

# **A human-ecology approach to environmental design — An integrative human-ecology design derived from Chinese agricultural culture experiences**

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**Abstract**—Based on fundamental principles of ecology, the ecological philosophy connotation of Feng-Shui (Wind and Water) concept from experiences of Chinese agricultural culture was first discussed, and then human-ecological implications of Feng-Shui environment architecture is analyzed. As a theoretical integration between human ecology and Feng-Shui theory, “environment” and “environmental design” concepts were re-examined and given new definitions. With holistic principles of human ecological design in the context of Feng-Shui, essential technical ways of integrative human ecological design were explored in the presentation of a case study of an urban environmental design in east China.

**Keywords:** integrative environmental design; human ecology; Feng-Shui environment architecture.

## **1 Introduction**

In the past several decades, a few scientists dedicated to human environmental design have attempted to a fresh theoretical and technical path of designing for the fulfillment of desired goal: man and its environment as one. On one hand, as a result of rapid penetration of modern ecology into other disciplines, two basic areas of research, human ecology and ecological anthropology, may provide much interdisciplinary opportunity to establish such a theoretical and technical basis, on the other hand, two distinct occidental and oriental philosophies with respects to man-environment relations have begun to blend with each other and have therefore promoted extensive mutual learning and exchange in environmental design science. Some work of study in these two fields has been conducted and some helpful results of research have been achieved (Bennett, 1980; Bookchin, 1980; Michael, 1989; Rapoport, 1982; Resgister, 1987; Yu, 1991). One of the hot subjects of research has internationally been focused upon Chinese Feng-Shui theory and its practice (He, 1990; Lip, 1987; Shang, 1989; Skinner, 1982; Yu, 1990), which is directed at a human ecological inquiry into man-environment relations, technical as Feng-Shui design. It is an overall summary of the essential principles and technical methods of optimum selection and designing for living environment in ancient China.

From a historic point of view, China experienced another path of agricultural culture in environmental design other than that of “industrial culture” the western countries traversed for the past more than two thousands years. A systematical comparison

of differences in theory and methods of environmental design between the western and eastern countries (especially China) may provide a good practical reference for man's exploring how to live in harmony with its environment at designing scale. The author wishes to launch such an item of specific discussion on the topic of Chinese Feng-Shui and environmental design among interested designers and researchers abroad or at home.

## 2 Chinese Feng-Shui environment architecture theory and its human ecological emphases in environmental design

### 2.1 The basic concept of Feng-Shui and Chinese ideal environmental model

Feng-Shui theory originated in late Qin Dynasty (Chinese first feudal dynasty about more than 2200 years ago) and gradually perfected until Tang Dynasty, which was established on the basis of Qi theory (Cai, 1990), one of Chinese ancient philosophical schools. So called "Feng" literally means "wind" and "Shui" means "water". According to Qi theory, Qi literally means a kind of "gas" without definite shape but really existing, is recognized as the origin of the world and everything is created from the interaction between Yin Qi and Yang Qi. Qi disperses along with wind and accumulates via water. Feng-Shui indicates two kinds of essential characteristics of Qi. Mankind is one of forms of Qi, so does its environment, which settles a philosophical basis for Feng-Shui theory, that is to say, man and nature should be unified as Qi and also coexist in harmony with each other.

Though Qi itself is evasive and invisible when dispersing in the universe, it forms everything tangible and visible when accumulating, and in general sense its dynamics may be expressed as follows:

$$Q=f(a, t, d, m, h, p, c).$$

Where,  $Q$  for Qi function variable.  $a$  for astronomical variables,  $t$  for geological variables,  $d$  for direction variables,  $m$  for meteorological variables,  $h$  for time variables,  $p$  for human psychological variables and  $c$  for social or cultural variables.

In the light of the radical ideas of Qi philosophy, the central tasks of Feng-Shui architecture are: (1) to search for living Qi which is a kind of harmonious entity of Yin and Yang Qi by investigating concrete forms of Qi in a site; there exist five basic forms that needs to be surveyed namely Dragon (geological tendency and vegetation pattern), Cave (a recess of land), Sand (outlines of land), water and orientation. (2) To regulate and transform dead Qi which is another state of inharmonious system of Yin and Yang Qi into living Qi in a site by designing and reforming the corresponding functional relations among five basic forms.

Through thousands of years in Feng-Shui studies, Chinese people gained very sophisticated techniques of Feng-Shui architecture and also set up their ideal Feng-Shui environment model for burying or living (Yu, 1990; 1991). It could be described as an expansive piece of land embraced by mountains or hills with exuberant plants and proper biodiversity and in the front one or more mountainous streams or springs. Such an ideal

environment model possesses the best living Qi, and achieves its harmony in eco-relations with local human activities.

## 2.2 Several typical environmental integral parts from the ideal Feng-Shui environment model and their human ecological significance

### 2.2.1 Basin-edge located settlement

In the ideal Feng-Shui environment model, natural forms of land were altered as little as possible so as to keep "garden vein" (primeval features of topography of Qi) intact, edges of some sloping fields with small size and little slope, especially on the southside of hills or mountains were comparatively poor in soil and water conditions for cropping or forestation, and were also able to avoid flooding and landslide and to screen winter wind. These sections of lands were usually recognized as a priority site for settlement selection (He, 1990; Yu, 1991). From a viewpoint of current human ecology, such agricultural landscape of settlement is a kind of cultural adaption to local bio-physical environment and also does good to making the best use of indigenous resources and protecting natural habitat or landscape.

### 2.2.2 Feng-Shui forest

Feng-Shui forest was one of the particulates of Chinese culture of agriculture and usually located on the upper-slope or top sections of hills or mountains and "water mouth" sections where water flowed into or out of a site (He, 1990). Used tree species in a Feng-Shui forest often were common and native ones. Such forests were able to accumulate Qi and help prevent soil erosion, reserve water resource, alleviate flood or drought, break unfavorable monsoon and improve local microclimate according to current ecology.

### 2.2.3 Water conservancy engineering

Water conservancy engineering in Chinese Feng-Shui environment model was to regulate performances of Qi in a site and make living Qi the most vigorous by changing or excavating waterways as Qi accumulated with water. There existed two methods for water conservancy in the model (Yu, 1991): (1) protection of "water mouth" and establishment of rationing system of water resources. Through sophisticated designing of water courses, water could be rationed among different users of the same site. In addition, around a "water mouth" or hilly spring were there some planting and temples as signs of protection; (2) ponds for water storatation and multiple uses. In a typical settlement such as a Chinese village, usually was a conserving pond in the front or the central part; water courses channeled water from nearby mountain springs or streams into the pond for futuristic uses, used water in the pond could also be directed into the lower part of the settlement, and drained into bigger ponds which could be used for local aquaculture or other interests of production.

The two types of water use assisted in storing water, irrigation, prevention against drought or flood, regulating local microclimate, improving regional hydrological conditions and also exerting beneficial psychological effects upon the residents. In short, these traditions of water use facilitated local natural ecological process, and made living Qi much more flourishing.

### 3 Human ecological importance of Chinese Feng-Shui experience to current environmental design

Chinese Feng-Shui architecture theory and technique in the past played an important role in coordinating man-environment relations for Chinese people. In the meanwhile, it has provided a lot of valuable ideas and operative skills for current environmental design. Here are its emphases which may be very meaningful.

Analyzing and assessing site environmental situations from a holism but not reductionism approach: In Feng-Shui theory, Qi is a general and comprehensive measurement for ecological relations of material, energy and information between man and its environment. In the context of Qi, all the environmental elements in a site including human physiological and psychological factors should exist as an ecologically interactive entity. Through finding out whether or not Qi is living and robust in a site, the integrativeness and harmoniousness of eco-relations in that site may be diagnosed.

Blending local cultural traditions and human psychological needs into designing processes; Chinese Feng-Shui were developed and perfected mainly under cultural background of Han nationality, and its ideal Feng-Shui environment model took distinct trains of Chinese Han culture. To form a combination between cultural traditions, especially exotic culture and vernacular environment, is a basic feature of Feng-Shui. For this reason, to build up connection between culture and local environment may be an important aspect of Chinese traditions of environmental design.

Making unification between continuity of environment and its ecological functions: Feng-Shui stresses the continuity of "Qi vein", which obviously has very close connexion with sound and continuous ecological flows in a site. We may infer, the continuity of "Qi vein" signify harmony and soundness of ecological process in the local environment, which help facilitate and regulate ecological functions of site environment.

Keeping local environment diversified and varied; Tortuosity and fluctuation of "Qi vein" are also highly appreciated in Feng-Shui as they are very central to maintaining and "nourishing" living Qi. As we know, paths, roof ridges, riverways and so on, in Chinese style, were built in the form of tortuosity and undulation but not complete straightness, their roles in environmental design may be expressed in the following four aspects; firstly, it is very favorable to keep local natural ecological balance and facilitate stability of natural eco-relations in a site; secondly, to create much more diversified habitat for adaptable organisms to live; thirdly, to produce positive psychological and cultural effects on local residents; fourthly, to enhance eco-aesthetic value of local environment.

Minimizing economic input and optimizing ecological functions; Feng-Shui design was usually oriented to reduce project expenses and maintenance cost to a reasonable level as low as possible by making good use of the advantages of local environment and cultural traditions. Protection of good-quality environmental sections, reformation and improvement of poor-quality or sensitive ones and multifunctional utilities of different types of environment are three basic modes in Chinese Feng-Shui architecture.

Sustainable exploitation of environmental resources; From a Feng-Shui viewpoint, selection and designing of environment is; to make a better use of all kinds of local environmental resources, sustainable utility of environmental resources in Feng-Shui practice in two basic ways: (a) multiple use; (b) recycling and regenerating use, which generated more eco-functional connections among local environmental elements.

## **4 Human ecological fundamentals of integrative environmental design**

### **4.1 "Environmental unit" and "environmental design" concept in the human ecological context**

From an integrative viewpoint of human ecology, environment is not all kinds of independent non-human elements such as soil, water, air, and so on, also not a mechanical combination of them, but function-oriented entity in structure with the constituent elements in social, human and bio-physical dimensions, which is relatively-dynamic definition with regard to the human subjective such as an individual, a social or ethnic group to the objective of used or altered settings man acts upon. It may be conceptually defined as all-levels "environmental units" (E-units) from human ecological term (Jiang, 1927). Such units contain overall functional dimensions of different eco-relations among social, cultural, human psychological, economic and bio-physical aspects and may be measured via its input/output eco-flows of material, energy and information.

From a viewpoint of reductionism, E-units may be reduced to three categories: (1) bio-physical environment which is usually named as habitat for organisms; (2) social and cultural environment such as ethics, customs, legislation, religions and so on, which serves to regulate and guide human behaviors of individuals or groups and stabilize internal and external eco-relations between man and its environment; (3) psychological environment as each other's social communication occasions. Such environment is mainly inherited from one's ancestors via genetic genes and express itself spontaneously according to specific social or cultural situations. In fact, these three kinds of environment exist in reality in the form of integrated environmental complex as E-units. In human ecological integrative context, environment design should be directed to rebuild the structure of E-units in order to coordinate eco-functional relations within or among a site at a minimum cost through integrative designing at different scales to overall relationships of physical, biological, economic, social, cultural and human psychological dimensions in a site.

## **5 Alternative technical ways of integrative environmental design**

### **5.1 Essential principles for human ecological integrative design**

Based on the conceptual foundations of human ecological design above noted and designing emphases of Chinese Feng-Shui architecture just discussed, we have addressed the following essential criterions of human ecological design to environment (Hu,

1994);

Making holistic design to environment as different-scale E-units; scaling levels of environment in designed sites for organization of a hierarchical system of E-units; put an emphasis of designing on establishment of internal/external multifunctional relations within or between an E-units; tapping vernacular ecological "rhythm" by utilizing time/space features of local environment; coordinating exploitation of environmental resources with its conservation and realizing the sustainable uses of them; integrating natural bio-physical features into designing of environmental unit; keeping and enhancing properly diversity and variation of local environment; creating symbiosis in eco-relations for the coevolution between local bio-physical environment and human development; facilitating and strengthening the recycling and regenerating uses of materials and energy in designed E-units; penetrating economy into E-units designing; according respect to and furthering the diversity of local historical cultural traditions and nationalities; orienting environmental design to human psychology and behaviorism; improving and regulating the reasonability of local landuse according to local human ecological requirements; enhancing human ecological awareness of local residents via eco-education throughout designing processes.

The above described are fourteen essential criteria for environmental design, which are a generalization from Chinese practice of environmental architecture which has expressed their success in our past practical endeavors of human ecological design

## 5. 2 A case study of human ecological integrative design to urban environment in east China

Based upon the theoretical presentations and established designing criterions we have, a exemplary study of urban environmental design in the central area of Maanshan City, Anhui Province of eastern China has been conducted in 1991. Maanshan is an industrial and mining city with population of 300000. The research project was carried out in cooperation with planners and decision-makers of the municipal government. Local residents participation was an important part of the whole designing project.

The study was expanded at four different levels of environmental unit which inter-related and supplemented as a whole. Before that, we first investigated its basic internal/external ecological contexts of four different levels in socio-cultural (local historical, demographical and cultural vicissitudes, social living quality, residents' mentality and public health), economic (industry, commerce, using fashions of natural resources and energy and their effects on the environment), urban construction (urban landuse pattern, infrastructure, traffic situation), visual landscape (landscape corridors, aesthetic and visual relations of landscape corridor and patches), bio-physical (topography, geology, hydrology, wildlife and its habitat, bio-diversity, water quality, air quality, noise, various wastes) aspects, which provided overall basic background information for our next planning and designing in this area. The planning and designing of four environmental units were processed as follows:

Considering the central area as a first-scale environmental unit, and then made the environmental suitability assessment/zoning and the planning and designing of principle eco-relations of the internal and in relation to the whole urban area ( ecological sketch

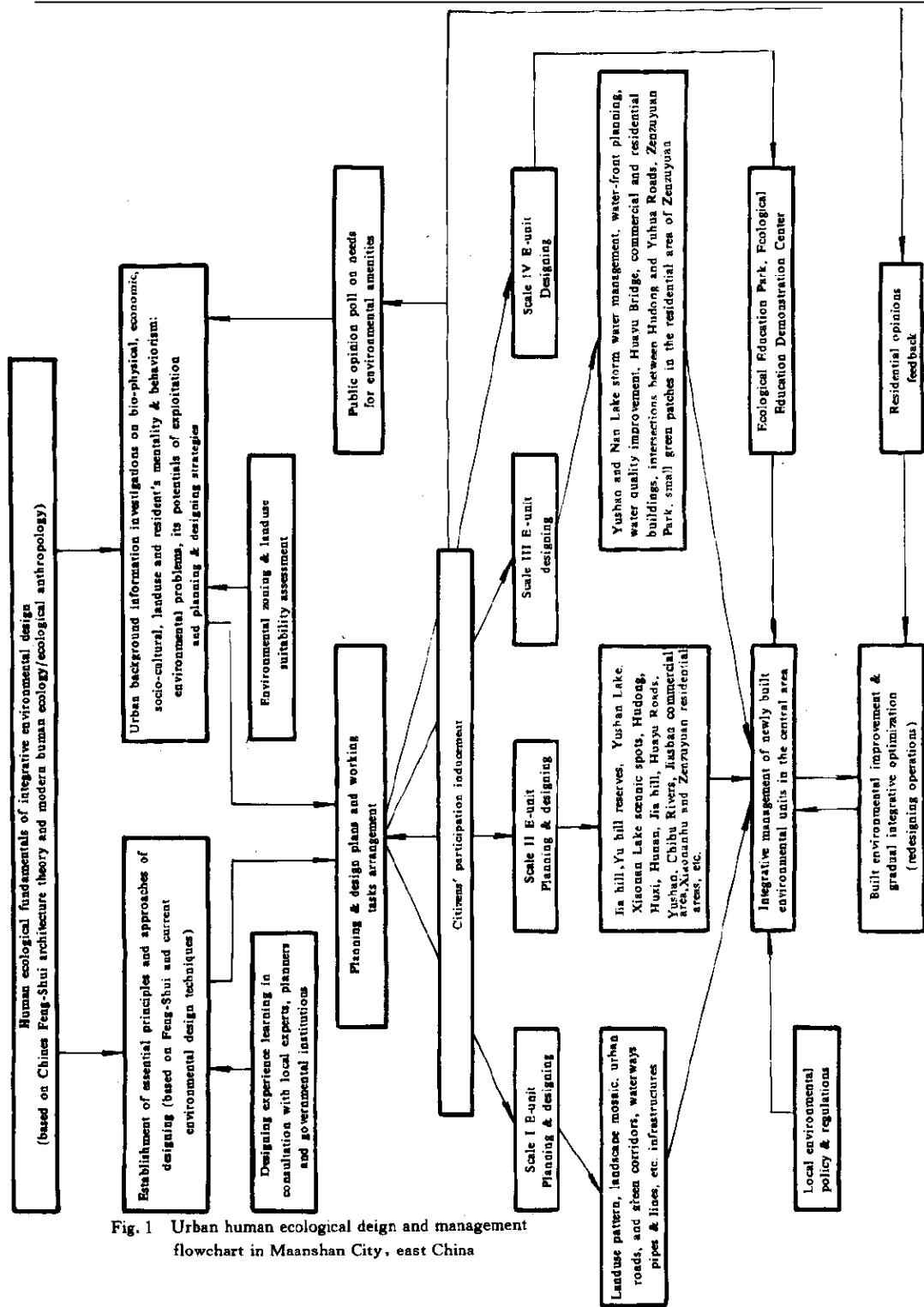


Fig. 1 Urban human ecological design and management flowchart in Maanshan City, east China

designing) with a concentration on keeping natural time/space features and bio-physical original look identical.

Defining the principal environmental bodies such as waterbodies, green space and natural open space, transportation networks, building blocks, natural reserves, cultural relics and so on as second scale environmental units within the central area as first-scale environment unit, then we planned and designed their internal/external eco-relations with a concentration on the integration of urban soft environment (biological or human) and hard environment (traffic ways, architectural groups and so on).

Determining small-scale and relatively-uniform environmental bodies such as a building, a pond, a park, a piece of greenery, a section of waterway, a road intersection, a recreation ground or sports yard as third-scale environmental units, we designed their functional eco-relations with a concentration on the multi-functional relations and human psychological and cultural concerns. Several typical third-scale environment units were designed in this step.

Specifying residents psychology and environmental ideas as fourth-scale environmental unit, we were aimed to induce and encourage them to participate in designing activities in the entire length of the project. In addition, an ecological education demonstration center and an ecological park were also designed in order to gradually raise citizens' human ecological awareness and make them learn to design their own "mental environment" beneficial to their living with urban nature, this step was also integrated in the above three ones. The planning and design of four environmental units can be described in Fig. 1.

## 6 Conclusion

What are above presented are integrative approaches to human ecological design of environment according to Chinese experience of agriculture culture: "environment" and "environment Design" concept in the context of integrative human ecological design, useful Feng-Shui technical ways to achieve integrative environmental design, holistic principles of human ecological design, and a technical case study of human ecological design from Maanshan City of China. As we know, these are some initiative researches, a lot of questions in its theoretical basis and designing techniques needs to be inquired in depth. Holistic design between physical or social environment and human psychological sides should be central targets for future research in this field, human self-design to its social environment also by ecological learning is an important interest of such approaches, some useful and successful experience of these approaches from Chinese ancient Feng-Shui architecture techniques needs to be further tapped up, the author would like to receive some inspiring academic responses on these topics.

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