

Fusing Concept with Practice: Sirius Community, a Model for Restoration

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This paper was selected as a finalist in the National Ideas Competition on Sustainable Strategies hosted by the American Institute of Architects in the summer and fall of 1993. This paper is also a synopsis of a more complete 50 page case study (by the author) on the Sirius Community published as part of an anthology of case studies entitled Sustainable Strategies, edited by the Consortium for Regional Sustainability at Tufts University's Center for Environmental Management in November 1993, with a grant from the Environmental Protection Agency.

As we approach the end of this millennium humanity is waking to the reality that our natural and built environments are not in healthy states. Simultaneously, a search for pathways to a sustainable future is reaching into every aspect of the design and building process. We are in need of a comprehensive re-education to understand how our buildings and cities can serve this planet Gaia in ways that create lasting community for all life forms.

The focus of this paper is threefold; first to provide the basis of a working model or matrix for sustainability/restoration that is at once comprehensive and user friendly. Secondly, to illustrate how this matrix can be applied to an educational process for architectural students and working professionals, in the schools and in the larger world of developing community scaled sustainability projects. Finally, we will investigate a specific Community Center building in terms of the matrix, the process within the community, and the Center's effectiveness in providing solutions and direction for the millennium we are about to enter.

Developing a Matrix

Looking at the planet as a cell, we accept that all energy ultimately come from the sun. What follows is a three fold system of stored energy in planetary sources, use and development of those sources by living systems and colonies, and byproducts of the systems in the form of planetary sinks. From here they go out to either pollute or restock those sources. Onto this threefold system we can overlay three other well-known concepts that we are born, we live, and that someday we all die and have our energy passed into another form. By equating primary energy and this solar source with birth, development and making connections with life and movement, and outflows/recycling with death and rebirth (as soil is created from dead matter), we can begin to see human and planetary processes working with a similar three fold pattern.

Throughout history our ancestors from a variety of cultures including Greek, Celtic and Native American have developed symbols, mandalas and medicine wheels to identify

a fourfold quality of our planet Gaia in the forms of fire, air, earth, and water. From our days in nursery school we learn that each day we need to find shelter and a hearth for fire (50* to 95* F), breathe the air (on the average of 33 lb./day), eat some food (5.5 lb./day), and drink some water (3.3 lb./day). Here again one can see how we mirror the planet (our extended body) in our need to stay connected with the consistent qualities of this four fold system.

Considering the three-fold process as a linear spine and the four-fold system as a field around it, we select the lemniscate or figure 8 pattern to serve as a linking or weaving device to knit these three and four fold processes together (see figure 1a). Well known as the sign for infinity, the mark of the magician, the lemniscate is also the cross section of the torus, regarded by many physicists as the primary form in the universe. When a water droplet hits the surface of a pond, a torus or donut form of water results. The morphology of the lemniscate is reflected constantly in the natural movement of currents of all kinds of phenomena whether they be waves of sand and water, cloud formations, river meanders, animal horns, tree trunks, rock formations or the licking flames in a fire. This matrix incorporates these natural flow systems with the essential components of a sustainable life process and can therefore be used as a comprehensive guide in addressing the development of sustainable projects of any scale.

While population is exponentially increasing and planetary resources are reaching their limits, we in the developed world, who consume a very disproportionate percentage of these sources are reassessing what makes up our collective dream. The isolation, environmental degradation and economic disparity resulting from our mad rush for material success is now peaking. There is a movement towards striking a balance of our spiritual, mental, physical, and emotional capacities as human beings and with it a growing understanding that our built environment and architecture must also respond to and reinforce the balanced integration of these four qualities on a regular basis. Associations of fire to the spiritual realm, air to the processes of mind, earth to the processes of the body, and water to the emotional realm is one traditional model found in teachings going back to the studies of Plato and Pythagoras.

The genius loci that Vincent Scully describes in the Greek tradition of siting ancient temples wasn't some sort of afterthought to appease the Gods, but a fundamental determining factor in laying out the design from the beginning. Finding ways of incorporating the tools of symbolic geometry that energize all traditional temple architecture and engage them as crystals in the landscape must be part of our sustainable process as well, to provide for the present without compromising the needs of future generations. We are finding that as modern architects, our vast cultural and educational inheritance has in fact been compromised, so that we need to revive and reclaim tools that have been buried, in some cases for centuries.

We also need to respond to the emotional needs of people who desperately need to have a connection with the spaces they live and work in. Designing sustainably is also about preserving and incorporating craft and art and the beauty of materials, color and

texture as well as geometries that give a sense of organic life to a building. All of these qualities touch our emotions on a daily basis as we open up and sense architecture as our third skin, and as it in turn opens up to the more subtle vibrations of the earth itself.

As we interact with the planet, so we must respond in a balanced way to all of our own inner and outer needs. Another layer to this model of sustainability is the political, economic, ecological and social issues that we all work with in society. As a continuous pathway, people have traditionally received a *vision* (through spirit) or inspiration that leads directly to a statement of purpose, a means of empowering that vision and establishing *practical wisdom* or politic. In architecture this is the intuitive spark that leads to a seed or partie diagram. In turn it leads to a plan of action (through the mind) that incorporates a series of reasonable alternatives/opportunities and limitations, gleaned through *education* and with respect to time and resources or *economics*.

The resulting physical reality or built environment is then put through the tests of *practice* in the real world with all the issues related to ecological *integrity* (through the body of Gaia, and/or our bodies themselves). The fourth stage is the societal response to the action or practice results in *growth and social evolution and quality of life issues* (response evidenced through the heart) which leads one back to either reinforcing the original vision and/or making adjustments to it.

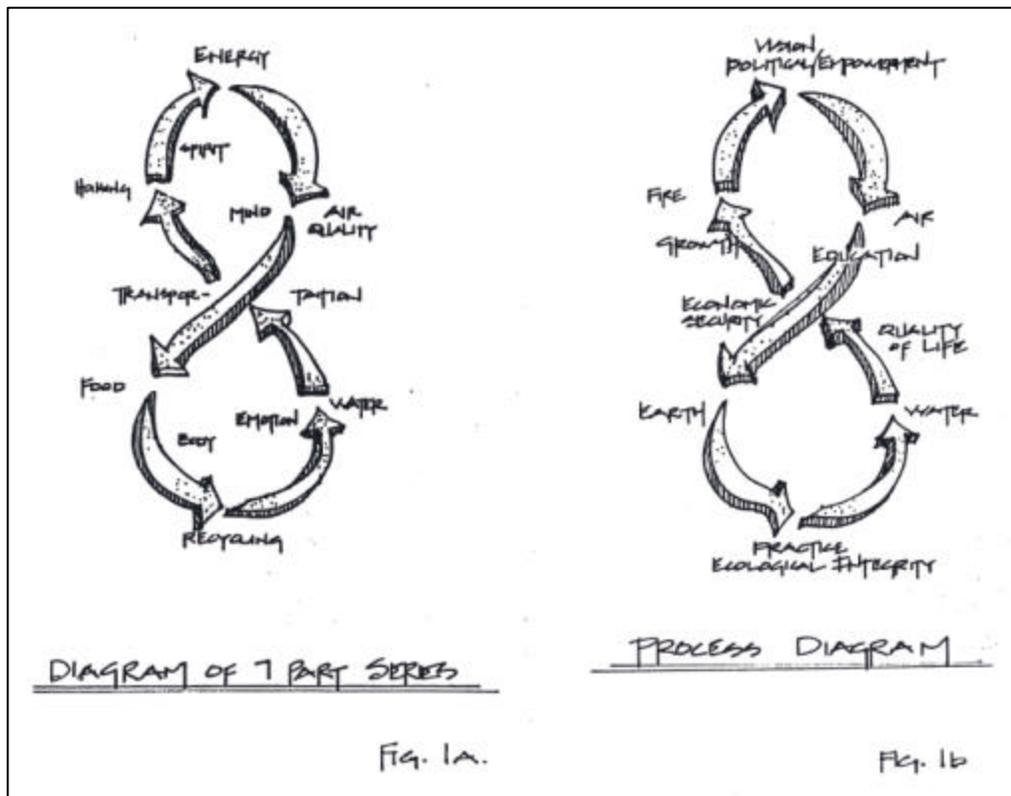


Fig. 1a.

Fig. 1b

There is a special interwoven relationship between the following seven foundations: energy, air quality/open space, transportation/communication, food production, recycling, water management and housing/community/hearth issues and the four characteristics or processes (described above). The characteristics might be viewed more as processes or bridges from one sphere to the next, such that vision/empowerment takes us from the realm of the spirit to that of the mind, or economics/education takes one from the realm of the mind to the body. The important point is that we have established multiplicity in unity with these seven foundation points. They can be seen to work as one living process to view a person, building or a planet with a variety of lens or layers we might choose to provide further focus.

Developing a Curricula in Sustainability:

I have been teaching and further refining a Survey Course on Regional Sustainability at the Boston Architectural Center and Wentworth Institute of Technology in Boston. Using the above mentioned matrix as a base structure, we have explored the emerging technological solutions being developed and their implementation in Architectural design and form. The goal of the course is to: 1) provide the student with a working knowledge of the present health of our natural environment; 2), illustrate how our built environment in the modern world is adversely affecting these systems; and 3), specifically address

What we can do to reverse this process of ecological decay. Specifically we focus on how currently available sustainable technologies can be adapted holistically into the design and planning process, with particular emphasis on New England and the Northeast of the US.

In the 15 week course, we spend two weeks on each of the seven areas engaging the class in readings, technical rules of thumb, and lecture and discussion with a variety of invited experts who are actively pursuing one of these aspect of sustainable process in their own work. Students are then required to apply these alternative technologies in a case study of their choice. I have also been teaching design studios with other colleagues at the third and fourth year levels at the Center, oriented to sustainable community programs. The survey course has been particularly useful as a source to these students. One of the tools we have found most exciting in the studios is organizing the program such that group process is at the heart of the major design decisions that need to be made. While each student is required to design a building of his or her own, he or she must learn to integrate their ideas and coordinate a number of decisions within a team situation that address these seven specific areas of study.

I have been involved with another form of sustainable research as one of a team of seven case studies brought together by the Consortium on Regional Sustainability at Tufts University's School of Environmental Management. Working with a grant from the Environmental Protection Agency (EPA), the Consortium set out to determine what

in fact constitutes a sustainable community. Through literature reviews and interviews with other specialists we developed a matrix that could be applied to the different projects that ranged in scale from an individual house to a city of 90,000 people, from remote areas to the metropolis.

The four characteristics that emerged in this process were empowerment and responsibility, economic security, ecological integrity and quality of life. The final document to be completed this fall is one of the first of its kind, in that it focuses on this process of engaging theory with practice in isolating sustainable solutions. The following is a summary of my case study that focused on Sirius Community and the process of developing their new Community Center.

Integrating Sustainable Practice in a Community Center:

Sirius Community, founded in 1978 in the hills of central Massachusetts just west of the Quabbin reservoir in the town of Shutesbury, is an Eco-village of twenty-four adults and 15 children. Since 1986 the community has been building a combined Conference Center and Housing Project which when fully operational (by 1995) promises to be a busy hub in the region. The 12,000 square foot multi-purpose structure will serve as a center for a myriad of activities from conferences, workshops, seminars and lectures, drama, dances, concerts and regional gatherings. The unique building, a central octagon that contains dining, conference and other community spaces connects two flanking wings dedicated primarily to housing for members and visitors.

The first purpose or intention of the community is to serve as a place of positive vision and hope for the future, such that its' committees in their administrative and political action work towards this intention/goal. As a second intention the Eco-village has focused on becoming an educational center, which includes developing businesses that incorporate these studies. These combined concerns of business and education are the basis of what is defined as economic security in a sustainable community. The wide range of practical skills that are so readily accessible through the community assures that the community is indispensable and ultimately critical to the growth and development of the local and regional economies.

The third purpose of the community was to demonstrate ways of living that are more ecologically in harmony with the earth. This is the work clearly relegated to the building and landscape design professions. The fourth and final intention of the community is to create a demonstration center for a community way of life that integrates respect for the individual process of growth. This socialization process of weaving individual to cooperative group living is the fourth and final key that insures balanced lifestyles and positive growth.

These are essentially the four qualities of the matrix outlined in the first part of this paper. The fact that the Community's stated purposes are coincident with the characteristics of the consortium is helpful for two reasons. First, it reinforces both the

work of Sirius and the Consortium in drawing out the central patterns of sustainable community. Secondly, we can view the new Community Center as a product of that process and as a microcosm that has these integrated intentions behind the plan of action.

Using the matrix of the seven foundation points outlined above, the following is a summary of the EPA study of the Eco-village, as an organic system of inputs and outputs. The actions have already been taken or are in the process of happening. The notion of living lightly on the land is at the heart of all these decisions. As a demonstration center, ultimately there may be messages and connections that the majority of American dwellers can incorporate back to the city where 80% of this country resides.

I. Energy:

The community strives to integrate renewable energy including passive and active solar, wind and wood harvested on the land with the use of cleaner burning back-up gas water heaters. The following list outlines the relationship of these inputs for the community center where the attempts to integrate these actions has been sharply focused.

Passive Solar through glass, mass/rock storage and air convection provides 30% of all Community Center heating and 20% community wide. Active Solar hot water provides 15% of all hot water to the building and wiring is in place for Photovoltaics. Super-insulation of all of the buildings in the community also accounts for a 50% reduction in heating costs from the original farm buildings renovated on the site. Electrical use for the Community Center in full operation is being projected to consume about 2,000 KW hours of power from the grid a month, w @ 10¢ a kilowatt hour works out to \$200.00 a month. Installing compact florescent lamps in all of the fixtures in the building has reduced the demand for lighting by roughly 70%.

The donated windmill, a 10 KW Jacob's windmill to be installed at 60% efficiency (for 335 hours a month, roughly eleven hours a day) could provide all of the electrical needs of the building, particularly if complimented with photo voltaic power. Propane usage which is burned for hot water, some space heating and all cooking is projected for the entire building to be roughly 150 gallons a month, which at \$1.20 a gallon comes to about \$180 a month. Efficient wood stoves provide 65% of space heating needs in the building (adding to passive solar fraction of 30%) and is projected at 15 cords for the entire building, sustainably harvested at two cords or less per acre/year from the 93 acres. The entire community burns 35 cords a year in 70% efficient stoves to heat 26,000 square feet of community buildings, resulting in total average energy budgets (passive solar included) of 31,893 BTUs/s.f./year for these new and retrofitted buildings. Residual ash from the stoves is added to the garden as a source of pot-ash.

II. Air Quality:

There are a number of positive actions that the community has taken with regard to air quality. By bringing down the energy needs of the community buildings to 15 cords of wood, a locally produced renewable resource being efficiently burned, and a few thousand gallons of clean burning gas, the Community is doing its part in reducing pollution from buildings.

A number of actions have been taken including fresh air supply to all wood and gas stoves through direct vents, operable windows provided in all rooms, through wall hand operable vents in closets, indoor smoking prohibited, and passive air cooling with mass, siting and vegetation incorporated in most buildings. In addition an 85 % reduction in toxic building materials and finishes from conventional new construction has been achieved which accounts for approximately 70% of the community buildings. This is achieved by using alternatives to most formaldehyde products in wood, insulation, and VOC's from finishes and paints. Safer health of construction workers is also assured by using non-toxic materials and finishes during construction. Environmental reduction in air quality from trucks by using local timber (90% of timber comes from within 10 miles in new buildings) results in a 20 mile instead of a 6,000 mile round trip for transport. Much of the Northwest supply is currently stocking Eastern lumber yards.

III. Transportation/Circulation/Communication:

The community is a hub of activity, as an educational center, as a demonstration center and as a retreat center for the local and regional areas. The site is also being revived as a meeting place to honor the local mythology of three Native American tribes that used to meet and hold ritual on the site. Archeo-astronomical research by the New England Antiquities Research Association has documented a number of hearthstones and related stone chambers that are safely integrated into the sacred pathways and retreat cabin maintained by community members on the site. The Eco-village sits on property that is one of the highest points geographically within a hundred square miles.

The number of vehicles on the site for the full-time residents number about 25, with another 30 vehicles coming in weekly with visitors, students, and trainees. When the community center is complete it is projected that there will be about 200 visitors each week. Car Pooling and bussing programs are being studied as alternatives to building extended new parking when the Community Center is in full operation.

Walking paths between buildings are well maintained creating a center network that minimizes car and truck travel on the site. No building on the site is more than a seven-minute walk from the community center, while the sense of being surrounded by the forest is ever present. Eighty percent of community members work off the site and the average commute is at least 300 miles a week per car with an average of 1.5

passengers, which ultimately contributes to the global air quality issues. This is a real issue for community members and perhaps the hardest criticism of rural Eco-village projects, as well as an issue that our whole culture must face together.

IV. Food and Agricultural Production :

At present, 20 % of the community is actively participating with the growing of food in the community gardens . A new 1500 sf greenhouse is being added this year to the community located in a freshly cleared area to the southwest of the community center, and another 700 square feet of greenhouse will be being added to the community center for starter plants and year round growing. A new root cellar and bulk storage facility have also been designed into the new community center building that will help expand the existing Food Coop operating for the community and surrounding area. The cost of being a member of the Coop is \$20.00 a month for individuals and \$45.00 per family. This fee covers all the grains, beans, oils, dried fruits and other goods such as pasta, honey, herbs, and salt one can use.

Organic raised beds intensive is the standard agricultural methodology being used in the community.

Nitrogen fixing shrubs are planted as companions to the orchard where urine separated from the composting toilets and composted with leaves is deposited. Other simple and elegant solutions are the placement of a toad pond in the center of the vegetable garden to balance the bug population, or chickens being set free to run around in the orchard where they help in the fertilization process. The concept of multiplicity is evident here in this constant process of locating and following the looped pathways of nature. Another aspect so important to the agriculture and gardens at Sirius is the time and energy all community members spend in honoring the spiritual presence in all the plant kingdoms. This study of permaculture gardening has a rich history and renowned achievements developed in a number of communities around the world.

As a registered Community Supported Agricultural business (CSA) which operates on three different sites in the surrounding area, Sirius employs community members to help plant, tend and harvest these various farm plots owned by other individuals who benefit as well. A primary element in the new community center is the commercial kitchen and community bakery that will provide meals for as many as 130 at a time for those attending conferences and various events taking place in the center. The bakery is also seen as an income source as well as a potential catering business. Access with a dumb waiter to the root cellar and bulk storage were primary determinants in the design of the facility. The co-housing style meals are prepared by all community members on a rotation basis and scheduled five evenings per week. There are a number of advantages to this system that provides for time and fuel savings as well as the opportunity to get out and an opportunity to catch up with one's neighbors. It is a voluntary system, so that one's pays for as much as one eats. For \$20 a month, members

get five meals a week and are responsible for supplying and preparing one to two meals a month.

V. Recycling:

There is a staff member who coordinates all of the recycling that individual members are responsible for, with a chart and a schedule. All paper that can be recycled is and the rest is composted. All bottles, cans and other plastic materials are bundled and shipped into redemption and recycling centers. All organic material from kitchen and other household chores are recycled in the community composting bins located adjacent to the community garden. Human wastes are primarily handled by septic systems with the exception of the Community Center and the Long House, for staff and woodworking shop. In these two buildings, the septic fields were down sized 40% due to the reduction in waste-water flow due to the installation of composting toilets, serviced once every two years. Urine is separated off and stored in tanks where it is periodically applied to rotting leaves and used as compost on the Orchard. A chicken coop is also located on the site where food scraps are fed daily to the birds.

Most of the furniture, fabrics and kitchen wear of the community comes from recycled stores and supply houses. With respect to furniture and fixtures, this provides for a great deal of the home-like quality of the community spaces. Much of the commercial kitchen fixtures were also donated to the community. Recycled materials used in the construction of the new and renovated building includes 20% of the hardwood timbers from old barns. Fifteen percent of all of the windows in these buildings were free, recycled from community building company projects, and retrofitted with weather-stripping notched into the window frames as part of the rehabilitation process. Many fixtures and appliances including wind and solar equipment are repaired and recycled second hand into the building. Blown in cellulose insulation made from recycled low toxicity newspapers accounts for all of the insulation in the buildings.

VI. Water Management:

The water for the community comes from a number of wells, established through dowsing by community members, all located uphill from the building or groups of buildings that they supply. The quality of the water has been good, each coming from an average of 200-250 feet in depth. A pond was created for swimming and for helping drain a portion of the site that was very wet and prone to attracting mosquitoes. The pond doubles as a skating pond in the winter and as a plunge pool for the Native American Sweat lodge.

Other full time conservation techniques include the installation of low flow shower heads, and faucet aerators. With these savings, the benefits of community dish washing, the water savings of the composting toilets of 400 gallons per week and other

miscellaneous uses, it is estimated that the community saves about half of their monthly use or 30 gallons versus 60 gallons/ person/ day. All of the major buildings on the site are equipped with typical septic systems which are never under any great stress due to all the water conservation measures listed above. During the past dry spell of 1993, one of the 20,000 gallon septic systems that receives nothing but non polluted gray water was drained to water the Orchard down grade. The late summer months are the driest time of year at which time community members and guests are encouraged to take fewer showers and toilet flushing is minimized. However, due to conservation measures taken in the past few years, the water shortages in the summer months has been reduced.

Future plans include an idea to dig a few more ponds and to fill them with reeds and marshes that can be used to help clean gray water discharge from the buildings as well as provide a variety of plant, fish and animal life. As the site moves downhill at a reasonable grade, there is the possibility of tapping into a spring at the top of the hill through dowsing and developing a stream that could move from pond to pond. The natural aeration that this would provide could be augmented by the use of flow forms in between ponds over the course of the flow. Future plans to recycle roof water off the community center octagonal roof into a cistern below with some solar exposure for passive heat storage would be another potential source for back up supply.

VII. Housing / Community:

The 12,000 square foot Community Center building sits at the center of the site and currently serves as a home for 10 members as well as part-time guest quarters for up to 18 visitors in the 4,500 square feet of the housing wings. These spaces are accessible to the community areas but also maintain privacy. While two of these floors are set aside for single family occupancy, two floors are arranged for single occupancy with generous common areas. The other 8,000 square feet are allocated to community kitchen, dining, bulk storage, greenhouse, day-care/children's room, office and assembly/conference space (see fig. #2).

The construction of the new Community Center has cost \$303,500 over the last six years. This includes all of the direct costs related to materials and labor. Sirius was also able to attract a number of talented design professionals to design the building with Bruce Davidson, the director and builder of the project from the early planning stages. These people include the author of this paper, architect Henry MacLean, structural engineer Bob Jennings, timber framer and joiner Andy Inganni and designer Alex Morse. Countless others in the Community as well as friends and visitors have also contributed to this dynamic synthesis.

With 3.5 apprentices working 35 hours a week for the past six years, the community has saved \$290,000 in labor costs on the building alone, paying \$2.00/hr equivalent in board and room in exchange for an education in sustainable building or farming

education. Another \$80,000 in construction funding is now being sought to complete the community spaces and associated landscaping which will bring the final costs up to roughly \$383,500, resulting in a square foot cost of \$31.96. This is a staggering figure to anyone doing building today, particularly with the level of craftsmanship involved in every aspect of this project.

Over its' first five years rent payments from community members and guest department receipts in the building total \$91,400. Once the main community spaces are complete it is expected that they will bring in another \$10,000 to \$15,000 a year (a waiting list for rental of the spaces is already filling up), bringing the total income of the building to roughly \$27,000 per year (or \$2.25 per square foot). Factoring in the cost of the building to date and the operations and maintenance costs of \$3,000 per year, the building should pay for itself by 2005. Starting in the early 21st century, the building will actually be a source of positive cash flow with respect to life cycle economics.

Conclusion:

For these people at Sirius, it is not simply a question of return on investment. They have come to do this work as they believe that there is in fact no other way for our civilization to go, and someone has to just start doing it. As Al Gore reminds us in his book Earth in The Balance; "The real solution will be found in reinventing and finally healing the relationship between civilization and the earth. ...The transformation will of course involve new technologies, but the key changes will involve new ways of thinking about the relationship itself." This is a process of sharing that goes beyond the word to fully integrate body, heart and spirit in the process as well. The building of a Community Center is only one piece of the puzzle. The building needs its' community of committed individuals and the development of the entire site to really operate in a sustainable fashion.

Finding the means of translating gifts into and back out from the urban matrix is a big part of our mission. Coming to terms with the power of place and the subtle energy fields of the planet will be instrumental in this process, listening as one would to the subtle emotional fields of a friend or relative. Developing the skills to look inward and outward with equal grace and attention is part of this business of truly living sustainably and insuring quality in one's life. Community that is healthy is an essential component of this process, which leads us on to new cycles of creating visions, new tools to disseminate and practice the visions, and the ability to sustain the new growth.