressions, the meaning of *sustainability* was at inception, and remains, idiomatic to the cultural and economic context. In the U.S. it is often defined as the employment of resources such to guarantee the status quo well-being of future generations. Elsewhere it is synonymous with *subsistence*, a goal incompatible with the ambitions of post-industrial societies or with those of cultures aspiring to that mythical state. In some circumstances it means *renovation* of damaged cultural and physical landscapes. The definition of *sustain* is clear enough: *to give support or relief to: to supply with sustenance: nourish: to keep up: prolong*¹ — it is made problematic by the absence of a shared vision of a commonly held future, by the willful and short-sighted partitioning of discreet horizons.

The move toward sustainable development in the U.S. is rooted in Western mid-twentieth century anxieties regarding the impact of Third World poverty and population growth on First World culture. During the 1970s that concern matured to embrace issues associated with the resource consumption and depletion which characterize urbanized societies, particularly that of the U.S. In the 1980s the true dimensions of the population explosion became apparent, Western societies exported their heavy industry to the less-developed world, and the global migration from rural to urban environments began in earnest. Simultaneously, populations across the globe embraced Western consumer culture without regard for its economic or environmental efficacy. In the 1990s these threats to a secure future assumed the cast of intractability; and skepticism regarding the developed world's motives in promoting sustainability gained political weight throughout the Third World. The questions then became, "How many futures can there be?" and "Whose is at stake?"

Although our understanding of natural systems, so called, now features deeper awareness of the finite dimensions of resources and of the essential values of diversity and integration, government policy and corporate strategies continue to promote a consumer's life style at the expense of any genuine attempts to realign Western culture to the status of one component in a collective future. Indeed, the imposition of the consumer ethos in the developing world continues apace with an enduring faith in both stopgap technological fixes and the global suitability of a narrowly conceived monoculture. Today, in the U.S., 4% of world population consumes 40% of world resources and generates 60% of the world's waste.² Moreover, the

¹ *Webster's New Collegiate Dictionary*, (1975), s.v. "sustain."

² <http://www.wri.org/wri/index.html>, World Resources Institute.

production and occupation of architecture here accounts for 75% of that resource exploitation and 20% of water usage³ — patently unsustainable levels of consumption. Yet the U.S. model persists as the ideal.

The purpose here is not served by a litany of resource consumption facts and figures, those having been made innocuous by repetition. It is, however, illuminated by the brief examination of two recent American phenomena: SUVs vis-à-vis the Arctic National Wildlife Refuge, and the relationship of Mexican timber to North American housing development.

SUVS AND THE ANWR

Although some industry historians date the suburban utility vehicle to the introduction of the Chevrolet *Suburban* of the 1930s (an enclosed van developed for the commercial market), its true incept came with the introduction of the Ford *Bronco* during the 1983/84 model season and matured to its present form with the introduction of the Ford *Explorer* in the early 1990s.⁴ These products aimed to satisfy the sensibilities of middle-class motorists who perceived their driving environment and their personas to be increasingly “urban” and rough-edged. Ford, followed by the rest of the automotive industry as Ford’s sales surged, calculated the SUV to qualify under the Corporate Average Fuel Economy (CAFE) standards as a “light truck” and, therefore, exempt from the stricter goals for passenger automobiles. The first dilemma emerges — Congress passed the CAFE standards in reaction to the energy crises of the early 1970s. It was intended as a means to reduce U.S. dependency on *foreign* oil. With its emphasis on conservation, it was, by any reasoning, a conscientious attempt to do so. Cynics might say that conservation was the only means available given the depleted state of domestic resources but Congress’ logic was, and remains, sound: *when faced with scarcity, use less* — particularly when that scarcity reveals the absolute dimensions of the resource. As timid as the CAFE standards are considered to be outside the automotive industry, they resulted in appreciably lower volumes of oil consumption totaling some three million barrels less each day than might have been the case otherwise.⁵ This despite the industry’s recalcitrance. So, faced with logic and, by 1990, empirical evidence that conservation succeeds, the auto manufacturers, in league, if not collaboration, with their cohorts in the oil industry, introduce a product designed specifically to circumvent the standards and, presumably, to undermine that progress. Half the story.

The more dispiriting half is told in the exuberant acceptance of the product by the American driving public. Sales have climbed steadily to reach 50% of new vehicles sold despite low fuel efficiency and vehicle safety records (SUV design employs the older cab application to truck ladder frame technology as opposed to the lighter and safer monocoque auto design.)⁶ The net result is an overall decline in fuel efficiency, current daily consumption rising to 18 million barrels, half of that imported, that half equivalent to the quantity consumed in light trucks and autos, and a society more dependent on oil imports than in 1973 (55% today v. 35% then.)⁷

³ Ibid.

⁴ *Roll Over: The Hidden History of the SUV* (Washington, D.C.: Public Broadcasting System, 2002) videotape.

⁵ Nedra Pickler, “SUV Sales Soar, Gas Mileage Hits 20-year Low,” Associated Press, December 19, 2000.

⁶ Ibid.

⁷ *NRDC Slams Senate Plan to Drill in the Arctic Refuge, Says GOP’s Omnibus Energy Bill Unresponsive to Nation’s Needs* (Washington, D.C.: Natural Resources Defense Council, February 26, 2001) press release.

The Arctic National Wildlife Refuge coastal plain has been targeted for exploitation periodically by the oil industry and its allies in Congress since its establishment by Congress in 1960, notwithstanding ongoing resource extraction in the remaining 95% of the Refuge. The rationale for extracting resources from the coastal plain never varies. It centers around “energy security” and U.S. dependency on imported oil, this despite uncontested projections by the U.S. Geological Survey that production would amount to no more than six months’ supply at present rates of consumption.⁸ The fact that the *export* of Alaskan crude is permitted usually dodges the equation altogether. The argument here is not in favor of wilderness, habitat, or diversity (although no apology for such argument is expressed or implied), but, rather, is intended to draw attention to the circular illogic underlying the actions and deeds of American corporations and consumers in their pursuit of — what, exactly? — the enjoyment of a purely conceived (and received) consumptive product of little use beyond its value as a elevated mobile perch and as a rationale for additional consumption?

MEXICAN TIMBER AND NEW MEXICAN HOUSING DEVELOPMENT

The import of timber originating in the region of Mexico centered on the Sierra Madre in the State of Chihuahua through the U.S. Customs port of Santa Theresa, New Mexico, increased from 22,000 board feet in 1995 to over 36 million board feet in 1997.⁹ This astronomical increase coincides with reduced harvesting in the U.S. resulting from declining timber resources and the legal gains made by environmental organizations questioning forestry management, such questions increasing in importance as degradation of the resource becomes more apparent. As the value of Mexican timber rises, harvesting that timber attracts U.S. corporations intent on satisfying the unabated demand for lumber-based residential construction. It has also piqued the interest of Drug Cartel capital in its search for laundering. No conspiracy theory directly tying the corporations to drug interests is necessary in the presence of the fact that harvesting by both ultimately funnels through to the housing industry here. Abuses of the resource in the Sierra Madre extends to those *ejiditarios* who dare to protest expedient, often unauthorized, harvesting of communal forests.

The import and crime statistics testify to the spiral effect created when resources diminish in a region without a concomitant decrease of appetite. Comparing consumption in the form of housing in the U.S. with that of other societies is meaningless since no basis exists for the comparison. Each comparison results in yet another multiple of the statistic from the society compared — 21 times that of one, 50 times that of another — and lends itself to the rationale that we enjoy the fruits of our labor and ingenuity. Looking at that consumption as an indicator internal to the U.S. of the direction and consciousness of the housing industry and its consumers reveals more. Alternatives to Growth Oregon (AGO) has collected and published the following figures:

From 1970 to 1996, the average house size in the US went from 1,385 to 2,060 square feet, an increase of 29%. At the same time, occupancy of the average house has dropped 16%.

From 1970 to 1979 in the Pacific Northwest, population increased about 65% while households increased 110%. A significant portion of this increase is due to divorce.

⁸ Ibid.

⁹ Kent Patterson, “Timber Trade,” <http://commongroundradio.org/transcript/98/9816.html>, Common Ground Radio, April 21, 1998.

In 1993, 9,400,000 Americans owned second or more homes. 1998, on any given night, 600,000 Americans were homeless.¹⁰

These statistics describe the single most important economic indicator used to gauge the health of the U.S. economy, which is to say the *consumer* market for housing as distinguished from the *need* for housing. Like any market, the interests dependent on it will seek satisfaction even in the face of declining resources with little or no consideration extended to conditions beyond its narrowly defined horizon.

All of the indications that Albuquerque is living beyond its natural resource means aside, housing starts here continue to number in the thousands each year. All of these new “homes” meet the statistical norms described by AGO. All of these new “homes” symbolize the health of the local economy in the minds of the consumers and those assigned the task of worrying about such matters. Though timber imports through Santa Theresa are destined for points throughout the Western U.S., all of these new “homes” contain some Sierra Madre content. One might say they contain the blood, sweat, and tears of Mexican peasants, as well.

These two examples of the power of the relationship between capital and consumer to limit the horizons of each to the immediate context in terms of both space and time reveal the impediment to a sustainable future; namely a structural, cultural inability to perceive interests beyond our own, beyond today. Accordingly, any definition of “sustainable” cannot be as specific as those currently in use. But a new definition may be found in the collective variety offered in the context of a commonly held future that spans political and economic borders. Hans-Georg Gadamer, in *Truth and Method*, tell us “Understanding...is always the fusion of these horizons which we imagine to exist by themselves.”¹¹ *Sustainable* needs to be tied to the idea of *legacy* in the minds of those doing the defining, which is to say, everyone, to spawn that kind of understanding. And Paulina Aguilera-Harwood reminds us that the only lasting legacy is cultural. Designers are doomed to working in the physical, but their product, thoughtful or not, for good and ill, directly impacts the culture. The purpose here is to uncover pieces of the physical that might promote a broader appreciation of long-term solutions in that culture most in need, the U.S.

APPROACH

If we don't change our direction, we'll wind up where we are headed.

Chinese Proverb

The straightest path to a broader understanding of the challenges we all face is to “adopt” another context with the conviction that there are lessons to be learned and brought to bear at home. That much is obvious in the same way that travel broadens outlook. And practically any alternate context serves the purpose. This project looks at conditions in the Peoples’ Republic of China in the belief that meeting those specific challenges tells us important things about the

¹⁰Alternatives to Growth Oregon, “Consumption Growth,” <http://www.agoregon.org/growth/consumption.asp>, March 15, 2001.

¹¹ Hans Georg Gadamer, *Truth and Method* (New York: Seabury Press, 1975 [1960]) p.273.

direction we might take here in the U.S. — about solutions for challenges we will inevitably face here. China's most important lesson is that we will face that future much sooner than we think.

There are three views of China: multinationals see a market that never ends; consumers see that market as a threat to their quality of life; and the less pessimistic see her as an experienced co-conspirator in the move toward sustainable systems. None of these views is all right or all wrong. The first two seem certain. The third is nuanced and requires time and effort. We know now that the rewards of the first will be short-lived and the depredations of the second eventually forgotten. It is the third view that holds one of the keys to the future. China's long experience with maximized landscapes and her long view of history complement the brash immediacy of Western environmental activism. China is a waking giant, but in ways that are much more subtle and powerful than those reflected in corporate balance sheets or consumer indexes. Her potential for tripling or quadrupling the global rate of consumption is limited only by the finite quantities of the resources available. All indications are that development in China currently exceeds that of the West: eighty million square feet of new housing in the coming decade, housing necessary to accommodate a population that is expected to peak at 1.6 billion by mid-century; large, unprecedented shifts of population from rural locales to urban complicate the picture. And the question of resource redeployment after mid-century complicates it yet further. The emergence of the Socialist Free Market, with its burgeoning urban middle class, shifts the consumption balance both inside China and throughout the world.

The applications proposed here assume the well established efficacy of renewable and recyclable resources as building systems as well as that of smaller, site-specific constructed wetlands for wastewater treatment. In combination with sound passive design (solar heat capture and avoidance), crop residues (baled straw) offer the greatest potential in the form of infill walls within box building frames (larger framing components). With bales smaller than those produced by Western mechanized equipment, such systems are appropriate for multistory applications. The benefits come in the form of reduced carbon dioxide generation (the avoidance of burn-off in the field, the cutting of timber, and energy intensive manufacturing) and in the creation of a windfall agricultural commodity. Likewise, pozzolan catalysts (coal ash, rice hull ash) used to supplant the Portland cement content in concrete further reduce greenhouse gases and also create commodity from waste (the manufacture of Portland cement accounts for 8% of carbon dioxide generated worldwide). Constructed wetlands (engineered versions of natural wetland filters), particularly at the site-specific scale, renovate downstream water quality and mitigate against erosion and aquifer fragmentation. Applying these systems and principles in the extreme circumstances represented by China's heated urban development and fractionated agricultural landscape will further substantiate their efficacy. Demonstrating that those extreme conditions still offer an abundance of materials and the possibility for cultural and natural renovation may prove to be a source for optimism and action. Given the global context, such designs are directly applicable here in the U.S. The potential for landscape and resource renovation here in New Mexico is, perhaps, more important.

CHALLENGES (*problems*)

- Overburden of incoherent western design
- Widespread adoption of high-embodied-energy/throwaway building systems and materials
- Degradation of water resources

Gas emissions resulting from the burning of crop residues & manufacturing
Wasteful centralized power generation
Meeting immediate need for exurban housing with an eye toward adaptation beyond mid-century

OPPORTUNITIES (*solutions*)

Reframing the design context for a common future
Redefining building capital in terms of natural systems and processes
Simpler designs supplanting mechanical energy with human
Recycling agricultural and industrial residues into building materials

SPECIFICALLY

Adapted CEPP design for composting toilets combined with wastewater wetland technology
Baled straw on lighter weight braced steel frames; reduced co2 emissions; windfall agricultural product
Smaller bales better suited for manual labor and a fractionated agricultural landscape
Reduced Portland cement content; reduced building mass; reduced co2 emissions
Recycled coal ash pellets for earth plasters and pozzolan content
Active & passive solar design
Grid-tied photovoltaic power generation
Kit-of-parts combined with local materials and manual labor

APPLICATIONS

A PRIVY FOR ANG WEN KAI ZHU

Human waste and wastewater treatment are central to the experience in China. Public facilities are utterly rudimentary and devoid of delight. They are, when convenient, associated with a stream or river for direct disposal. In the absence of surface water, the product is

practiced throughout the country. Residential urban systems have adopted Western style fixtures and chemical-based municipal treatment facilities. The net results: no potable surface water—anywhere¹²; colossal waste of water in conveying waste and in treatment facilities; squandered human and soil nourishment resources

The opportunity here is to design detached toilet and shower facilities for a bed and breakfast in Zhong Dian (10,500 ft., 28° N) owned and operated by one of the local incarnate lamas and his wife.

Ang Wen Kai Zhu and Dawazhuoma, his wife, live in a traditional Tibetan house on the outskirts of Zhong Dian along the route to Songzanlin Lamasery. The house is 20 years old and was constructed as a part of the Lama's rehabilitation following the Cultural Revolution. They operate the site as a bed-and-breakfast which enjoys considerable popularity stemming

¹² Caroline Blunden and Mark Elvin, *Cultural Atlas of China*. (New York: Chekmark Books, 1998) p.44-45.

from the gracious and accommodating attitude extended to visitors from within China and around the world.

Their higher water consciousness is evidenced by formal petitions to local and provincial officials protesting the degradation of ground and surface water resources throughout Zhong Dian caused by deep wells servicing new hotels in the city and the profligate consumption and waste generation resulting from government promoted tourism. They are also skeptical of claims made in promoting the new wastewater treatment plant designed by engineers from Qing Hua University, Beijing, which is scheduled to go online in 2003.

Although the bath and toilet facilities at their site are inadequate, those facilities do represent an improvement over those generally available by virtue of frequent maintenance. General practice in the region is to use open-pit latrines which are occasionally mucked out, the contents then spread on gardens or across adjacent meadows. The occupied terrain is the product of natural meadow building with the concomitant meandering streams and shallow water table.

The Lama and his wife agreed that the existing privy was not adequate in both aesthetic and practical terms. They also expressed a need for the increased energy to operate a computer and the desire to expand the courtyard wall to the farthest extent possible to the east. The courtyard garden is well maintained with ornamentals and herbs. They aspire to a seasonal truck garden producing quantities sufficient to meet the need of guests.

A VERTICAL VILLAGE AT DIAN CHI

The great rift valley lake immediately south of and contiguous to Kunming suffers every environmental and social malady imaginable: choked with vegetation fed by agricultural runoff; direct industrial and wastewater effluents; and, the relocation of the farming population and the poaching of arable land as the city sprawls in the only direction available (mountains to the north and west block expansion, indigenous reserves to the east.) All of the familiar urban challenges compounded by the expected pre-peak 30% population increase by mid-century (400 million people) and a wholesale abandonment of the farm for the city by those present (130 million in the last 10 years.)¹³

If the object is to keep people on the farm, producing for an inexorably (for now) expanding population, and accommodate the concomitant population increase on the farm, then the only way to go is up. This application borrows directly from the previous in technical terms and more clearly embraces the architectural issues of community and future.

The eastern shore of Dian Chi is a classic example of rift geology with minimal gradients facing sharply rising escarpments across the narrow 400 square kilometer lake. The city of Kunming has always been contiguous with the lake and dredging and filling at the northern extremity dates to the Ming period (400 years). Despite official policy proscribing the poaching of arable land, modern Kunming encroaches increasingly with official approval to accommodate the new middle class desire for low-rise dwellings.

Industrial pollution point sources exist at the southern end of the lake. Generalized fertilizer runoff from the perennial cultivation of ornamentals for the world's markets along the

¹³ Robert Benewick and Stephanie Donald, *The State of China Atlas* (London: Penguin Putnam, 1999) p.14-15.

eastern shore exacerbates algal and hyacinth proliferation. And direct disposal of raw or inadequately treated sewage from Kunming and other communities within the basin completes this picture of habitat degradation.¹⁴

Conversations with the people now providing rowing services to tourists visiting the formal gardens across the Da Guan inlet confirm the officially sanctioned displacement of farmers symbolized by two story townhouse developments visible from those gardens. The complaints range from those associated with degraded lifestyle and employment to inadequate compensation for their land. Net results are centralized ownership of cash-crop monocultural agriculture and an increasing displaced, dispirited population.

¹⁴ *Yunnan Environmental Project: Environmental Assessment Report* (World Bank Overseas Development Administration, February 3, 1996) p.1.6-1.10.

ESSENTIAL READING

CITED

Benewick, Robert, and Stephanie Donald. *The State of China Atlas*. London: Penguin Putnam, 1999.

Blunden, Caroline, and Mark Elvin. *Cultural Atlas of China*. New York: Chekmark Books, 1998.

Gadamer, Hans Georg. *Truth and Method*. New York: Seabury Press, 1975 [1960].

Natural Resources Defense Council. "NRDC Slams Senate Plan to Drill in the Arctic Refuge, Says GOP's Omnibus Energy Bill Unresponsive to Nation's Needs," Washington, D.C., February 26, 2001, press release.

Patterson, Kent. "Timber Trade," <http://commongroundradio.org/transcpt/98/9816.html>, Common Ground Radio, April 21, 1998.

Pickler, Nedra. "SUV Sales Soar, Gas Mileage Hits 20-year Low," Associated Press, December 19, 2000.

Alternatives to Growth Oregon, "Consumption Growth," <http://www.agoregon.org/growth/consumption.asp>, March 15, 2001.

Public Broadcasting System. *Roll Over: The Hidden History of the SUV*, Washington, D.C., 2002, videotape.

Webster's New Collegiate Dictionary, 1975 ed., s.v. "sustain."

World Resources Institute. <http://www.wri.org/wri/index.html>,

Yunnan Environmental Project: Environmental Assessment Report. World Bank Overseas Development Administration, February 3, 1996.

HISTORY/CULTURE

Benewick, Robert, and Stephanie Donald. *The State of China Atlas*. London: Penguin Putnam, 1999.

Blunden, Caroline, and Mark Elvin. *Cultural Atlas of China*. New York: Chekmark Books, 1998.

Information about the current state of Chinese Society becomes increasingly available in the West. However, the introduction of opinion often shades the facts. These two atlases provide the latest information without bias or opinion.

Butterfield, Fox. *China: Alive in the Bitter Sea*. New York: Times Books, 1982.

Although Butterfield's world view is as quaint as that prevailing at the time of publication, his account of personal stories recorded in the immediate aftermath of the Cultural Revolution offers insight into an important influence on the modern Chinese character.

Debo, Angie. *Prairie City*. Tulsa, Council Oaks Books, Ltd., 1985.

This 1944 work by a grossly neglected author is the fictionalized account of the history of Marshall, Oklahoma. It describes the "adventitious...development that put the American farmer alone on his land."

Fairbank, John King. *China: A New History*. Cambridge: Harvard University Press, 1992.

The final book by the classic American historian of Chinese history and politics.

Gadamer, Hans Georg. *Truth and Method*. New York: Seabury Press, 1975 [1960].

The author's dense but ultimately understandable seminal work on the hermeneutics of art and literature. Perhaps not essential reading in toto, but helpful in explaining the private experience of "fused horizons."

Goldstein, Melvyn C. *A History of Modern Tibet, 1913—1951: The Demise of the Lamaist State*. Berkeley: University of California Press, 1989.

Thorough, frank appraisal of the interaction between those forces internal and external to Tibet leading to her forced occupation by the Peoples' Republic. Goldstein demystifies the myth of Tibet at no expense to a deeper appreciation for the intimate interplay of temporal and spiritual interests in the Buddhist state.

Jackson, Wes. *Becoming Native to this Place*. Lexington, The University Press of Kentucky, 1994.

The lectures on the future of American culture/agriculture delivered at the University of Kentucky as the 1991 Blazer Lectures by Wes Jackson, recipient of a MacArthur Fellowship for his seminal work researching the prairie grass biome and landscape renovation. Anyone with an interest in the potential future of agriculture in America should avail themselves of Jackson's wisdom and the work being done at his Land Institute in Salina, Kansas.

Kaplan, Robert D. *An Empire Wilderness: Travels into America's Future*. New York: Vintage Books, 1997.

An uncompromising look at the current state of American culture and where it is certain (in Kaplan's mind) to lead.

_____. *The Ends of the Earth: A Journey to the Frontiers of Anarchy*. New York: Vintage Books, 1999.

Kaplan's equally frank and frightening account of modern societies in crises leavened with an optimism best summed up by Krishnamurti's axiom: "Whatever can be solved locally will be."

Shakya, Tsering. *The Dragon in the Land of Snows: A History of Modern Tibet Since 1947*. New York: Penguin Compass, 1999.

Dry, but exhaustive account of that period in Tibetan history, the first written by a Tibetan.

Starr, John Bryan. *Understanding China*. New York: Hill and Wang, 2001.

Politically biased but informative comparison of Chinese and U.S. societies.

TECHNICAL

Campbell, Craig S. and Michael H. Ogden. *Constructed Wetlands in the Sustainable Landscape*. New York, John Wiley and Sons, 1999.

The first work on the subject to place constructed wetlands in the non-industrial landscape. An excellent source book for both technical and aesthetic design issues, readable even.

Del Porto, David and Carol Steinfeld. *The Composting Toilet System Book*. Concord: The Center for Ecological Pollution Prevention, 1998.

Complete guide to most, if not all, options for dry toilet technologies and designs.

Marsh, George Perkins. *Man and Nature or, Physical Geography as Modified by Human Action*. Cambridge, The Belknap Press of the Harvard University Press, 1965.

Originally published in 1864, this is the seminal American work chronicling the degradation of habitat. Consider it the technical companion to Thoreau's *Walden Pond*.

Outwater, Alice. *Water, A Natural History*. New York, Basic Books, 1996.

The first natural history of water in North America, Outwater's account of the dismantling of the continental filter gives one a keen sense of the intricate, irreplaceable relationships that made clean water possible.

Van der Ryn, Sim. *The Toilet Papers: Recycling Waste and Conserving Water*. New Sausalito: Ecological Design Press, 1995.

Reissue of the classic pocket design guide and polemic on the history and future of toilets and wastewater management.

APPENDIX A

CEPP TWIN-BIN NET COMPOSTER

Although David Del Porto's design for the Center for Ecological Pollution Prevention is successful across societies and terrains, the challenge here is to accommodate bathing facilities in combination with toilet. Moreover, one goal is to ensure lowest odor levels and "self-cleaning" waste chambers with enough ammonia and minor solids finding their way to the wetland rock/reed filters to support the micro-biological community, plant growth, and, thereby, thorough treatment of wastewater before the effluent is exposed to the surroundings as irrigation water.

It is important to understand the difference between light-water (sometimes called gray) filters in which physical filtering only occurs and constructed wetland cells in which biological filtering akin to natural wetlands is the process at work.

The combination of oxic (aerobic) composting for solids and wetland oxic/anoxic combined cleaning of liquid wastes is the optimum.

APPENDIX B

MICRO WETLANDS AS LOGICAL LANDSCAPE ELEMENTS

A brief compilation of information and rationale for smaller, widely dispersed site-specific constructed wetlands. Much of the information is gleaned from Campbell and Ogden (see Essential Reading) which is the first (and only, so far) source placing the technology within the non-industrial environment.

Campbell and Ogden promote the use of rock/reed filter cells which are appropriate for households and clients with an established interest in gardening and plant maintenance. Bill Coleman has developed designs (unpublished) for rock (only) filters supporting the same oxic/anoxic processes with the same quality of effluent that are appropriate in those situations where no such interest exists or in situations where site forces preclude plantings in the filter.

Rock/reed filters are incorporated into the designs here because interest in agricultural and gardening endeavors is high and appropriate.

APPENDIX C

CHINESE RURAL ARCHITECTURE

Despite the authors claims, the Hakka round house designs of Fujian Province in the southeast of China are not the sole examples of multifamily agricultural dwellings. The most obvious exceptions to the claim are the many examples of Puebloan villages, many still occupied. Beyond that are the Dogon villages of Mali, West Africa and Shaker towns of 19th-century Northeast America.

The object here is not to suggest that apartment living for farmers is something new so much as it is something forgotten in the sense that farmers traditionally clustered their dwellings and cultivated either communal lands and herds or individually owned plots or a combination of the two. See Angie Debo and Wes Jackson in Essential Reading.

APPENDIX D

STAGGERED TRUSS DESIGN

One example of steel braced-frame construction. As is related in this article, braced frames are gaining popularity among architects, builders, and owners for their suitability in seismically active locations and for the systematic reduction in building weight. The combined result is a structure that responds well to eccentric forces, goes up in a shorter period of time, and exacts a much lighter (30% reduction, or more) toll on the environment in terms of emissions generated during manufacture and erection.

The system also lends itself to adaptation and reconstitution thereby prolonging the utility half-life of the materials.

APPENDIX E

SLOTTED BOLT CONNECTIONS

The poor man's alternative to expensive, manufactured "un-bonded" connections for braced-frame construction, this technique for seismic design also lends itself to site-assembled trusses suitable for circumstances offering surpluses of manual labor.

APPENDIX F

BALED STRAW CONSTRUCTION

An internet treatise on the efficacy of baled-straw building systems.

Much has been written and claimed about baled-straw systems, but most of that has centered around the industrial-scaled bale. This thesis proposes the employment of smaller bales harvested from the barley, wheat, and rice crops common to the regions in which the sites are situated. The smaller bales are more appropriate to the fractionated agricultural landscape of China, reduce the high tare square footage associated with the industrial-scale bales, and are more appropriate to placement in multistory structures. See the Practicum images for the Tab Tape/Braced Frame innovation for placement and securing.

APPENDIX G

PHOTOVOLTAICS

Significant advances have been made within the last five years in the productivity of photovoltaic panels as well as in manufacturing processes. Conversion of sunlight reaching the panels surpasses 15% and the energy embodied during manufacture has been reduced to such that it is recouped through three to five years' power generation leaving as many as forty years' productive half-life on the plus side of the cost-benefit equation. Thin-film panels laser etched to pass 5% sunlight are specified in each of the applications here thereby offering some solar gain and day-lighting in addition to power generation.

Generally speaking the rationale for PVs is rooted in the efficacy of dispersed production. Large-scale centralized production, whether hydroelectric or coal-fired, lays the system open to significant energy losses through transmission and energy squandered (as much as 70%) in the form of heat. The efficiencies of co-generation are compromised by transmission losses. And the wholesale degradation or destruction of habitat associated with hydroelectric generation is a cost calculable only on an imponderable level.

The grid-tied aspect of this component has as much to do with community issues as it does with environmental. Stand-alone PV installations require large arrays of batteries that easily eclipse the environmental efficacy of the PV panels with increased tare square footage, maintenance, and the dissemination of toxic pollutants. Stand-alone systems usually lead to imbalances between production and consumption with resulting hardship or waste. Moreover, the idea of stand alone systems is inimical to that of a commonly held future. Our ability to survive *alone* is not the issue. Our ability to survive *together* is.

Both applications here have electrical power available on site.

APPENDIX H

CONSUMPTION GROWTH

The complete text of the Alternatives to Growth Oregon treatise on the profligacy of consumption in the U.S.

Apropos of the claim made here that common title to the future is the only definition of “sustainable” that seems reasonable, let alone computes, one essential element to making that shift in the U.S. is an understanding that consumption here must assume levels in tune with the rest of the world. It is not enough to ensure the future of the child living in a suburban neighborhood of El Paso; the future of the child living across the Rio Grande in one of the *favelas* thrown up last week in Juarez must become a part of the equation. Otherwise the math continues to defy logic.

APPENDIX I

THE TIMBER INDUSTRY IN NORTHERN MEXICO

An exhaustive examination of Mexican forestry practices and politics by María Teresa Guerrero, Cyrus Reed, and Brandon Vegter, with George Kourous prepared and published by de los Derechos Humanos, A.C., Chihuahua City, Chihuahua, México and the Texas Center for Policy Studies, Austin, Texas, July, 2000.

Excerpted transcriptions of a National Radio Project broadcast and a Common Ground Radio broadcast featuring Kent Patterson's reports on the predations of U.S. corporations and other unsavory elements in the forests held in common by the *edijos* of the Sierra Madre. This documents the very real implications of consumption in the U.S. Sustainability is no longer (probably never has been) a benign question of maintaining lifestyle, but rather is associated with immediate life and death issues that cast the debate into the realms of morality and economic, social, and criminal justice.