

The Machine Age

1. To make machines capital is required.
2. Capital comes from savings
3. Savings come from Trade and Commerce
4. Trade is facilitated by discovery of new sources, easy access, control in the form of monopoly or monopsony
5. Freedom from authoritative, despotic rule, spread of general education and skills promotes exploitation and inventions.
6. Individual initiative and effort, personal skills, organisational abilities can operate freely.
7. Individuals are free to choose and prefer.
8. They are free to use scarce resources in such a way as to get maximum returns from them.
9. Alternative demand and uses compete with each other for scarce resources.
10. Resources are allocated among competing uses in such a way as to earn optimum return to every use or demand
11. Favourable conditions for all, welfare of society in general, are achieved as if through the operation of an invisible hand.

Operation of the Machine Age

Reality belied this optimistic scenario

Land and labour proved limiting factors

Best lands are limited, output falls as inferior lands come into use

After a point every additional unit brings in less returns, marginal returns to labour diminish and costs increase.

Wages cannot fall with every fall in demand

Profits are mainly due to low wages and externalities

Economic growth could not be sustained; therefore, economics was called a dismal science.

But exploration of new lands, availability of new sources of raw materials and supply of cheap labour increased profits and prosperity

For a time there was no unemployment and no failure of demand

Consumer sovereignty means a given set of wants and a given set of preferences

Market is the place where infinite numbers of producers and consumers interact.

It is the mechanism which has all the knowledge - the amounts of factors of production available, the information about the household preferences, present and future set of prices etc.

Price is related to scarcity of a commodity. As resources deplete, prices rise, production will shift to less resource use, consumption will decline, recycling will be encouraged.

Thus price mechanism will regulate the production and consumption.

Price efficiency involves a given set of property rights, a given set of resources and given organisation and technology.

In perfect markets there is absence of public goods and of externalities. Everything has a price and everyone is a price taker.

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, manufactured 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 re-cyclability.

- 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?

6. Extend product durability.

- 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 needs?

How firms can React to Government Interventions

- 1) They can either react to government policy or try to influence it
- 2) They can support or co-operate with official agencies or try to hinder them
- 3) They can threaten to go out of country
- 4) They can lobby and pressurise to change policy
- 5) They may even try to manipulate information
- 6) They may try to underestimate emissions and over-estimate abatement costs
- 7) They may take preventive action by stopping obnoxious production
- 8) They may create a common fund to share costs
- 9) They may develop performance indicators
- 10) They may set up a green product standard
- 11) They may fit improvements to their investments schedule
- 12) They may invite government action to reduce free riding

On the other hand Government Officials can

- a) impose a time limit;
- b) favour and interact with interest groups;
- c) design an incentive system;
- d) ask for data and expertise;
- e) consult industry and bargain with them
- f) establish a programme in consultation with industry

Urban Buildings: Eco- Design Considerations

1. Broader social & environment context

Consider including public uses – childcare facilities, galleries & restaurants

Minimize dependency on urban infrastructure

Reduce existing urban wind tunnels through building form;

Consider design for crime prevention, & provide for environmental education tours.

2. Transportation & global warming

Encourage tele- commuting to reduce transport

Accommodate public transport

3. Contact with nature in urban areas

Provide outdoor open space, seating & plazas

Encourage food production on site

(roofs, balconies, atria)

Provide for vermiculture

Create micro- habitats of flora & fauna

Use solar landscaping – trees for shading & ponds / fountains for cooling

4. Floor planning & layout

Locate services (Wires, ducts) in the floor for easy access;

Screen the sun in hot areas with storage, lifts, & corridors.

Ensure lighting fixtures are easy to access.

5. Day light & employee comfort

Maximize natural lighting in the interior;

Ensure cross- ventilation

Avoid glaze & heat from windows

Design ceiling for both acoustics & absorption of heat

6. Air quality & health

Reduce or avoid air- conditioning by cool air intake

Avoid hazardous materials

Reduce noise amplifications through wall & ceiling articulation, materials etc.

Ensure air intake is not near kitchens, congested streets & garbage areas

7. Resource & materials conservation

Design for rooftop rain water harvesting

Develop a system for collecting, storing & 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 & native forest timbers

Wood can only be used from sustainably managed plantations,

Use woodless timbers (Hemp, bamboo)

Minimum timber waste & plant trees

9. Energy & Heat Conservation

Take into account local climate

Consider co- generation; use passive solar heating & cooling technologies;

Use insulation serving many functions (heat, noise)

10. Technology

Design for future upgrading & 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 & safety plan

Ensure energy conservation measures are checked & fine – tuned after use.

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 trying to tax, 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 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.

FOREST AND WETLAND RESTORATION PROJECTS NEAR PANSHET DAM WEST OF PUNE CITY.

This pioneer restoration work began in 1986. It is now internationally acclaimed as the only such one in developing countries.

Benefits accruing from these projects:

1. Regeneration of indigenous forest and wetland plants;
2. Improved fodder supply to local people;
3. Low-cost water purification for all;
4. Conservation of fish and other fauna such as Barking deer, Indian Fox, Hyena, Monitor lizard, Snakes and a variety of birds;
5. A forest and wetland data collection, monitoring and research station.

These projects have received the Excellent Project Award from the Society for Ecological Restoration, U. S. A.

Very complex eco-systems, such as tropical forests, may lack resilience once disturbed by human beings

The relevant question is how much or rather how little, redundancy we can afford to lose without pushing the system to the edge of some irreversible and catastrophic change

The choice of a suitable time scale for evaluating the effects of a proposed action is of paramount importance

Eco-systems affected by human activity usually exhibit low resistance to natural stresses such as fires, droughts, pests and diseases. When native grassland is converted to monoculture, the resulting system is inherently unstable and needs huge inputs of energy and material to remain in a desired condition

Placing an economic value on biodiversity prevents us from coping with the root causes of loss of diversity and from recognizing the value of the environment, other than as a commodity to be exploited; it assumes a perfect substitution between natural and market capital

All over the world renewable resources have been systematically overexploited and diminished to local decimation or extinction

Focusing strictly on target or endangered species is rarely the best strategy. Conversely, a community based conservation strategy may protect up to 85-90% of species by conserving representative natural communities without a separate inventory of individual species.

In Nature young eco-systems are characterised by growth and a high production efficiency while mature eco-systems by a high maintenance efficiency.

In a fully grown, mature eco- system like a rain forest, net productivity is zero.

What we have today are ecological- economic systems which are co-evolutionary.

The dynamics of the joint systems are characterised by the discontinuous change around critical threshold values both for economic and for ecological resources and its stability depends on the resilience of the uncontrolled parts of that system.

The very notions of equilibrium in economics and ecology are antithetical

In growth economics equilibrium refers not to physical magnitudes at all but to a balance of desires between savers and investors.

As long as saving is greater than depreciation, net investment will be positive. This implies a growing flow of physical inputs from and outputs to nature, that is a biophysical disequilibrium.

Internalising all externalities may not be a sufficient policy. Without an external limit, the price system may keep on spreading the increasing weight evenly until the evenly-loaded boat sinks.

Ecology and Technology-2 sides of the same coin.

They do not exclude each other

We need a New Perspective to look at things.

A New Technology is coming into vogue today

Based not on Profit Maximisation but Natural Resource Management.

The present course may be seen as a Blue Print of New Technology.

The 4 Pillars on which this New Technology stands erected are:

1) Sustainability

2) Adequacy

3) Equity

4) Purity

PROJECT TO DEMONSTRATE MULTI-PURPOSE USE AND SUSTAINABLE MANAGEMENT OF IRRIGATION RESERVOIR AT UJNI

There are thousands of irrigation reservoirs in India. If managed well they can provide a variety of benefits. To demonstrate these possibilities Ecological Society carried out a project on the Ujni reservoir east of Pune. Unfortunately it was destroyed through vandalism and negligence by authorities after completion. It could have earned the following benefits:

1. Provision of clean drinking water, quality fodder, firewood and timber to people in the vicinity;
2. conservation of many rare aquatic and land plants including some medicinal varieties;
3. conservation and quality enhancement of indigenous riverine fish stocks;
4. conservation of a variety of waterfowl and other birds and
5. eco-tourism development in the vicinity of Ujni reservoir.

GRASSLAND & WETLAND DEVELOPMENT PROJECT IN RAIN-SHADOW AREAS NEAR PHALTAN

In drought-prone areas grassland & fodder development is more sustainable than agriculture. This project aims at conservation of biodiversity of dry areas. This diversity includes a number of unique and medicinal plants, flowering herbs, interesting insects and reptiles and a variety of birds and animals. Benefits of the project include:

1. conservation and quality enhancement of grasses and fodder plants;
2. conservation of surface and groundwater in dry areas;
3. conservation of dry land biodiversity and
4. provision of fodder and grazing management for pastoral communities such as Dhangars.

Micro-Environments

1. Protected Areas

Home gardens, Kitchen gardens, Vegetable and horticultural patches, Protected plots (from livestock)

2. Natural Drainage

River beds, Riverine strips and vegetation, wet and dry water courses, Channels, Springs, Patches of high ground water seepage, Strips and pockets of impounded drainage, Animal wallows.

3. Depositional Areas

Valley bottoms, Alluvial pans, Terraces, Depositional fields, Raised fields, Pockets of fertile soil, Former cattle pens, Small flood plains, Flood recession zones.

4. Erosional Areas

Ditches, Gullies, Ponds, Lake basins, Fish ponds, Water harvesting structures

5. Cover types

Hedges and windbreaks, Clumps, Groves, Lines of trees and bushes, Sheltered corners, Strips on slope, Configuration

India is the most Fertile Ground to initiate this New Technology.

Its Technique is to study Nature and Adapt to its Basic Ecological Processes, instead of trying to overcome or change them.

It emphasizes Vegetation Management and Biomass Utilization.

It endeavours to restore Degraded Eco-systems and make them Productive and Sustainable.

It is Cost-effective, Equitable and involves least side effects.

In most cases, it is groups of species, rather than individual species, that assume importance, forming "Keystone Groups" or "Functional Groups (guilds)"

Functional groups are collection of species that perform the same function and that, to some extent, may be substitutable and viewed as a unit

Loss of species within a guild may reduce the long-term resilience properties of the system, and may lead to noticeable change in short-term system dynamics

On the other hand, redundancy in the guild plays a fundamental role in maintaining an eco-system's ability to respond to changes and disturbance and may provide a hedge against stresses and catastrophes

Changes in species populations within a functional group usually occur on a much faster time scale than dynamics among groups. Therefore, in the short time scale, a reduction of within group heterogeneity is not likely to change eco-system properties appreciably.

Rising incomes means resources
committed to protecting an
unstable equilibrium

Eco-systems characterised by Fast-
Moving sub-systems in slow-moving
large systems

Change in sub-systems may trigger
an avalanche.

Economic sustainability may still
not achieve ecological sustainability

Technology then adapts to degrading
environment-

Maintenance of Diversity and
underutilization of eco-systems
necessary