

Will the PM prove me wrong?

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Now that the new govt. is in power at the Centre, and the new PM has assumed office, many must be speculating about his likely policies & the budget, and some may proffer advice of what he should or should not do. I cannot do either of these. But I am reasonably sure of what the PM will not do or will not be able to do. I shall be delighted if the PM proves me wrong!

The new PM is has a doctorate in Economics from a reputed foreign university. One can assume that he knows the essence of all that has been advocated by renowned economists about govt. policies. According to micro-economic theory, the goal of the modern economy is to ^{maximise} increase the production of goods and services by using the best available technology. If due to some reasons there is an imbalance in the forces of supply & demand and demand slackens, the state must intervene, take up activities that would put purchasing power in the hands of the people & stimulate demand. Globalization also aims at ~~is~~ maximising the production of goods & services wherever it is best possible and without any hindrance.

But some of the leading economists have also said that the best & the most efficient form of production is one based on

utilization of local resources to satisfy local needs! And then to cater to the needs of distant people through exports & imports is ultimately both expensive and uneconomic!! This is almost similar to what Gandhi visualised - Village self-sufficiency.

~~And~~ Our new PM must be aware of this; but I am confident that he will do nothing to promote development of local resources to satisfy basic needs of local communities. Neither will he do anything to promote village employment through development & wise utilization of local resources.

But he will do everything possible to enhance agri. development through greater allocations to this sector. But this development in all probability will follow the Green Revolution model - enhanced use of irrigation, fertilizers & pesticides with biotechnological miracles thrown in whenever possible! That agriculture is an integral part of local resource development will be beyond the macro-economic vision of the new PM.

Is the PM consciously thinking of reducing the burden of population dependent on agriculture? I do not think so. This can only be done by creating alternative livelihoods such as through developing at local level grasslands, wetlands, forests etc. But the macro-economic

Vision need to consider an economy as consisting of agri, industry, transport & communication, services etc. cannot visualise such non-technological niches & their improvement!

The emerging water problem will undoubtedly demand PM's attention. He may not push the project to interlink rivers with as much vigour as the Vajpayee government. But he will continue to support gigantic projects. Again his macro-economic vision will not enable him to visualise that the ultimate goal of the water policy is to ensure at least minimum water (50 to 80 litres per day) ^{of good quality} to every Indian irrespective of his income!

The recent droughts and resulting water shortages in different parts of the country have underlined the shortcomings in the present water management. The goal of ensuring minimum supply of good quality water to everyone can be achieved only if at the local level every stream & river is rejuvenated, managed well & allowed to flow freely! (thereby recharging groundwater too). Indeed rejuvenation & maintenance of streams & rivers at the local level is an integral part of local resources development. I do not think the PM will emphasize the need to develop & manage streams & rivers at the local level!

This means that the present policy of constructing big dams & canals will continue. The result of such policy is to encourage the production of goods & services that satisfy the needs of Urban India. It means cities will continue to receive goods & people from rural areas. Cities will continue to expand, will put increasing demands on natural resources in the country side around them and destroy & pollute soil, water & atmosphere in areas.

I do not think the PM's policy will include a conscious effort to restrict the growth of cities!

A growing city requires space for roads, highways, railways, airports, housing, water storages, waste disposal & many other things. Provision of such infrastructure disturbs different landscapes on a gigantic scale. A researcher has recently filmed a revealing phenomenon. His film shows that on roads leading to a popular hill station, vehicles everyday kill on an average 50 snakes during the peak ^{tourist} season. One can imagine the colossal destruction of biodiversity that every gigantic construction project must involve!

Will the new PM ^{be} sensitive to such destruction? I do not credit him with such sensitivity, though he may not allow himself to be drawn into the environment vs develop. debate.

9 Feb.

On the whole, the new PM is likely to continue the low priority accorded to Environment & Nature Conservation by the Vajpayee Govt.

If the economy is going to be directed to maximise production of goods & services required by the Urban India, Intermediate or Life style goods will mainly be produced. These goods include cars, ^{motorbikes} refrigerators, air conditioners, TV sets, transistors, music systems, washing machines, etc. etc. They are capital and energy intensive and create heaps of waste in the surroundings leading to increased pollution. Enhanced prod. of these goods may create a "feel good" factor for the urban people, but will deny common people the means & resources to satisfy their basic needs. In addition they will have to ^{suffer} ~~face~~ increasing contamination of the countryside. The lot of the common man will be to breathe poisonous air, to drink polluted water, to eat food contaminated with pesticides and to live surrounded by garbage! I do not think the PM will make a concious effort to improve these conditions.

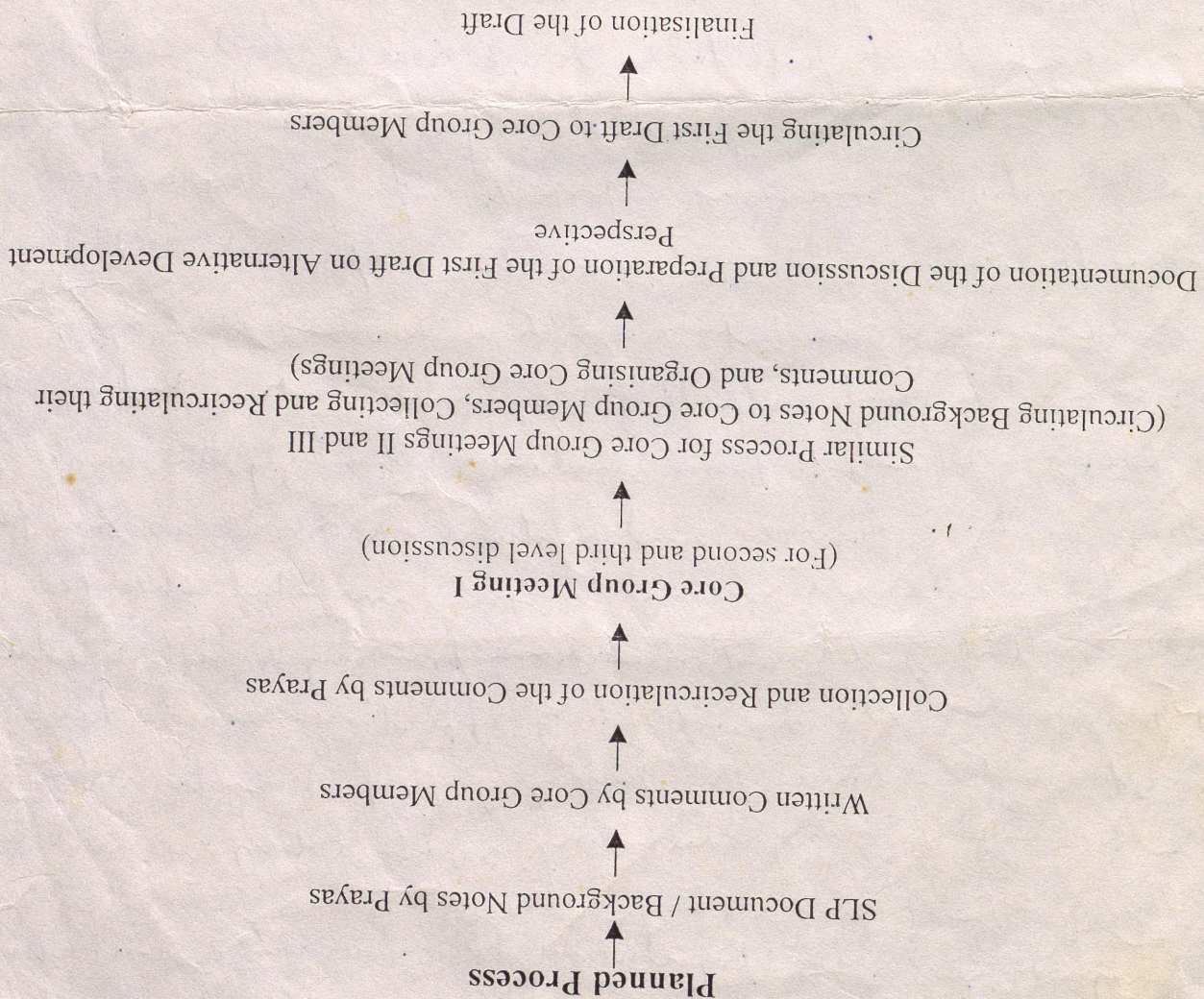
These degrading conditions can be improved not through a macro-economic vision but through a far more comprehensive holistic vision. The understanding of bureaucrats & policy makers must undergo a change: from making technology the basis of life to accepting nature's services and natural resources as the foundation of human life. This also means a fundamental change in the direction & content of education - from primary to higher education. I do not think the PM is capable of effecting such fundamental changes. He will continue the policy of preferring higher technological education to basic primary education. Such policy means greater inequality in society.

A majority of India's population, both human & non-human continues to eke out its living on a shrinking natural base. Like his predecessor the new PM will continue to ignore this basic fact. Our present education kills our traditions of conserving natural resources.

I do not think the PM will do anything to ensure that education for the common man includes enhancement & conservation of the quantity & quality of our natural resources.

Leading economists all the world over not only say that production from local resources to satisfy local needs is the most efficient & economical but they also emphasize the importance of the maintenance of ecological services that Nature affords. That production is the best which maintains the flow of eco-services, according to them. I am sure the PM as an economist, must be familiar with this credo. But I do not think he will effect changes in the content & quality of production necessary to bring this about.

To sum up the new PM & his govt. will only be able to bring about cosmetic changes in the policies & programmes of previous govt. that will neither benefit the common man, nor heal the wounds of Nature. Will the PM prove me wrong?



ENVIRONMENTAL ECONOMICS

The period that preceded the birth of Modern Economics was called Mercantilist Era.

In that Era, Wealth meant precious metal; treasure easily convertible into armies and national power.

Discovering of mines; favourable balance of trade based on low prices of exported goods were necessary to create wealth.

But low prices meant low wages to home workers resulting in an army of poor labourers.

With the advent of machine based production, the importance of division of labour in mass production was recognised.

Productivity could be increased by:-

- 1) Increasing the output of goods and services per unit of natural resource input.
- 2) Increasing the flow of natural resources per unit of national stock
- 3) Increase natural resource inputs per unit of waste by recycling or making waste easier to assimilate.
- 4) Increase the end use efficiency with which goods produced yield services to the final user.

All these may not conserve ^{erve}~~the~~ the natural resource.

ENVIRONMENTAL ECONOMICS

1) The Character of Ecology and Economics

Ecology

- Deals with inter-relationships between biotic and abiotic components
- Its basis is fundamental eco-processes and eco-systems
- Prime movers Solar energy and survival and reproduction of Organisms
- Deals with common resources whose prices are difficult to determine
- Leads to production of Natural Capital which has a low rate of return in the market
- Allocative efficiency through survival of the fittest and natural disturbances
- Tends towards high biodiversity and low energy surplus

Economics

- Deals with interactions between forces of supply and of demand
- Its basis is consumer wants and preferences expressed through property rights
- Prime movers individual profit motive and technology
- Deals with privately owned resources whose prices are determined in the market
- Leads to production of Man-made Capital which has a higher rate of return in market
- Free competition enables markets to allocate scarce resources among competing wants
- Tends towards standardisation and mass production to produce large surpluses

1. The theory of economic growth rests on the assumption that aggregate wants are infinite and aggregate production can be made infinite due to continuous improvements in technology.
2. More and more efficient technology enhances the scale of exploitation of resources.
3. It appears as if overall costs are reduced as costs in terms of entropy and in terms of developing the technology are not considered.
4. Increasing costs leads to compulsion to sell; increasing the scale has an inherent tendency to over-produce and over-consume.
5. The idea is money must constantly circulate and everyone will feel happy if everyone gets a share in it.
6. Though money incomes rise real incomes go on falling, resulting in greater income disparities, unrest and violence in society.

Increase in productivity leads to growth.

John Maynard Keynes tried to seek full macro-economic employment through optional micro-economic allocation of resources.

Technological progress led to high productivity and a boom in economic activity after the 2nd world war.

The assumption of Keynesian growth mania was that aggregate wants are infinite and could be served by making aggregate production infinite by means of technology.

The growth economists' vision is one of continuous growth in intermediate means in order to satisfy ever more intermediate ends.

The problem before Neo-classical economists was how to get maximum want satisfaction from scarce resources?

The answer was through perfect competition between buyers and sellers.

But perfect competition was possible only if the distribution of wealth and income in the society is ideal.

The problem of economics is not to assume ideal conditions but to create ideal conditions.

Ideal conditions are difficult to create as rationally self-interested individuals will frequently act so as to externalise all or part of the costs of their activity.

In macro- economics, the common pre- analytic vision is the circular flow in which the economy is viewed as a system isolated from its surrounding environment.

Economy does not depend on physical environment but rather on the continuous flow of money income.

Nature is considered to be just one more sector like agriculture and industry.

But the economic sub- system has grown to the point that its physical demands on the eco-system are far from trivial.

Nature imposes particular and general scarcities upon resource availability and pollution sink space.

Kenneth Boulding, Georgescu-Roegen, H. Daly and Ayers expressed the first concern of the physical properties of ecological economic systems.

They first drew the economists' attention to the necessity for physical production and consumption to respect the basic laws of physics.

That higher rates of economic growth imply higher rates of change in the processes of the environment. Growth simply means the satisfaction of ever more trivial wants while simultaneously creating ever powerful externalities that destroy ever more important environmental amenities.

Rational individual does not mean ethical individual.

Consumer sovereignty may involve irrational preferences.

Self-interest should be circumscribed by a moral climate, social virtue, proper education and institutional set up.

Market cannot find an optimum scale, an optimum income distribution.

What is produced is of no concern to the market.

Common law recognizes polluter's rights and not pollutee's.

Market system does not recognise the physico-biological realities.

Price system does not recognise the bio-physical characteristics of the ecology-economic system.

Market prices fail to recognise social scarcities

Marginal benefit of an additional unit of man-made capital is equal to marginal cost of sacrificed natural capital.

Prices do not balance marginal eco-system services sacrificed against marginal social benefit from increased resource use.

Uncertainty and irreversibility of eco-system functioning are not taken into account.

• Economic Perspective

- * Infinite Technological progress leading to infinite growth
- * Man-made Capital is a perfect substitute for natural Capital
- * Environmental damage can be easily repaired through :
internalising externalities

Setting standards & Limits to harvesting and emissions.
- * Legalising EIA & Cost-benefit analysis
- * Creating national parks and Sanctuaries
- * Develop & implement restorative, preventive & adaptive measures
- * Create government agencies to set limits & standards & enforce them
- * Promote eco-development, sustainable use of energy and resources and polluter pays principle.

Ecological Perspective

- Continued expansion of economic activity cannot be supported by eco-systems
- Harvesting rates within Regenerative Capacity of eco-systems
- Waste emission should not exceed absorptive capacity
- Stabilise human population & reduce consumption of the rich
- Rate of exhaustible resource exploitation equal to creation of renewable substitutes
Protect biodiversity, water, soil and nutrient cycles
- Maintain stability & resilience of eco-systems
- Promote cultural & biological diversity, multiple value systems & decentralised planning
- Maintain multi-functionality of natural capital and protect eco-processes

ECONOMIC SUSTAINABILITY

- Consumer Sovereignty

requires A set of Wants
requires A set of preferences
requires A set of resources
requires A set of property rights
requires A set of present &
future markets

Organisations & Technology
of Production

As some resources are exhaustible,
to maintain consumption, it is
necessary that

- 1) their prices must increase
at the rate of interest for
efficient allocation of
exhaustible resources
- 2) Rents received over time
from efficient allocation
are re-invested in
reproducible capital (which
can be substituted for the
exhaustible resource)

ECOLOGICAL SUSTAINABILITY

Cleaner Technologies
Long term Planning
Co-ordinated actions
Micro-level planning
No change in the number
of native species
No change in standing
biomass

No change in mineral micro-
nutrient stocks
No change in the mechanisms
of and capacity to dampen
oscillations

Requirements of the system
are more important than
consumer sovereignty

Entropy formation and wastage
of energy must stop

1. It was assumed that pursuit of profits leads to and promotes social gain.
2. Therefore, it was assumed that the distribution of income would be fair and just.
3. It was assumed that aggregate wants were infinite and technology would make aggregate production infinite even though resources were scarce,
4. Thus infinite economic growth was possible with infinite technological progress. Consumer sovereignty was assumed to be paramount and more important than Eco-system requirements.
5. The quality of individual or household preferences was not considered by economics.
6. Also creation of waste and its disposal was not considered. Environment was treated as a sink, capable of taking care of all waste.
7. Thus ideal economic conditions were assumed though the basic economic problem is to realize ideal conditions

The Character of Eco-system and Economy

Eco-system

- * It is an area where inter-action takes place between species and their environment
- It organises flows of solar energy and materials
- Distribution of energy and matter between communities and individuals
- Leads to biological productivity
- Gives rise to food chains and food webs
- Waste recycled through positive & negative feedback loops
- Species compete for resources food and space
- Species can use a range of resources
- Progress non-linear and discontinuous
- Progress hampered by loss of resilience & of absorptive & regenerative capacities

Economy

- It is an area where interactions takes place between firms and households
- It organises flows of free energy and matter
- Distribution of energy and materials between firms and households
- Leads to economic productivity
- Gives rise to social organisation hierarchies and institutions
- Tends to create an open system with accumulation and partial recycling
- Individuals compete for resources, food and space
- Individuals can choose bet. resources and alternative uses
- Progress through expansion of scale and increase in output
- Progress hampered by increasing pollution and damage to eco-processes

Valuation of Natural Resources

Considerations

- 1) Valuation of existing resources in terms of market value
- 2) Valuation in terms of restoration costs
- 3) Valuation in terms of regeneration rates & carrying capacity
- 4) Pollution absorption capacity of natural systems including costs to be incurred if some set levels for acceptable damage are exceeded
- 5) Subtracting the costs of explicitly defensive measures from value of production
- 6) Evolution of other measures such as net national welfare instead of GNP for evaluation of national economic performance.

PARAMETERS OF SUSTAINABILITY

Less Physical Movement

Less emphasis on physical transportation

More information and capital flows

Greater mixing of land-use

Less specialization and concentration in production

Small-scale installations

Economies of scope over economies of scale

Decentralisation

Greater reliance on local resources

Greater reliance on local markets

More sensitivity in matching activities and locations so as not to over-reach environmental capacities

DIFFERENT MEANINGS OF SUSTAINABILITY

- 1) Sustainability means maximum yield from local resources in consonance with long- term environmental conditions
- 2) It may mean maintenance of agricultural production through periods of disturbance and stress
- 3) It may mean an integrated system where the overall productivity is dependent on maintaining soil, water, plant and animal resources on a farm or over a larger area
- 4) It is low-input agriculture where, instead of increasing productivity, profitability or net gain is enhanced by decreasing expenditure on fertiliser, pesticides, machinery and other expensive inputs

WHAT IS A SUSTAINABLE ENVIRONMENT?

- 1) It is an area in which ecological integrity and basic human needs are concurrently maintained over generations
- 2) Ecological integrity means maintaining near natural conditions in 4 broad areas- soil, water, biodiversity & productivity
- 3) The condition of soil can be measured by the amount of soil erosion
- 4) Quantity of water depends on average local rainfall and area and fish diversity is a good indicator for water quality
- 5) Natural biodiversity is the number of native species in each group; for example, trees, shrubs, birds, mammals etc.
- 6) Near natural productivity indicates a level that would prevail if the whole landscape had native eco- systems

Research and Management
to
Achieve Sustainability

- 1) Discount future damage to environment at a correct rate (low)
- 2) Develop methods to predict the future productivity of all capital : man- made and natural
- 3) Develop methods and techniques for assessing present and future values of damages to environmental resources
- 4) Develop techniques to deal with uncertainty about future damages
- 5) Try for agreement on principles of risk- sharing between generations
- 6) Design incentive systems so that decision- makers take into account the consequences of their decisions on future generations
- 7) Form institutions to undertake necessary investment to compensate future generations for current degrading activities

But sustainable use of resources involves :

Harvesting rates within the regenerative capacity of the eco-system

Waste emission and disposal within the assimilative capacity of the eco-system

Rate of non-renewable resource exploitation to be equal to creation of renewable substitutes.

It will also involve enhancing the quality of life supporting services

It can only be achieved through :

Reducing the consumption of the rich

Stabilizing human population

Promotion of biological and cultural diversity and multiple value systems and adopting the precautionary principle

Decentralized planning based on local resources for local populations

Greater investment in natural capital and increasing the prices of resources relative to labour

Simple low-level technologies promoting non-growth economies.

Valuing Natural Resources

$$TEU = UV + NUV = DUV + IUV + OV + PUV + EV + BV$$

Total Economic Value = Use value + Non-use value
= Direct use value + Indirect use value + Option
value + Potential use value + Existence value +
Bequest value

DUV = Direct consumption = food, biomass, recreation,
health

IUV = Functional benefits = Ecological function =
Flood control, Storm protection

OV = Future direct & indirect use & non-use values =
Biodiversity, conserved habitat =
WTP for the option of preserving for
future

BV = Leaving use & non-use value for offspring =
Habitats, Irreversible change =
Benefit to others in future

EV = Knowledge of continued existence =
Habitats, endangered species =
Loss if the resource fails to exist

The general belief is that one can adopt a market and one can grow forever

Technology is considered to be a perfect substitute for resources

Perfect competition requires same level of development among different participants

But labour market is inefficient; it does not always respond to price changes

Market cannot solve the problem of distribution; tax pollution and depletion and account for social scarcities

Market should not determine rates of flow of matter and energy across economy

Prices of energy and resources should be higher than the price of labour

1. The compulsion to reduce costs leads to increasing elimination of labour as a factor of production and its substitution by machines.
2. Fall in employment leads to reduced purchasing power, resulting in fall in aggregate demand.
3. Demand failure may lead to general recession which can only be ameliorated through state intervention.
4. Price mechanism is unable to bring in the desired redistribution of incomes in a technology-powered economic growth.
5. At critical stages of growth state intervention becomes imperative giving a lie to the belief that free trade, liberalization and globalization are the only requirements of economic growth.
6. Market forces are completely insensitive to the distribution of wealth in society. They are no friends of the poor for the production system they promote is based on savings which are built up only through unequal distribution of wealth.

Effects of the large-scale and intensive use of energy and matter

1. Changes in energy flows: Greater use of fossil fuels and metals and chemicals leading to release of heat and creation of waste.
2. Changes in nutrient-cycling: Intensive farming with greater use of fertilizers and insecticides leading to nutrient export and breakdown of soil structure, soil biota and recycling.
3. Bio-productivity: High, short-term productivity encouraged, sustained, long-term productivity ignored.
4. Population Dynamics: Natural population balance disturbed due to species extinction and disappearance, introduction of exotics, monoculture and genetic manipulation.
5. Changes in Biological Succession: Land use patterns lead to more open and bare areas, reverting to earlier and younger stages of succession instead of mature eco-systems.
6. Changes in Bio-diversity: Erosion of diversity; standardisation, and break up of food pyramid. Effects especially severe on predator species, island habitats and tropical (moist) forests.
7. Ecosystem stability: Disturbed; greater release of greenhouse gases, CFC, chlorine leading to changes in atmospheric balance and hydrological cycle
8. Ecosystem modification: Most of the natural Eco-systems modified; wilderness areas getting reduced due to modification and destruction.

All physical processes proceed in such a way that the entropy or disorder of the universe increases.

Man's economic activity may transform a high entropy copper ore into a low entropy copper sheet.

But this lowering of entropy is more than compensated by increase in the entropy of the surroundings.

That means the cost of any biological or economic product is always greater than the product.

During the last two centuries we have known nothing but exponential growth and in parallel have evolved an exponential growth-culture.

It is incapable of reckoning with problems of non-growth.

What is being called into question is not our technical competence but our value system and the very aims and objectives we are pursuing.

As Prof. Galbraith complained about the richest country in the world, it produces private affluence and public squalor.

How Engineering & Economics have Created the Surplus since the 17th Century

Intellectual Awakening

New Sources of Energy

Trade

New Sources of Natural Wealth

Capital Accumulation & Savings

Exploitation of Tropics

Invention of Machines

Large-scale Demands on Nature

Creation of Surplus

Through Low Wages, Cheap Raw Materials and Externalities

Inequalities in Society

Lack of Purchasing Power in the hands of a Majority

Failure of Demand

Recession, Bankruptcy, Mergers

Revival

New Sources of Energy, Raw Materials, Savings or External Credit

Creation of Man-made Capital

Depletion of Natural Capital

DISTRIBUTION OF FINANCIAL & INDUSTRIAL RESOURCES AT
THE BEGINNING OF 21ST CENTURY

Resource	OECD Nations	Middle Income	Lower Income
Population (billions)	1.1	3.4	1.2
% World GNP	82.7	15.9	1.4
% World Trade	81.2	17.8	1.0
% Commer. Credit	94.6	5.2	0.2
Food & Fertilizer Consumption	50% of grain 60% of Ferti.	30-40% Of food	800 m. under- nourished, no fresh water
Transport & Household Technology	92% of cars	2 billion persons without electricity or telephone	
Production & Consumption of energy per year	75% of energy use	10-15% of energy use	100m. no adequate fuel Energy from biomass

GLOBAL INDICATORS AFFECTING NATURAL CAPITAL

Human Population	+ 1.7% per annum
Fertile Soil	- 2.5 % per annum
Biodiversity	1000 species lost per year
Stratospheric Ozone	- 3% per annum (causing forest loss & affecting human health)
Tropospheric Ozone	+ 1% per annum (CF ₄ , C ₂ F ₆ eternal risks)
Greenhous Gases	+ 1% Co ₂ equivalent (> twice the global rate)
Aerosols	+1% Sulphur p.a.

Development based on depletion of natural capital may be sustainable if,

- a) There exists substitutes for such natural capital
and
- b) investment in these substitutes at least compensates for the loss of natural capital.

The welfare gains secured through productivity improvement due to the conversion of natural capital involve a cost and that cost is the loss of resilience in the general system.

It is measured by the resources committed to protecting an unstable equilibrium. For example - expenditure on fertilisers, insecticides, irrigation to maintain agricultural production.

Resilience means the propensity of a system to retain its organisational structure following disturbances.

It is an index of the integrity or health of the system.

The most important factor in the resilience of ecological systems is the diversity of organisms that mediate essential eco- system functions and processes.

Sustainability requires the maintenance of the productive potential of the system.

Protecting the resilience of critical eco- systems is therefore, an important element in any strategy of sustainable development. Basically it is a strategy of managing risk and uncertainty.

Price of an exhaustible resource must increase at the rate of interest for its efficient allocation as time goes.

Consumption expenditure to include expenditure to avoid degradation.

Investment should equal depreciation.

Profits, rents received are to be reinvested in reproducible capital.

Market price do not indicate resilience limits.

Indicators of eco-system resilience -

- a) Changes in the number of native species
- b) Changes in standing crop biomass
- c) Changes in relative energy flows
- d) Changes in mineral micro-nutrient stocks
- e) Changes in the capacity for dampening oscillations
- f) Regressive succession

Eco- system functioning and services are more important than consumer sovereignty.

Ecological- economic systems are characterised by multiple locally stable states, the properties of which are different.

They are said to be productive if they produce economically valuable ecological goods or services.

They are treated as degraded if they do not.

Many times failure to exercise restraint leads to failure of ecological systems.

If we cannot exercise restraint, our technology needs to rapidly adapt to degraded eco- systems.

The optimal pattern of consumption, producing a high degree of human satisfaction by means of a relatively low rate of consumption allows people to live without great pressure and strain.

Therefore, production from local resources to satisfy local needs is the most rational way of economic life; while dependence on imports from afar and consequent need to produce for export to unknown and distant people is highly uneconomic.

For Ruskin, the ideal of human life is a union of "Spartan simplicity of manners with the Athenian sensibility and imagination."

The present mindset assumes that environmental damage can be easily repaired through

Internalizing the costs of externalities;

Setting standards and limits to harmful activities;

Creating government agencies to set these limits;

Carrying out cost-benefit analysis and environmental impact assessment and institutionalizing these arrangements;

Develop and implement rehabilitative, restorative measures and preventive and adaptive strategies;

Initiating eco-development measures and insisting on sustainable use of resources, energy and eco-system services;

Modifying agricultural and industrial processes to mimic ecological processes;

Creating national parks and sanctuaries to conserve biodiversity;
and

Providing access to education, information and to an environmentally meaningful legal and judicial system.

DEVELOPMENT OF MODERN ECONOMY

- Trade first began in natural products,
-- precious stones & metals, birds and animals, timber and forest produce
- Agriculture for the first time created a durable surplus

From farmers it is appropriated by others through consent
(as in religion and cults),

Appropriated by force by Kings, Armies and the State
(through taxes)

Farmers' labour appropriated to build temples, monuments

- Appropriation of surplus facilitated satisfaction of other needs and needs of other classes
Farmers hardly benefited as also consumers
- But Traders benefited at the expense of both
They accumulated wealth (Capital) and purchasing power and began to influence supply and demand
- Lack of purchasing power among other classes led to famines
Other classes had to depend on Nature - Forests, the sea
- Early industrial activity depended on cheap fuel from forest (wood) and peat (from wetlands)
Then wind power was used
Cheap fuel is nature's subsidy
- When coal became available, its price was kept low by poor wages, child labour & bad conditions of work
- When oil was discovered, industrial countries were able to get it at extremely cheap prices through political power
Thus modern economy has come to be developed on the basis of various subsidies, either from nature or from certain sections of the society

- Nature was seen as a form of property, collection of goods and a supply depot.
- Air and Atmosphere, Hydrological Cycle, Wild Animals were treated as free goods, with unlimited supply.
- Forests, wilderness areas, the sea were considered common property resources to be exploited at will.
- Nature treated as a sub-system, a sector of man's economy like agriculture, industry etc.
- Prices were related to scarcity of commodities.
- As resources deplete, prices rise, production will shift to less resource use, consumption will decline, and recycling will be encouraged. Price mechanism will bring all this about
- Individual preference will decide what to produce; amount of resources will decide how much to produce and how to produce will be decided by technology
- Market is the mechanism through which all this happens. It has all knowledge- the amount of factors of production available at present and in future; the information about household preferences at present and in future and the current technology and future changes therein.
- It is assumed that everybody is a price taker and a member of the market. There is absence of public goods and of externalities. Also there is no mention of the mechanism to distribute wealth or profits.

Work in the stream basin or river basin within & around village:
Cleaning & upkeep of stream basin; providing proper banks & bank vegetation to streams; checking & diverting sewage & effluent flows that come into the basin; building root zone treatment ponds & wetlands to clean up sewage & effluents; building check dams.

Village Commons: Demarcating boundaries of commons by means of a live fence; Making stone enclosures to encourage regeneration; planting fodder grasses, shrubs & trees during monsoon.

3) Productive Assets, Basic facilities & amenities;

Works to be undertaken include: Providing live hedges, shade-giving trees along routes that enter & go out of village; constructing & covering channels to carry sewage from settlements to a place where root zone treatment is possible; building sanitary blocks, septic tanks, providing composting to waste; vermiculture & manure production from waste; developing fish culture in canal seepage areas; planting shelter belts & building corridors for movement of wild species; developing an energy plantation & a fodder bank for use of village; wetland creation, maintenance & development.

4) All these works are expected to develop the village resource base; provide defences against drought & bad years; assist building-up a variety of livelihoods and lead to capacity-building,

They can be carried on over the years & need not looked upon as temporary, drought-relief measures.

Eventually they should be integrated with the normal work of Gram Panchayats who may be assisted to form cadres out of EGS workers when drought relief is over. The aim should be to institutionalize habitat development & livelihood security work at the village level.

This will gradually re-establish the village system where every resident has duties & responsibilities & take active part in village development, maintenance & welfare.

The Biomass Resources

- 1 Biomass denotes the total weight of all living beings including plants.
- 2 Plant biomass is useful in providing food, fibre, firewood, fodder and feed for animals.
- 3 Crop biomass includes harvested and unharvested portion and non-crop biomass has to be estimated through sampling and estimates of yield produced by various users.
- 4 Biomass consumption can be based on actual consumption or a need based approach of estimating consumption.
- 5 Imports into the watershed of food, fodder & fuel and exports out of it also need to be considered.

ESSENTIAL ECOLOGICAL SERVICES AND LIFE-SUPPORT SYSTEMS

MAINTENANCE OF THE QUALITY OF THE ATMOSPHERE

AMELIORATION OF THE CLIMATE

OPERATION OF THE HYDROLOGICAL CYCLE

RECYCLING OF NUTRIENTS

ASSIMILATION OF WASTE

GENERATION OF SOILS AND MAINTENANCE OF SOIL FERTILITY

POLLINATION OF PLANTS INCLUDING CROPS

MAINTENANCE OF THE MARINE ECO-SYSTEM AND PROVISION OF SEA-FOOD

MAINTENANCE OF GENE BANK

The Water Resources

- 1 The inflows of water include precipitation, surface water inflows and ground water inflows.
- 2 The outflows include evaporation & evapotranspiration losses, domestic and non-agricultural use, surface and ground water outflows.
- 3 We need to consider rainfall in good years and bad years over a continuous, large period to find out the average balance in inflows and outflows.
- 4 The storage of water can be at the surface, as ground water and as root zone storage.
- 5 To store water on the surface, a variety of structures can be built. Infiltration of water in ground can be increased by run-off suppression structures. Addition of biomass to a soil increases its infiltration and water holding capacity.
- 6 Groundwater has to be recharged to the point where it becomes a reserve for bad years.

WATERSHED IS USUALLY LOOKED UPON AS A DEVELOPMENT UNIT.

ITS PRODUCTION APPARATUS IS GENERALLY CONSIDERED AS GEARED TO SATISFY HUMAN WANTS.

ECOLOGICAL APPROACH CONSIDERS WATERSHED AS A LIVING, NATURAL UNIT CONTAINING ITS OWN PROCESSES AND SYSTEMS.

THE SEVERAL ECO-SYSTEMS IN THE WATERSHED ARE GEARED TO MAINTAIN CERTAIN BASIC PROCESSES AND TO PROVIDE THE SURVIVAL NEEDS OF THEIR BIOLOGICAL COMPONENTS.

ECOLOGICAL PERSPECTIVES IN WATERSHED DEVELOPMENT PROJECTS

OBJECTIVES

- 1) Providing support & supplements to production systems instituted in a watershed development programme
- 2) Drawing attention to features hitherto little accounted for; for example: Micro- environments and Difficult Areas
- 3) Attempting interventions through eco- system development and biodiversity conservation
- 4) Interventions will include:
 - a) Restoration of degraded eco- systems
 - b) Habitat creation and development