International Journal of Architecture and Urban Development
Vol. 2, No 4, Autumn 2012

Eco-Village and Climatic Design

Marzieh Ghasemi Eshtaftaki

M.A. student, Islamic Azad University, Qazvin Science and Reaserch Branch, Qazvin,Iran

Received 09.04 .2012; Accepted 23 .07 .2012

ABSTRACT: Eco village design is a new field of knowledge still under development. It will be the physical manifestation of the unfolding of the ecovillage dream held by so many. It is generally agreed that concept of sustainability should play an increasing role in future urban development world-wide. In order to ensure ecological sustainability, cities around the world have to decrease their environmental footprint. In this article, will try to find some principles of designing eco-villages in Iran that have less environmental footprint. Two aspects are important in this regard: the decrease of energy consumption and the decrease of waste products and its subsequent management. The concept of eco-village, despite having arguably limited influence, does have the potential to serve as an alternative urban model. As relatively small experimental communities, eco-villages are in the position to explore and apply novel solutions, the necessity of which is evident in the global concern for sustainability. Valuable practical lessons can be provided in the current for suitable urban development. In this article, some eco-villages around the world have been compared with each other and will suggested some solutions for designing eco-villages in Iran.

Keywords: *Eco-village, Sustainability, Permaculture, Co-housing, Iran.*

INTRODUCTION

Possibilities for the future of human settlements basically point to two competing alternatives: The first is that the status quo is continued indefinitely, with continued dependence on non-renewable natural resources. The second is a concerted change in creating more efficient land-use and consumer patterns so as to render the available resources more sustainable. The limits to growth case has been well-developed over the years and it is realized that large scale global changes are necessary to counteract the process of diminishing natural resources (Birkeland, 2002,34).

Trainer points out a number of implications for sustainable settlement design (Ibid,5). It is emphasized that not only are physical changes required, but to accomplish this, social systems should be developed in which a satisfactory quality of life can be achieved at much lower levels of resource consumption than at present lifestyles would have to be simpler; a high level of economic self-sufficiency should be sought (at national as well as at local levels); and more cooperative ways of working and sharing of resources should be explored.

In this assignment eco-villages are examined as a relatively new pattern of development. Trainer describes this global movement as an innovative type of development. Taking place at community and village level. A primary motivation for this is a spirit of self-reliance in which groups have decided to take charge of their own development. Eco-villages are based on an approach where the available technology is used to assist in environmentally-friendly practices.

Eco-villages by striving for lifestyles which can be continued indefinitely, are living models of sustainability, and illustrate how action can be taken immediately. They represent an effective and practical way in which to combat the degradation of the social and ecological environment.

Corresponding Author Email: *marzi.1989@yahoo.com*

MATERIALS AND METHODS

Defining Eco-Village

Eco-village are described by the Global Eco village Movement (2005) as Urban or rural communities of people, who strive to integrate a supportive social environment with a low impact way of life. To achieve this, they integrate various aspects of ecological design, permaculture, ecological building, green production, alternative energy and community building practices.

Eco-village are created as a response to the environmental and social problems of our times (Irrgang,2005,27). Kennedy (2004) suggests that the motivation for eco-village is the need to reverse the gradual disintegration of supportive social and cultural structures and the upsurge of destructive environmental practices on our planet (Ibid; Kennedy,2004,5).

Crow and Allan (1994) Refer to the complexities in the creation of community life. They point out that traditional communities have evolved through a gradual process. Intentional settlement might therefore encounter novel problems in their quest for a like minded society. In their view the endeavour to create communities is hampered by the perception of community life as natural and therefore antithetical to planed intervention (Ardzijauskaite,2009,14; Crow and Allan,1994,8).

Eco-village can be summarized as intentional communities striving to create cooperative lifestyles in harmony with their local environments (Living Routes Consortium 2005). Eco-villages world-wide are developing and refining social and ecological tools such as consensus decision making, inter-generational care, alternative economic models, whole systems design, permaculture practices (Irrgang,2005,28).

Robert Gilman (1991,10) of the context institute defines an eco-village as a human scale, full-featured settlement that harmlessly integrates human activities into the natural world, supports healthy human development and can be successfully continued into the indefinite future (Atkisson,2005,16).

Emergence of Eco-Villages

Emergence of eco-villages were founded before the term itself came into existence. These according to the Global Ecovillage Network (2005),include Findhorn in Scotland, Auroville in Burkina fasso. Such environmentally-aware communities developed in isolation without the guidance of an organized movement (Irrgang, 2005,20; Jackson a, 2004,1-6). Kennedy 2004 mentions that , while the term eco-village is relatively new, communities described by that term have been around for much longer. Examples of Steinerian communities, like Solheimer in Iceland and Jarna in Sweden that emerged in the late 1920 and early 1930s.The concept of communal living continued to evolve through the Danish co-housing movement (Ardzijauskaite,2009,15; Irrgang,2005,20).

In 1991 the Gaia Trust commissioned a survey of the best examples of eco-villages globally. The study performed by Robert and Diane Gilman, found that despite many variations of sustainable communities ,the full-scale ideal eco-village did not yet exist(Irrgang,2005,20; Suzuki and Dastur,2009,13-27).

Following the Gilmans report, representatives from some of the communities and other people with a global social interest, met in Denmark in 1991 to discuss a strategy for developing spreading the eco-village concept (Irrgang,2005,21; Jackson, 2004,1-6).

Denmark because of its experience with other alternative housing arrangements, emerged as a leader in the development of eco-villages. In 1993 the Gaia Trust brought together a number of established and emerging eco-villages as the Danish association of sustainable communities (Ibid).

The first eco-villages and sustainable communities conference was held in Scotland in 1994. By this stage, Eco-villages have been formed on all five continents. The global eco-village strategy was finalized at a second meeting in Denmark in 1994.The global Ecovillage Network was informally initiated with a secretariat in Denmark funded by the Gaia Trust (Ibid).

Findhorn in Scotland: Findhorn was built before that the word eco-village came into the existence (Fig.1).

Findhorn Eco-village was started in 1962.It is situated in the Findhorn Bay of Moray in Scotland. In 2007 it had the lowest recorded ecological footprint of any community in the industrialized world. Consist of 61 ecological buildings and 4 wind turbines and a biological Living Machine sewage treatment system (Dawson, 2006; Eisenstein, 2001,1-5).

Findhorn Uses of passive solar features where possible through orientation and window layout(Fig.2). This Eco-village Uses of solar panels for domestic hot water heating. A district heating system using a gas condensing boiler for highest fuel efficiency. There is Super-efficient insulation in Findhorn (U-values of 0.2 watts/m2C in roof, walls and floors) (Dawson,2006).

Using Low-energy light bulbs throughout, Triple glazing (U=1.65 watts/m2 C),Cellulose insulation (made from recycled paper),Non-toxic organic paints and wood preservatives throughout are common in Findhorn (Ibid) (Fig.3).

Another things about Findhorn: Isolating electrical circuits to reduce electromagnetic field stress. Water conservation (showers, low-flush toilets and self-closing taps). Collection and recycling of rainwater for garden use. Shared facilities (laundry, kitchens, lounges) avoiding unnecessary duplication. Simple timber frame construction and detailing, suitable for self building (Ibid).

Sarvodaya in Sri Lanka: Sarvodaya in Sri Lanka is another eco-village that was built before that the word eco-village came into the existence (Fig.4).

Sarvodaya designed and introduced for 55 poor tsunami affected families. It was started in2006. A feature of this

Fig.1:One house in Findhorn Evo-village
(Source: www.findhorn.org/ecovillage).

Fig.2: Type of windows in Findhorn eco-village
(Source: www.findhorn.org/ecovillage)

Fig.3: Some buildings in Findhorn Eco-village
(Source: www.findhorn.org/ecovillage)

resettlement is its focus on ecological and sustainability. The total population will settle down in the eco-village is 245. Each home has a battery that stores power from a small roof-mounted solar panel. The only appliances for most houses are normally only lights, a radio or television (Irrgang, 2005; Jackson, 2004,1-8).

Use of renewable energy sources and Composting of organic waste are available in this eco-village (Fig.6). And in this ecovillage Roof top capture of rain water will contribute to production of fruit and vegetables (Fig.5) (Irrgang, 2005, Jackson, 2004,1-8).

Permaculture Design

Many ecologically oriented ecovillages have started from the perspective of developing low impact lifestyles. They want to reduce the "ecological footprint" by as much as 80% (Jackson b,2004,1-8).

Permaculture design has been their primary method of choice. It was initiated 30 years ago by Bill Mollison, and carrid on by David Holmgren, Max Lindegger Declan Kennedy and thousands of other permaculture desigers all over the world. It is based in the values of "care of the earth and of people". It has mainly been developed as seen from the perspective of the single-family dwelling and how houses were best integrated in nature. Zoning is done from here. Attention to watersheds and following the contours and slopes of the landscape is a distinctive characteristic of permaculture design. It also includes the placement of houses according to the four directions, exposure to wind and sun, frequency of rainfall, creating microclimates, capacity to retain water etc. Dams may be built to retain water on its way to the ocean-for irrigation, swimming, microclimates and beauty. The placement and architecture of houses are based on these observations and follow ecological building principles. Infrastucture is also finding new expressions (Ibid).

The same considerations are used for the placement and methods of food production activities, renewable energy production, wastewater treatment facilities, recycling of waste, compost toilets and green businesses. Restoration of natural habitats and diversity of nature are guiding principles, as is the now classic concept of permaculture zones.

An effctive and practical design method of having several layers of design creates a whole new understanding of the posibilities of designing human settlements in harmony with nature. Crysal Water Permaculture Village in Australia and Earthhavenin NorthCarolina are examples of ecologically inspired ecovillages based on permaculture (Ibid).

Earthaven: Earthaven is 320 acrs in the North Carolina blue ridge mountain near Asheville.It started in the early 1990s.The soil is a well draining sand/clay mixture. The neighborhoods near the entrance and center will be more densely populated than the neighborhoods at the tops of the ridges. Buildings are generally built on slopes to save flat land for growing food. All buildings are built with south facing solar access. Most building are constructed largely of materials from the site. One of the largest buildings is made from recycled juice pallets (Vander Wal,2010).

The roads within Earthaven are gravel with bridges suitable for heavy trucks. Fourteen natural springs provide drinking water. There are filtered water stations strategically placed around the site. Hot water comes from solar water heaters. Electricity is generated by photovoltaic panels on the roof of each building and one small hydroelectric power plant that provides power to the central neighborhood (Fig.7). Toilets are composting and peeing in the woods is encouraged. There are small propane tanks used for cooking (Ibid).

The major mode of transportation within Earthaven is walking. There are several golf cars charged by solar panels on their roofs (Fig.8).The residents tend to drive small fuel efficient cars. There are several biodiesel fueled vehicles, but a lot of them just have gas engines (Ibid).

Crystal water: Another permaculture village is Crystal water. It is Located 100 km (62 mi) northeast of Brisbane, Crystal Waters Permaculture Village is a community of 83

Fig.4: Sarvodaya in Sri Lanka (Source: www.gen.ecovillage.org)

Fig.5: Capture of rain water in Sarvodaya (Source: www.gen.ecovillage.org)

Fig.6: The edge of town recycling station emptied monthly in Sarvodaya (Source: www.gen.ecovillage.org)

separate households united in their desire to live a more environmentally friendly life (Fig.9). Design process started in March 1985.Total land area is about 259 hectares (640acres) and Privately owned land is 14% approx,Co-op owned land is 6% approx and Common land is 80% approx. Population of crystal water is Approximately 230 people (Atkisson,2005). There is Solar house and communal kitchen at crystal water (Fig.10) and Bamboo is one of their businessin this eco-village (Ibid).

Co-Housings and Socially Motivated Ecovillages

Socially motivated communities like the Danish Co-housings have the social dimension as their major focus. Residential houses are built closely together along a street or around a common area (playgrounds, terraces) for easy communication among all inhabitants and for putting children's needs first. Typically the common house will be placed at the entrance or in the center of the design. Cars are always kept on the periphery.In socially motivated ecovillages, the houses are often subdivided into clusters to create more interaction and community within each cluster, each one typically having a common house. Clusters should not be too big, between 10 and 30 homes (Jackson b,2004).

Munksøgaard in Denmark: consists of 5 clusters of 20 homes each: one for seniors, one for youths and three family clusters (Fig.11). It now provides over 100 units for 240 residents. Of the family clusters one is owner built, one is a coop and one is rental based. In this way all social- and income groups of the Danish society can live together in quite similar looking houses (Loux,2011).

Waste Management in Munksogaard: The Munksøgaard community is able to process most of it's organic, biological, and water waste onsite,food scraps and other organic wastes are composted, urine is collected by separation toilets and used as an organic fertilizer, and waste water is treated by a biological sand filter.

This eco-village also has its own recycling center to manage excess waste output.

These local waste management practices help preserve the environment by reducing transportation trips and alleviating

Fig.7: Hydroelectric Power Plant in Earthaven (Source: www.permaculture.com)

Fig.8: Golf car with batteries charged by solar panels in Earthaven (Source: www.permaculture.com)

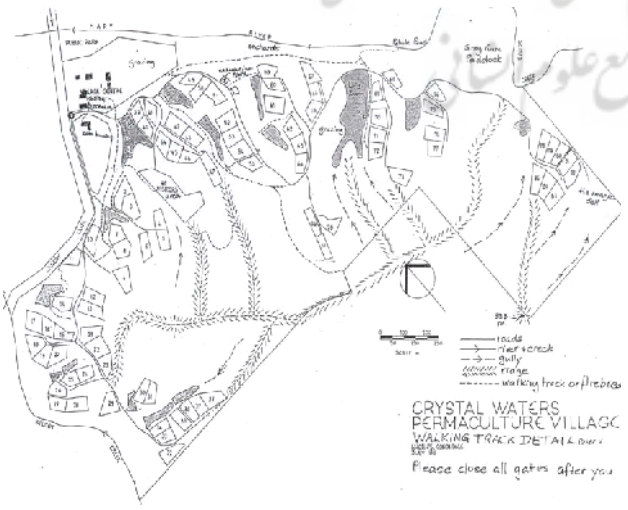

Fig.9: Crystal water permaculture village in Australia (Source: www.permaculture.com)

Fig.10: Solar house at crystal waters (Source: www.permaculture.com)

Fig.11: Site plan of Munksøgaard (Source: Loux,2011)

Fig.12: Use of green roof in Munksogaard (Source: Loux,2011)

pressure on existing waste treatment facilities (Ibid).

Building Materials in Munksogaard

Green Roofs: Green roofs can effectively treat and mitigate the effects of storm water runoff while providing a pleasing aesthetic for the community (Fig.12). Green roofs work to temporarily retain excess storm water. This type of water retention helps prevent flooding and avoid water contamination that may occur from an overwhelmed wastewater collection system. The vegetation on the roofs also help insulate buildings. Green roofs on several residential dwellings, storage units, and animal shelters (Ibid).

Shell Roofs: Munksøgaard is one of the first communities to experiment with using mussel-shells as a type of storm water management system(Fig.13). The shell roof functions similarly to a traditional green roof by absorbing and temporarily retaining excess water runoff. All of the mussel shells are collected from a local fishery.

Straw Insulation: This picture reveals the straw insulation that supports Munksøgaard's new community center.

Instead of using traditional energy-intensive materials, Munksøgaard is committed to integrating organic, low-tech building materials into its new development projects (Ibid).

Community Garden in Munksogaard: Each residential dwelling in Munksøgaard has the opportunity to cultivate its own fruits and vegetables onsite (Fig.14).

The elderly residents are responsible for maintaining a large garden located in the center of community. This cooperative gardening program provides local and organic food to residents while supporting an active, healthy lifestyle (Ibid). Car Share in Munksøgaard:

The Munksøgaard community has implemented a car sharing program that aims to promote alternative energy and reduce fossil fuel dependency.

The car fleet is comprised of hybrid vehicles with a new addition of a completely electric car.

Munksøgaard residents rely on bicycles as their primary mode of transportation within the community and also support public transportation by using the nearby railway station when traveling to other cities (Ibid).

Cultural/Spiritual Ecovillages

Some ecovillages have a cultural or spiritual impulse as their main focus. At Findhorn, the centrally placed Universal Hall can hold 500 people and is used for big celebrations, cultural performances, meditations and seminars. In

Fig.13: Use of mussel-shells in roofs of Munksogaard (Source: Loux,2011)

Fig.14: Gardens in Munksogaard (Source: Loux,2011)

Huehuecoyotl, Mexico, a theatre is the center of the village. Damanhur has the Temple of Humankind with eight decorated halls in the bowels of a mountain as their main attraction (for cultural and spiritual activities) (Ibid).

Auroville: In Auroville, India, a huge golden plated globe surrounded by twelve petals, known as Matrimandir, functions as their meditation hall(Fig.15). The City of Auroville is divided into four parts representing four different cultural aspects. In traditional villages there is often a central meeting place (a tree, a well) where villagers get together. Currently, approximately 2,160 people of 45 nationalities live in Auroville (Lefay,2005,39-42; Lindegger,2011,234-239).

A Greenbelt, "a zone for organic farms, dairies, orchards, forests, and wildlife areas", surrounds the other areas (Fig.16). It is 1.25 kilometers wide, and is to "act as a barrier against urban encroachment, provide a variety of habitats for wildlife, and serve as a source for food, timber, medicines etc. and as a place for recreation (Ibid).

Some Recent Important Examples

Sieben linden Eco-village

In former east Germany has been working very systematically with the siteplan With the help of local universities. Sieben Linden was founded in 1997 on 190 acres (77 hectares).13 square meters allowed for each person as private space. Currently 80 adults and 35 children live in large, multi-family dwellings in six distinct neighborhood groups (Dawson,2006).

Ecological Sustainability: Sieben Linden is doing all the right stuff ecologically. Electric power is from photovoltaic systems. Firewood from their forest supplies back-up wood heat (Fig.17).

Sieben Linden members eat nearly 100 percent organic food with relatively little animal products. Grow 70 percent of their vegetables in their gardens,irrigated with graywater.They use composting toilets (Dawson, 2006). They share cars and are advocates for more public transportation in the region. They uses draft horses instead of farm machinery (Ibid).

Innovative Aspects: Construction of the first three-storey building made of straw, timber and clay in Germany with full regulatory approval (Fig.18) (Strohpolis). The application of Vegan building construction methods (Strohpolis). Development of a model for sustainable living and building (Ibid).

Developed to explore practical solutions for creating a more sustainable lifestyle, the Sieben Linden Ecovillage aims to provide a model for a future way of life in which work, leisure, economy, ecology, urban and rural culture can find a balance. The project seeks to combine modern and traditional construction knowledge in the buildings that are developed on the site (Ibid).

Eco-village Living in Russia: Ecovillage 'Kovcheg' is located in the Kaluga region of Russia, 140 kilometres southwest of Moscow. A small warm house made of natural materials (wood, clay and straw) (Fig.19).

Furnace heating (using wood from neighbouring forest clearances). Water is from a spring or well in kovcheg.

Composting toilets and a traditional Russian sauna (Lazutin and Vatolin,2011,27-29). Currently more than 40 families

Fig.15: Peace Area of Auroville
(Source: www.auroville.org)

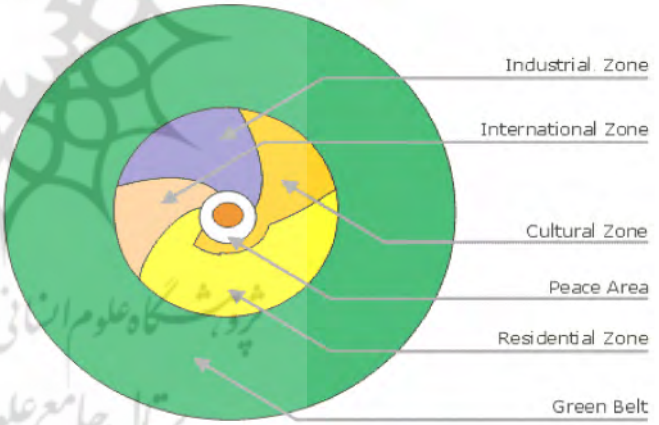

Fig.16: Peace Area,City zones and Green Belt in Auroville
(Source: www.auroville.org)

Fig.17:Fire wood from forests of Sieben linden
(Source: www.gaiaeducation.org)

Fig.18: One Type of buildings in Sieben linden
(Source: www.gaiaeducation.org)

live in the ecovillage permanently (about 120 people).

Every family or every member has their own piece of land (1 hectare). Different people are responsible for different tasks in community living: education, government relations,operation of machinery, snow removal. Organic gardening (no pesticides, no herbicides – permaculture or traditional agriculture are welcome (Ibid,27-29).

RESULTS AND DISCUSSION

Comparing Eco-villages

When we compare eco-villages we understand that eco-villages use local and natural material for buildings and this material are completely in harmony with climate. For example: in findhorn uses natural material and non toxic material like stone and using breathing wall structure, which allows the fabric of a building to interact beneficially with people to moderate humidity and air quality is common in this eco-village. As a result of gulfstream in findhorn,buildings are circle forms with green roof and there is retreat in windows.In Munksøgaard uses local material like mussel-shells and straw is available,mussel-shells can retain excess water and are collected from a local fishery.and straw insulation uses in walls this materials are natural and lightweight.

Straw,timber and clay are used in Sieben linden,these material are completely non-toxic and natural.

As a result of comparing ecovillages we can undersatand that using inexpensive and sustainable materials is very important for example bamboo is used in Crystal water (Fig.21).bamboo has a lots of advantages:

Growing in Hot and humid climate(tropical area);
Growing fast;
Using bamboo in bridges,roofs,walls;
Bamboo is Fire resistant;
Bamboo is Earthquake resistant;
Tensile strength nearly as high as steel;
No changes in thickness;
High mechanical strength;
Inexpensive and sustainable;
reusability of beams and joints (Kitamura,1975; Wenwei and Taihui, 1987).

When we compare eco-villages we can understand use of renewable energy sources and use of organic wastes and toilets as composting and use of greywater for irrigating is very important in eco-villages.

Another important thing is,cooperating all residents to build an eco-village.

CONCLUSION

Two important aspects in the creation of a successful eco-village. The first is the realization that a sustainable process is as important as a sustainable village and that all phases of the project therefore deserves equal emphasis. This includes initial research and development, creation and implementation, to the ongoing maintenance of the final eco-village itself. Secondly ,those involved have to determine how decisions will be made and how things are to be done. This is an important aspect as the typical high densities of eco-village require highly-developed social skills and careful community design.

As results of this research we can have some principles of designing eco-village in Iran:

We can have successful eco-village when all residents protect environment and all residents have to cooperate with each other to build an successful eco-village. Another important thing is live in harmony with nature and all residents should have same targets and have same ideas.

Residents need to be educated about protecting environment so a training building should be build in eco-village to help and train something about eco-village to residents.

Use of recyclable, local and non toxic materials is very important. Material must have the ability to use multiple times.

Fig.19: Vegetable garden in Kovcheg
(Source: Lazutin and Vatolin,2011,28)

Fig.20: Cellar for winter supplies in Kovcheg
(Source: Lazutin, Vatolin,2011,28)

Fig.21: Use bamboo in Crystal water
(Source: www.permaculture.com)

Humid climate (north of iran)

Using mussel-shells and local material for roofs.
Using rainwater for irrigating.
Using biodiesel fueled vehicles.
Composting of organic waste.

Arid climate, desert region

Using clay and adobe.
Using photovoltaic panel on the roof.
Using green belt.
Composting of organic waste.

Hot and humid climate

Using bamboo for buildings.
Using photovoltaic panel on the roof.
Composting of organic waste.

cold climate

Using eco-villages that have clusters and putting homes in one cluster and another requirements in other clusters.
Composting of organic waste.
Cellulose insulation (made from recycled paper or recyclable materials).

REFERENCES

Ardzijauskaite, V.,(2009), **"Ecovillages: is it a way to reach environmental sustainability",** In ESST, **V.**3, October 2009, P14-19.

Anderson, V., (1993), **"Energy efficiency policies"**, New Economic Foundation (Routledge).

Atkisson, A., (2005), **"A cluster of eco-village",** Environmental Design and Urban Ecology, v.9,P15-17.

Birkeland, J., (2002), "**Design for sustainability: A source book of integrated Eco-logical solutions**", Earthscan.London.

Crow, G. and Allan, G., (1994), **"Community Life: An Introduction to Local Social Relations"**, Harvester Wheatsheaf. Hemel Hempstead, United Kingdom.

Dawson, J., (2006), **"How eco-villages can grow sustainable local economies",** Global Acovillage Network, No.133, Winter 2006,P56-61.

Eisenstein, W., (2001), **"Ecological Design, Urban Places,and the Culture of Sustainability",** In San Francisco Planning and Urban Research (SPUR) Newsletter**,** September , P1-5.

Gilman, R andGilman D.,(1991), **"The eco-village challenge"**, In Context, V.29, Summer 1991, P10.Available on http://www.context.org?ICLIB/IC25/Gilman.htm. Accessed 23 september 2005.

Irrgang, B., (2005), "**A study of the efficiency and potential of the eco-villages**", In Pectora Roborant Cultus Recti, v.3, December 2005, P17-35.

Jackson, H., (2004a), **"global ecovillage network history 1990-2004"**,Denmark.

Jackson, H., (2004b), **"a new planning tool for sustainable settlements"**, In Integrated Eco-village Design**,**May 2004, P1-8.

Kennedy, Joseph.F., (2004), **"Creating an Eco-village"**, Article available on: (http://www.newcollege.edu/news/ecovillage.html. Accessed 20 August 2004)

Kitamura, H., (1975), **"Physical and mechanical properties of bloomed bamboo culms"**, Utsunomly University, Japan.

Lazutin, F. and Vatolin D., (2011), **"How their eco-village in the kaluga region of Russia has developed",**In permaculture magazine, No.63, July 2011,P27-29.

Lefay, R., (2005), **"From dust to dawn"**, permaculture magazine, No.45, Autumn 2005, P39-42.

Lindegger, M., (2011), **"Designing Ecological Habitats Creating a Sense of Place"**, Permanent Publications.

Loux, J., (2011), **"Cohousing and Sustainability: Munksogaard",** In Sustainable Design, July 2011,P1-4.

Suzuki, H. and Dastur, A.,(2009), **"Eco Cities"**, Washington, DC.

Vander Wal, L.,(2010), **"South Cache Ecovillage: Addressing the Past, Present, and Future"**, Utah State University , Salt Lake City.

Wenwei, Ch and Taihui, W., (1987) , **"A study on the anatomy of the vascular bundles of bamboo from China"**, In: Recent Research on Bamboo, Ed. Rao, A.N., Ohanarajan, G., Sastry, C.B. Proc. Intern. Workshop Hangzhou, P.R. China, Singapore.

www.findhorn.org/ecovillage
www.gen.ecovillage.org
www.permaculture.com
www.auroville.org
www.gaiaeducation.org