PERMACULTURE AS A DESIGN DISCIPLINE

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Introduction

Permaculture is a design system for creating sustainable human environments. [Mollison 1994, page 1]. The term was coined in 1978 by Australian ecologist Bill Mollison and his student David Holmgren as a contraction for Permanent Agriculture. The term has been expanded to mean Permanent Culture, for food production is only one of many activities needed for healthy, sustainable environments for humans. Permaculture is an interdisciplinary practice focusing on sustainable food production, energy-efficient building, recycling, waste-water treatment, land stewardship, and just and workable social structures and economies.

The importance of good design in Permaculture cannot be overstated. Although Permaculture has amassed a wealth of practical techniques for building sustainable habitats, the real genius of the discipline is its ability to utilize those techniques within an overall design based on the characteristics of the site to be built or renovated.

This paper discusses techniques of successful design and describes how these techniques are used in Permaculture.

Characteristics of Successful Design

This section discusses three characteristics of successful design. The term "design," of course, is both a noun and a verb. As a noun we take its meaning to be a plan or scheme, a physical representation of something to be created or accomplished. As a verb we take its meaning to be the activity of producing the plan or scheme [Webster 1960].

We consider a design to be successful if it meets the following criteria:

- It is elegant, that is aesthetically pleasing in itself, without reference to its aim.
- It has utility, i.e. it accomplishes the client's goal or goals.
- It is good; that is, it accomplishes goals that are nurturing or beneficial to the client and the client's environment.

Elegance

One of the meanings of the term "design" is akin to one of the meanings of "pattern," an ornamentation or repetitive figure, the intent of which is to produce a pleasing aesthetic effect [Webster 1960]. It is this sense which informs our first criterion. If a design is ugly, jarring, or discordant, we have found that it is unlikely to have as much utility and goodness as one that is aesthetically pleasing. An ugly design does not inspire the client's confidence. An ugly design is harder to work from than an elegant design, so the construction phase is more difficult. An ugly design is often a signal that the client's requirements are not well understood or that the client has failed fully to think through and clarify his or her requirements.

By contrast, an elegant design gives something of worth to the client regardless of whether the landscape or habitat is actually constructed. (Careful design sometimes

reveals that the desired project is not feasible under the client's budget or time constraints.) An elegant design is easy to work from, so the construction phase can proceed gracefully. An elegant design gives the client confidence that the system to be built will in fact have the features desired.

Utility

The goal of the process of design is to produce a plan from which something – a software system, a landscape, a building, an appliance, or even a work of art – can be constructed. The success of the design in this sense is dependent on a clear understanding of the client's wants and needs, or requirements.

In designing and building something for a client, there are four considerations, the first three of which are necessary and last of which is desirable:

Meet the stated requirements. The stated requirements are those that the client has explicitly told you (the designer) at the beginning of the engagement or that you have elicited through interviews and conversations. If the design and the subsequent construction do not meet these requirements, the system will be deemed a partial or complete failure.

Meet the unstated requirements. The unstated requirements are those that the client has not explicitly told you but, if unmet, will produce a system that is not to the client's liking. This is the trickiest ground for the designer to traverse. Sometimes the client does not fully know what she or he wants; sometimes the client assumes knowledge that the designer does not have. In pathological cases, requirements are concealed from the designer in order to fulfill a hidden agenda of system failure. You must make every effort to uncover these unstated requirements and make them visible so that design and construction will produce a satisfactory result.

In order to accomplish these two goals, you must, of course, clarify the client's requirements and decide how you will know if they have been met. You must define the criteria for success, the observable outcomes that will indicate that the requirements have been met.

Satisfy the client. The reason the designer wants to meet the requirements, stated and unstated, is to satisfy the client. Client satisfaction is good in itself, in that it is a goal of the design process. It is also instrumentally good for the designer in that it enhances the designer's reputation and may lead to repeat business from the same client or additional business from others.

However there is a potential trap here. If the requirements are not met, the client will surely be dissatisfied, but the absence of a negative is not the same as the presence of a positive. Meeting the requirements does not guarantee client satisfaction. The client may simply be indifferent. That is why the fourth consideration is important.

Delight the client. Delighting the client involves going beyond the requirements to provide extra, unexpected benefits. These need not be large or out of scale with the stated requirements. In fact, if they are, the client may feel suspicious or vaguely

guilty. Delight comes from little extra touches that indicate caring and concern on the part of the designer. For instance, a landscape can be inexpensive to maintain as well as beautiful and functional. Client delight entails and ensures client satisfaction.

Goodness

Beyond the utility of meeting the client's wants and needs is the goal of providing something of true value and benefit to the client and to the client's environment. We seek to create something that promotes the health and welfare of the client and the environment. This is related to the goal of meeting the unstated requirements, but goes beyond it. If the client is satisfied, even delighted, but the system or product is ultimately unhealthy for the client or his or her environment, then, in the broader view, the system is not a success. The environment nourishes and sustains the client. If the environment is unhealthy, the results are not likely to be good for the client.

This perspective is too often overlooked in the design process, but the consequences of overlooking it are not hard to find. Lack of this perspective produces unsustainable land designs that waste resources.

Principles of Successful Design

Three general principles, or broad approaches to the design process, underlie the many things that successful designers do. These principles are listening to the client, listening to the land, and making skillful use of good tools.

Listen to the Client

The designer must find out what the client wants and needs. "Listen," of course, is a metaphor. One might also use a visual or tactile metaphor: The designer must see the client's needs clearly or have a firm grasp of the client's requirements. This is necessary to achieve the goal of utility (see above).

Listen to the Land

The designer must pay attention to the constraints of the medium in which the design is to be implemented or constructed. (Again, "listen" is a metaphor.) The designer must know the capabilities and limitations of each particular site in question and design the solution accordingly.

Use Good Tools

There are several aspects to this principle. The designer must have good tools to create the design, and he or she must employ good techniques for using the tools. In addition he or she must know and design for the capabilities of the tools that will be used to build the system or habitat.

Permaculture Design

Permaculture is a design system for human habitats based on ecology and ethics. It began in Australia in the 1970s as a way to develop farms and gardens that were as

rich, productive and resilient as old-growth forests. Permaculture integrates human and natural systems in ways that are beneficial for all the elements engaged, human and non-human, living and lifeless [PDI].

The practice of Permaculture is based on two things:

- Observation of healthy, natural systems.
- Design of human systems on the basis of the patterns observed in the natural systems.

Permaculture practitioners have observed that the richness, productivity, resilience and beauty of a natural system increases with the number and quality of beneficial relationships among the elements and forces in the system. Examples of elements include such things as nitrogen-fixing plants, gray water, gophers, driveways, roofs, conifers, humans, cattle, etc. Examples of forces include the dynamics of sun, wind, fire, water, traffic, etc. Over the years Permaculture has amassed a great deal of knowledge regarding the patterns found in nature and practical experience with building sustainable habitats on the basis of those patterns.

Ethics

Unique to Permaculture is its emphasis on ethics. The practice of Permaculture is based on three ethical principles: care for the earth, care for the people and sharing of surpluses.

Care for the Earth

Care for the earth means to ensure that all the elements that contribute to a healthy ecosystem are nourished and conserved, not degraded. It is the earth which sustains every one of us, so it behooves us to take care of it. Permaculture recognizes that each element plays an important role in many systems at once. Cooperation, not competition, is the key to mutually beneficial relationships.

Care for the People

Caring for the earth includes caring for the people who inhabit it. This principle affirms that humans are not separate from the natural world and each person, like each wild thing, has important contributions to make. It calls on all of us to cultivate our inherent capacities for kindness, creativity, joy and generosity. When we accurately identify and fulfill people's basic needs, we cultivate healthy human settlements and alleviate pressures that lead to destructive acts.

Sharing of Surplus

The co-founder of Permaculture, Bill Mollison, says

> The third component of the basic 'care for the earth' ethic is the contribution of surplus time, currency and energy to achieve the aims of earth and people care. This means that after we have taken care of our basic needs and designed our systems to the best of our ability, we can extend our influence and energies to helping others achieve this aim as well [Mollison 1994, p. 3].

Every element in a natural system consumes resources from other elements and provides resources to them, most often in a different form. Resources that are provided above and beyond what can be used by the other elements are surplus. Unused surplus becomes pollution (i.e. material that gets in the way). Sharing the surplus means to make the surplus available to elements in surrounding systems, including other people. In human terms it means contributing one's extra time, money and energy to worthwhile endeavors. Sharing the surplus provides a number of benefits: it reduces pollution, it nourishes other elements and other people, and it enlivens the one who shares.

Permaculture aims to create bounty. It welcomes abundance, recognizing that surplus serves all things well when we plow it back into our communities and landscapes.

Listening to the Client

The Permaculture design process begins with gathering and documenting the client's wants and needs. The term "wants and needs" denotes the set of benefits that the client wants from the system. The designer interviews the client, lists the wants and needs, asks elucidating questions, etc., documents the wants and needs, and asks the client to verify them.

The process is iterative, and the iteration always involves the second principle, listening to the land, because the client's wants and needs are inevitably constrained by the particular site on which he or she wishes to build something. The characteristics of the site not only limit what is feasible, but also suggest new possibilities to the client.

Listening to the Land

In Permaculture the designer listens to the land to find out if and how what the client wants to do can fit there. Two separate activities are involved: (1) carefully observing the site and its surroundings; and (2) researching things about the site that are not directly observable, such as its history, applicable legal codes, etc.

The land tells the designer how to meet the client's wants and needs: how to place the elements and what patterns to use. Typically the designer walks the land, investigates the neighboring land, talks to the neighbors, determines things like prevailing wind and sun, researches annual rainfall, observes the flow of animals through the land, investigates legal restrictions and the availability of electricity, water and other utilities, and in many other ways gathers as much information as possible.

Having gathered this information, the designer works with the clients to clarify their wants and needs and designs a solution that will fit the land. This is often very educational for the client; possibilities emerge that were not thought of before. At the end, the client has a very rich design for the site.

Using Good Tools

In this section we cover techniques and strategies used in Permaculture design rather than physical tools. (The tools are simple: pencil, paper, templates for drawing shapes, etc.) Permaculture designers have accumulated vast knowledge about natural laws and principles. This accumulated knowledge informs the designer's approach to any given site. This section lists some of Permaculture's tricks of the trade and gives examples of their application [Mollison 1994, pp. 5-31].

All of the tools are based on the fundamental principle of designing with nature:

> In designing with nature, rather than against it, we can create landscapes that operate like healthy natural systems, where energy is conserved, wastes are recycled and resources are abundant [Mollison 1994, p. 72].

Permaculture design makes use of this principle on two levels:

- The designer applies overarching laws and principles that pertain in any climate, cultural condition and scale of project and construction technique.
- The designer applies insights and techniques that are specific to the particular region, site, individual and situation under consideration.

Relative location

Every element such as a house, pond, road, etc., is placed in relationship to others so that they assist each other. For example, the garden is placed between the house and the chicken pen so that garden refuse is collected on the way to the pen and chicken manure is easily shoveled over to the garden. The designer sets up working relationships between the elements so that the needs of one element are filled by the yields of another.

Each element performs multiple functions

The designer chooses and places each element so it performs as many functions as possible. A pond, for example, can be used for irrigation, watering livestock, growing aquatic crops or fish, fire control, habitat for wild fowl, a firebreak, etc.

Each function is supported by many elements

Important basic needs such as water, food, energy and fire protection are served in more than one way. For instance, a house with solar hot water would also have a wood-burning stove with a water jacket. On a sea coast, winds can be contained by a strong windbreak of trees and shrubs as well as semi-permeable fences and trellises. Fire protection can be obtained from ponds, slow-burning windbreak trees, driveways cut to serve as firebreaks, etc.

Planning for energy efficiency

Planning for energy use is planning for economics, as all economic good depends on energy. To this end, Permaculture analyzes a site into zones, sectors, and slope. Zones are portions of the site used at different frequencies, such as daily, weekly, monthly, and less frequently. Structures and features that are needed for daily activity are placed near each other and close to the house; features needed less frequently are

placed farther away. This reduces the energy used to get to them and streamlines the infrastructure.

On a broader scale, one places housing, working and shopping areas close together so that a whole community uses energy efficiently.

Sectors are directions from which natural energy comes to the site from outside it, energy such as wind, sunlight, water, wildfire, etc. The designer places components to manage incoming energy. For instance, the designer would place plants and structures in order to accomplish the following:

- Block out or screen unwanted incoming energy such as excessive wind or late afternoon sun in the summer.
- Channel energy for special uses, such as harvesting wind for power.
- Capture energy where desired, such as sunlight and rain for crops.

Slope is the contour of the land in profile, the relative elevation of each part. One places elements on the land to take advantage of flow and convection, placing, for instance, water holding tanks on higher ground than buildings and fields that need to use the water, thus reducing the need to pump.

Using biological resources instead of fossil fuels and chemicals

A site designed using Permaculture principles uses nitrogen-fixing plants instead of nitrogen fertilizer, geese instead of a lawnmower to keep weeds down, biological insect control instead of pesticides, etc. For example, a farmer in England has trained his geese to recognize and migrate toward a distinctive flag. He hires out the geese to clean insect pests from fields. He plants several flags on one side of a field and releases the geese on the other side. The geese make their way across the field, eating insects as they go. At the end of the day, the farmer collects his geese and his fee, and the field is free, or nearly so, of harmful insects.

Energy cycling

Energy is one of the critical resources on any site. The Permaculture designer wants to be as efficient as possible in its use. Permaculture systems seek to stop the flow of nutrients and energy off the site and instead turn them into cycles. Kitchen wastes are turned into compost; animal manure is used to produce biogas or compost; household graywater (water that has been used for cleaning) is directed to the garden for irrigation; nitrogen-fixing plants are planted next to other plants that need the nitrogen, etc.

Small-scale intensive systems

Large-scale industrial agriculture requires lots of energy input in the form of fossil fuels to power farm machinery and chemical fertilizer to feed the mono-crops. Permaculture reduces the need for both by planting densely and in small plots. Permaculture sites use the land efficiently and thoroughly.

Natural plant stacking and succession

Permaculture works in more dimensions than industrial agriculture. It works in the vertical dimension of space by stacking useful plants. It works in the dimension of time by planning the succession of plants through the seasons and years.

Stacking emulates a natural forest, in which plants of varying heights grow together. To increase the yield of a plot of land one would plant root crops such as radishes or bulbs, ground cover such as herbs or clover, low shrubs such as pumpkin or squash or berries, taller plants such as climbing beans, and trees such as fruit trees or quality hardwood all in the same area.

The Permaculture designer also increases yields by planning the succession of plants through time. One would plant annual food crops, perennial bushes, and longer-living nut or fruit trees all at the same time. In the early years the land yields produce from the food crops, later it yields useful products from the shrubs and finally from the trees.

Polyculture and diversity of species

A Permaculture site includes many species of plants and animals. The yield of any one of them may be than it would be if the site were planted in a monoculture of that species, but the sum of the yields of all of them is much greater. In addition diversity protects the growers from adversity; if frost wipes out the fruit crop, other produce is available to eat or sell.

A Permaculture site is marked by cooperative diversity of species, called guilds. A guild is an association of mutually-beneficial species often clustered around a central element. Companion planting in gardens and beneficial crop mixes in agriculture are examples.

The Permaculture designer aims, however, not for diversity as such but for useful diversity. Says Mollison: "… the importance of diversity is not so much the number of elements in a system; rather it is the number of functional connections between those elements. It is not the number of things, but the number of ways in which things work [Mollison 1994, p. 25]."

Increase edge within a system

By "edge" we mean the boundary between one area or subsystem and another, for instance between field and forest, or between two media such as between water and air or water and land. The edge is the most fertile and abundant region; more species inhabit the edge, and more interesting things happen there, because the edge gets resources from two different environments. By increasing edge we increase abundance of yield. One way increase edge is to construct ponds and woodlands on the site, if none are there to begin with. Another is to lay out the plots so their edge is maximized. Instead of a straight path through a garden, one might lay it out with short protrusions into the surrounding space, making it easier to get to the whole garden.

Conclusion

The Permaculture designer can enhance the health and well-being of a site and its surrounding local region as well as create beautiful, abundant sites that are economically viable and ecologically sound. The key to doing so is to have a good understanding of the design process and to be able to apply the principles of successful design described in this paper.

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