Responsibility Of A Designer – An Ecologist’s Perspective

Change the Prevalent Paradigm

Our cultural, religious, intellectual and economic traditions that co-evolved with Industrial Capitalism assume humans could and should transcend nature.

Poorly designed objects, structures, settlement patterns and spaces are responsible for environmental problems. Our environmental management processes remain geared towards predicting and accommodating growth and controlling nature rather than working with natural processes. Design fields remain unconcerned about the impact of designs on health of human systems and ecosystems. The built environment constraints or enhances social and personal relationships and our attitudes towards nature and society. Designers have the capacity to design healthy habitats that reduce demands upon nature and enhance life quality.

Designers could sway the apparent preference for conspicuous consumption towards a desire for low-impact dwellings as new status symbols.

Designers can also have a dramatic impact on reducing the material content of consumption and hence aggregate demands on the environment.

Design needs to shift from a paradigm of transforming nature to one of transforming society by improving life quality and relationships between all living things and built environment.

Design must integrate knowledge from other fields concerning human health and ecosystem processes.

It should promote technologies, systems of production and construction methods that do not rely on natural capital, fossil
fuels and harmful chemicals.

**Construction Ecology**

To create more quality of life with less materials and energy, we need to redesign not only the built-environment, but the nature of development itself!

Development interests in government or industry have therefore, pressured for an ever-increasing supply of raw materials, or promoted increased demand or consumption. This has resulted in a growing throughput of materials and energy. The concept of efficiency has largely been limited to profit instead of reduced resource input. The traditional approach of trying to fix, set caps on, or slow the rate of resource and energy use by regulation is difficult to implement in a capitalistic democracy, as producers, decision makers, consumers and voters, generally oppose limits on consumption. The construction industry’s role is central to land, resource and energy consumption. The scale and nature of environmental impacts attributable to CO2 emissions in primary industries depends on how the construction sector is organised, the form of urban settlements, and the materials and energy resources used by buildings. Landscape designers are often hired after construction to enhance the visual backdrop of a building and sculptors are commissioned to add symbols of prestige to a development. Urban planning and design has treated the impact of cities on the hinterland and environment as mere externalities. We must promote consumer accountability by promoting green alternatives; make environmental systems visible, internalise costs of development and help the transition from a fossil-based economy to a carbohydrate-based human ecology.

**Ecological Design Principles**

1. Solutions grow from place: Ecological design begins with the intimate knowledge of a particular place.
2. Trace the environmental impacts of existing or proposed designs.
3. By working with natural processes we respect the needs of all species while meeting our own.
4. Listen to every voice in the design process flow and the special knowledge that such person brings.
5. Making natural processes visible brings the environment back
to life.
6. Insist on rights of humanity and nature to co-exist in a healthy, supportive, diverse and sustainable condition.
7. Expand design considerations to recognizing even distant effects.
8. Create safe objects of life-term value.
9. Eliminate the concept of waste.
10. Rely on natural energy flows.
11. Treat nature as a model and mentor, not as an inconvenience to be evaded or controlled.
12. Seek constant improvement by the sharing of knowledge.

Eco-Efficiency Checklist
1. Reduce material intensity of goods and services.
   - Are there less material intensive raw materials?
   - Can the product or service be combined with others to reduce overall material intensity?
   - Can the product be reused, or recycled?
2. Reduce energy intensity of goods and services.
   - Can energy be exchanged between processes?
   - Can waste heat be utilised?
   - Can transport be reduced or greater use made of energy-efficient transport such as rail?
3. Reduce toxic dispersion.
   - Can toxic dispersion be reduced or eliminated by using alternative raw materials or producing them differently?
   - Can any remaining harmful substances be recycled or incinerated?
4. Enhance materials recyclability.
   - Can products be made of fewer or marked and easily recyclable materials?
   - Can products be designed for easy disassembly?
   - Can energy be recovered from end-of-life products?
5. Maximise sustainable use of renewable resources.
   - Can more use be made of resources that are certified as being sustainably produced?
   - Are new buildings and refurbishments maximising use of passive heating and cooling?
   - Can maintenance of the product be improved?
• Can customers be educated or informed about ways of extending product durability?

7. Increase the service intensity of goods and services.

• Can customer’s disposal problems be eliminated by providing a take-back service?

Can production be localised to both enhance service and reduce transport

Ecological Foot Print of the Built Environment

Current patterns of design are wasteful of non-renewable resources, create toxic materials, and by-products, require excessive energy for production, harm biodiversity at the source of extraction, and often involve energy-intensive harmful long-distance transport. Estimates of impact of the built environment on nature are as follows: Buildings alone account for one quarter of the world’s wood harvest;

a) Buildings consume 1/6th of freshwater supplies;

b) Buildings contribute 25% to 48% carbon dioxide emissions;

c) Buildings account for 1/3rd to ½ of total green house gas emissions in developed nations;

d) Construction industry uses 20 to 60% of total energy consumption in different countries

e) Buildings account for over 40% of the world’s total energy and raw materials consumption

f) Building waste accounts for 44% of landfill and 50% of packaging waste in industrial nations,

Because of faulty design people have to spend more on defensive expenditure on health, safety etc. Landscape designs often demand wasteful watering systems and introduce feral plants while failing to provide local people local food sources and food for non-human beings. At the end of product life, more costs are incurred in landfills that consume valuable space and leach toxins into ground water.

Even Innovations Need to Change

Material and energy consumption in developed countries need to be reduced by 90% in the next 40 years, if we are to meet human needs equitably within the earth’s carrying capacity. Today’s R and D is geared to assume innovation to occur within the con-
straints of a linear industrial system. R and D investment is di-
rected towards spurring economic growth through resource ex-
ploration and consumption.

Even when innovation is linked to eco- efficiency its value
appears to lie in the survival of business, rather than human health
and well-being. Priority should be given to innovations that target
wasteful and polluting processes and products or reduce material
and energy flows. For designers it is necessary to go beyond “re-
duce, reuse and recycle” to “radical resource reduction”.

The other requirements of new design strategy are:

a) Bio-mimicry to eliminate waste and toxicity
b) Service and flow economy – meeting customer needs and not
   creating new wants
c) Investing in natural capital to restore eco- systems and nature’s
   services.

Public education that promotes economics in energy and ma-
terials use needs to be promoted

**Human Ecology Design: Checklist**

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Essential Qualities</th>
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<tbody>
<tr>
<td>Genius Loci</td>
<td>The spirit of place, Voice of the land, local history;</td>
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<tr>
<td>Landscape</td>
<td>Pattern of Spatial relationship, Location on maps and plans</td>
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<tr>
<td>Elements</td>
<td>Physical features, Climate and weather</td>
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<tr>
<td>Biotics</td>
<td>Life and its supporting systems, Habitats and toxins</td>
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<tr>
<td>Community</td>
<td>Social control, Group and Community processes, institutions, Power</td>
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<tr>
<td>Population</td>
<td>Numbers of species present</td>
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<td>Organism</td>
<td>Living or non-living entities, health and function issues, basic needs</td>
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<td>Eco-cycles</td>
<td>Cycles of matter, energy efficiency, technology, pollution</td>
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<tr>
<td>Connectivity</td>
<td>Linkages, communications, transport</td>
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<tr>
<td>Time</td>
<td>Change over time, life cycles, learning systems, continuous improvement</td>
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<tr>
<td>Catalysts</td>
<td>Positive and negative feedback, SWOT analysis, Ownership, Implementation</td>
</tr>
<tr>
<td>Unspecified</td>
<td>Any special project themes</td>
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Industrial Ecology

The global scale of Industry implies that the existing architecture of the Industrial System is obsolete. Industrial ecology is the emerging response to this challenge. It sets out systemic design principles for harmonious co-existence of the industrial system and the natural system. Nature is a cyclic system. International economy can be designed as continuous cyclic flow of materials. Germany is the first country to begin seriously experimenting with the legislation needed to create a cyclic economy. The best known example of an eco-industrial park is in Denmark. It involves cooperation between an electric power plant, a plasterboard factory, an oil refinery, a biotechnology production plant, a sulphuric acid producer, cement producers, local agriculture and horticulture and district heating. Waste of one becomes the raw material of the next. In developed nations Dematerialization, less use of energy and material is happening. De-carbonization, i.e. moving away from high carbon fuels to low ones is also happening. Cyclic flow of materials may suffer from leaks. This problem can be solved by designing differently.

Philosophic Base of Eco-design

Social justice and non-violence, biological and cultural diversity, democracy and participatory decision-making and non-competitive, non-hierarchical forms of social organisation are accepted as preconditions of a sustainable society.

There has been a gradual convergence of ecology, feminism and socialism in green thought. Instead of a Rational Man and Consumer Sovereignty, a relational concept of humanity is developed stressing interdependence of community and nature and emphasizing altruism, empathy and caring. Individual is seen as a caring entity rather than a claimant of rights. Creative design thinking can avoid trade-offs between rich and poor and nature and society. Environmental management has traditionally concerned itself with issues that lend themselves to “hard” measurable, dispassionate methodologies. There has been now increasing attention to developing life quality indicators that look at outcomes rather than outputs.
Responsible Design

If building upon the foundations of eco-philosophy is the first step, redefining design is the second step making ecological design. At the very least, designers should ensure that the long-term social and ecological costs of products or developments are internalised, rather than passed on to third parties, the poor or future generations. For example, Urban development should always reduce demand for conventional infrastructure systems (transport, sewage, water and food supply).

Such design strategies include “design for disassembly”, design for reuse and design for long-life. A multiple of software is now available to help designers eliminate the life cycle impacts of design decisions. Ecological design can help improve the health of humans and other flora and fauna. It can help reintegrate social and natural world, restoring physical and psychological health.

Ecological design can be “hard tech” or “nuts and bolts”, like hyper-car or “soft tech” or “nuts and berries” such as perma-culture. Ecological design is diverted toward a vision for a better future. This process involves determining needs and priorities through participatory planning and design processes and encouraging clients and communities to rethinking end – uses, functions or services required to meet their needs. Buildings, landscapes and urban areas as a whole should provide their own ecosystem services, use only renewable or reusable materials, supply their own energy and water on site.

The Sustainable Landscape

Landscapes can be seen as the matrix within which the structures and processes of modernity and post modernity operate, and as a potential form-giver and catalyst for a paradigm of sustainability. New holistic perspectives emerging from fields as diverse as physics, economics and philosophy provide useful insights and methodologies through which the relationship between people and nature may be restructured.

A Sustainable landscape design should
a. Respond to original sources of inspiration;
b. Respond to the site, the unfolding of ecological potential;
c. Minimise inputs;
d. Maximise resilience;
e. Create a place
f. Make systems visible;
g. Minimize maintenance.

The design should catalyse a general shift towards sustainability:
Through integrating art and ecology; Mitigating negative environmental impacts; Enabling opportunities for green product and services; facilitate a multi-disciplinary, participatory design framework.

Urban Buildings: Eco-Design Considerations
1. Broader social and environment context
   • Consider including public uses – childcare facilities, galleries and restaurants
   • Minimize dependency on urban infrastructure
   • Reduce existing urban wind tunnels through building form;
   • Consider design for crime prevention, and provide for environmental education tours.
2. Transportation and global warming
   • Encourage tele-commuting to reduce transport
   • Accommodate public transport
3. Contact with nature in urban areas
   • Provide outdoor open space, seating and plazas
   • Encourage food production on site (roofs, balconies, atria)
   • Provide for vermiculture
   • Create micro-habitats of flora and fauna
   • Use solar landscaping – trees for shading and ponds / fountains for cooling
4. Floor planning and layout
   • Locate services (Wires, ducts) in the floor for easy access;
   • Screen the sun in hot areas with storage, lifts, and corridors.
   • Ensure lighting fixtures are easy to access.
5. Day light and employee comfort
   • Maximize natural lighting in the interior;
   • Ensure cross-ventilation
   • Avoid glaze and heat from windows
   • Design ceiling for both acoustics and absorption of heat
6. Air quality and health
• Reduce or avoid air-conditioning by cool air intake
• Avoid hazardous materials
• Reduce noise amplifications through wall and ceiling articulation, materials etc.
• Ensure air intake is not near kitchens, congested streets and garbage areas

7. Resource and materials conservation
• Design for rooftop rain water harvesting
• Develop a system for collecting, storing and distributing surface water run-off.
• Treat grey water with organic systems
• Basement may be used for organic waste treatment
• Reuse materials from buildings demolished nearby
• Design for durability

8. Timber Usage
• Avoid rainforest timbers and native forest timbers
• Wood can only be used from sustainably managed plantations,
• Use woodless timbers (Hemp, bamboo)
• Minimum timber waste and plant trees

9. Energy and Heat Conservation
• Take into account local climate
• Consider co-generation; use passive solar heating and cooling technologies;
• Use insulation serving many functions (heat, noise)

10. Technology
• Design for future upgrading and downsizing of mechanical equipment;
• Consider smart windows that shade automatically and generate electricity;
• Use photovoltaic cells that are integral to the roof or walls to generate electricity.

11. Construction process
• Demand minimum packaging of products delivered to the site; use contracting systems where incentives can be given for eco-solutions.
• Ensure comprehensive waste management and safety plan
• Ensure energy conservation measures are checked and fine-tuned after use.
Urban Ecology

Urban areas occupy only 2% of the world’s land surface, they use 75% of the world’s resources and release a similar percentage of global wastes.

By looking at the city as a whole and by analyzing pathways along with energy, materials and pollutants move, it is essential to conceive management and technology to increase efficiency of resource use and recycling.

It is necessary to mimic circular metabolism of natural systems. Grey water can be used for urban irrigation.

More ecologically advanced treatment processes use microorganisms and plants to detoxify sewage.

Urban ecology helps us to generate information relevant to functioning of ecological and human systems and to create responses which are holistic.

The Human responses must incorporate a sound understanding of the functions of eco- systems.

Waste Reduction Check List

1. Has a culture of resource efficiency been developed in your operation? Are sub-contractors and suppliers aware and involved in your waste minimisation plan?
2. Do you have reward system that benefits waste-smart staff?
3. Have you developed waste minimisation performance indicators?
4. Do you have a suitable record-keeping system to monitor and assess performance?
5. Are all key office and site personnel involved in your waste reduction planning?
6. Do suppliers and sub-contractors know what is required of them?
7. Have you developed policies and procedures for separating waste material on site?
8. Are trees and native vegetation retained to fullest extent?
9. Do you retain top soil for reuse on the site?
10. Are erosion and sedimentation controls in place before excavation? Are these controls checked regularly and after heavy storms to ensure they remain effective?
11. Do you use materials produced locally?
12. Do you maximize prefabrication which reduces site waste?
13. Do you specify and or purchase recycled products where possible?

References


Prakash Gole