What can be the Holistic Point of View?

The dictionary (Little Dictionary-Oxford) meaning of holistic is connected with the treatment of a disease. It says, “Treating the whole person rather than the symptoms of a disease.”

I am using the whole person as our planet and the disease probably is the modern human being and his/her life style.

I am a human being but am trying not to be a part of that disease, by looking at the person as a whole and trying to interpret my existence according to the order given below.

I shall explore the various sciences in the following order:

The Genesis of Evolution

Now let us start with evolution first. How does it contribute to a holistic point of view? Energy and matter are the main constituents of the universe. Initially they must be in a diffuse, unorganized form. Evolution may be said to have begun when matter and energy began to organize in discernible shapes and forms. It is force of gravity that binds them and does not allow their dissipation into unorganized state. But they always exhibit a tendency to relapse into entropy. Energy dissipates into heat and matter into waste.
Especially when energy is applied to matter to produce work, greater portions of heat and matter are wasted than are embodied in work. **Work, that is conversion of matter with energy, should be carried up to a point where heat and waste creation balances the value of the product. That is energy should be used sparingly and conversions should be minimised. Thus entropy is reduced and mutual linkages built by the evolution are saved.**

**Geology and Geomorphology**

Now take Geology and Geomorphology. How do these contribute to a holistic point of view? Geology is the structure of the planet. The planet has a boiling hot but liquid core overtopped by a succession of layers formed with the cooling of the planet. But the core is active with the trapped heat and gases trying to escape and keep the overlying plates constantly in motion. On the one hand these forces give rise to natural disturbances like volcanoes, earthquakes, tsunamis and on the other keep the land surface changing over a longer term.

**Natural disturbances are thus a part of life on this planet and cannot be ignored.**

Climate interacting with base material shapes geomorphology. The process of erosion and deposition are influenced by these two factors. **For a Holistic Point of View it is essential that the erosional and depositional balance be considered.** (Hugget R.J. 2003)

Erosional and depositional processes are important in another connection. They gave rise to flows of different mixes of minerals that combined with sea water collected in depressions of earth’s surface as the planet cooled and water vapor turned into precipitation. The shallow seas became a soup of minerals, which when played upon by lightning sparked the emergence of early life. The soup, through a process of fermentation facilitated by heat from the earth’s core also provided food for the early anaerobic life. (Ward B., Dubos R. 1972.)

**The Holistic Point of View, therefore, recognizes the vital connection between the land and the sea. It means it is necessary that flows from land to sea are kept as natural as possible.** (Carson R. 1950)

The march of evolution was excruciatingly slow before primitive life formed in the sea. Conditions in which life could
emerge took billions of years to evolve. **Life, therefore is very precious,** the result of millions of years of development. It is all the more valuable as it flourishes only on earth and on no other planet in the solar system. **The Holistic Point of View demands therefore, that life should not be wantonly destroyed. One should be very circumspect of one’s actions!**

**Chemistry**

**Photosynthesis**

Chance, scientists say, governs the course of evolution. Its march is punctuated with fortuitous events. One such event is the development of photosynthesis by tiny organisms living in the sea. They mastered the technique of converting sun’s diffuse energy into food at ambient temperatures, a feat our technology cannot accomplish even today.

The tiny organisms first developed a wonderful chemical called chlorophyll from carbon, hydrogen, magnesium and nitrogen. The diffuse energy of the sun could be used to separate hydrogen from water and combine it with carbon and other elements to form carbohydrates, a reaction made possible due to the presence of chlorophyll. Oxygen was released in the process which was later absorbed by living organisms who respired carbon dioxide which replaced the portion used in photosynthesis. Food was created without using any concentrated form of energy, i.e. at almost no cost. (Stephen Jay Gould 1965).

Moreover the quantity of food produced was over and above the growth and maintenance needs of the photosynthesizing organism. Later this surplus food made possible the development of non-photosynthesizing organisms but not before another fortuitous event occurred.

**Atmospheric Balance**

By a series of fortuitous events that spanned millions of years, land was uplifted from oceans at various places. This upheaval substantially slowed down the process of oxygen dissolving in the sea and combining with iron ions to form iron sulphates. The percentage of oxygen on uplifted land went on increasing and life learnt to take advantage of it by crawling onto
land. Anaerobic life forms went into eclipse and slowly disappeared. Aerobic life came to stay on the planet. (Carson R.1955)

The Holistic Point of View has no alternative but to attach the highest value to the whole drama of the creation of chlorophyll, photosynthesis, oxygen and aerobic life. As all these processes form the fundamentals of life on the planet. The most important is the existence of green plants on land and in water. They are the producers of food for all other living organisms. Maintenance of atmospheric balance with its about 20 % oxygen content is another vital need.

A person professing A Holistic Point of View is naturally extremely wary of disturbing green plants and the atmospheric balance.

Ozone Layer

The holistic point of view has to take cognizance of yet another development that took place concurrently. It is the development of the ozone layer. The oxygen that we breathe has two atoms of oxygen joined together. But in earth’s higher atmosphere, in the stratosphere about 48 kilometres above us, ultraviolet radiation occasionally forces an extra oxygen atom to join the two. The result is three-atom molecule, a bluish gas called ozone. It is basically unstable for it is constantly losing its third atom but new ones are forever being created by sunlight, so a constant amount persists in an undamaged atmosphere (about 10 parts per million). The ozone layer shields us from almost 95% of UV radiation striking the earth. The flowering of life on earth would be impossible if ozone layer was absent. (Flannery T. 2005).

The Holistic Point of View prescribes that the ozone layer, the protector of all life on earth, must be conserved by banning all activities and substances inimical to it.

Botany and Zoology

Extinctions

The past and present diversity of life has evolved only during the last 700 million years. This is a tiny period in the life of the planet. Even then life has suffered 5 extinctions in the period
between 440 million years ago to 65 million years ago. During each extinction life almost vanished from the earth. Dominant forms of life perished totally. Scientists are not in agreement about the cause of these extinctions. For example, the last extinction (5th) which occurred 65 million years ago, totally wiped out the then dominant form of life, the dinosaurs. It is said to have triggered by a meteorite strike or a forced winter caused by a series of volcanic eruptions, their dust preventing sun’s energy reaching the earth or through the greed of giant dinosaurs, who ate almost all plants which formed their food (Leaky R. 1995).

A tiny mammal that survived the extinction was the precursor of all mammalian diversity that we witness today.

Some scientists are predicting a sixth extinction soon, to be triggered by human greed and wantonness! Though technology may be able to deflect a small meteorite and prevent it hitting the earth, destruction due to volcanic eruptions, earthquakes etc. is difficult to avoid. Easily avoidable is the destruction of vegetation.

The Holistic Point of View means a widespread awareness about nature and life in all its forms. One can even say that the Holistic Point of View prescribes that eco-system needs are more important than consumer needs and accord higher priority to nature conservation than to creation of wealth.

Palaeontology

Dominant life-forms

Life continued to evolve in spite of these great extinctions. After each extinction life took a different line of development, the earlier forms and shapes with their behavioural characteristics, were not repeated. Nature displayed great innovative power, the total number of forms that existed on earth since the emergence of life is therefore, far greater than the biodiversity that exists today. Each time a group of life-forms achieved greater evolutionary success than others and became the dominant form of an era but ultimately destined to perish and leave no descendants. (S. J. Gould ibid)

Dinosaurs was the dominant form of the last era, and at present, it is the human being.
The question is can human beings change their ultimate destiny or perish like dinosaurs and leave no descendants?

Geography

Latitudinal zones and micro-climates

In the course of evolution and over all these millions of years the planet continued to undergo physical changes also. The axis of the earth tilted 23.5 degrees as it faced the sun. The intensity of sun’s energy received by different regions of the earth became dissimilar. It was intense at the equator but away from the equator, it became less intense as the rays cover a larger area. Latitudinally, earth was divided into different climatic zones and life adjusted to climatic differences. Seasonal changes became the dominant feature of the earth’s climatic regime. Life adapted to these changes.

It is extremely interesting to note differences in vegetation and animal life as one moves north or south away from the equator. Tropical evergreen forests cover the equatorial region with their characteristic fauna. Sub-tropical vegetation dominates the next latitudinal zone. Higher seasonal rainfall and warmer temperatures produce moist deciduous forests, less rainfall produces dry deciduous forests and semi-arid regions have savanna and thorn forests or grasslands.

The next latitudinal zone which borders deserts is the real grassland zone. Even deserts are not without biodiversity. Plants and animals with special adaptations inhabit deserts. Temperate zone is the next latitudinal zone with a year-round rainfall. Here the main factor controlling vegetation is the length of the cold season. Warmer temperatures produce broadleaf deciduous forests while cooler regions are covered by coniferous forests. In still higher latitudes grasses and herbs dominate as higher plants cannot sustain themselves in low temperatures.

As rainfall varies according to all these latitudinal zones, availability of water and quality of soil vary also. Hills and mountains give rise to different watersheds producing a diversity of micro-climates. Over the years micro-climates have produced their own diversity and gave rise to endemism.

The Holistic Point of View is not only deeply aware of the zonal variations but takes intelligent note of micro-climates
and micro-climatic diversity and endemism.

Persons professing Holistic Point of View are well aware that such diversity excludes application of uniform solutions, that each of these sub-zones and micro-climates should be treated on its merits and manifold resource development alone can sustain soil quality and availability.

Anthropology - History - Sociology

Human Evolution

Human beings evolved in a zone bordering the humid tropics, where climate was neither too hot nor too cold. Human evolution is said to have begun when a primate sub-species established its separate identity by moving to the forest edge and using toes of both hands to grasp objects and use them as tools to strike, to dig and throw. Soon they learnt to live in small groups as a defence against powerful animals who were their enemies. They fashioned tools from stones, bone and wood using them to kill, to tear flesh and pound it. Yet meat formed only 20% of their diet, the rest being, fruit, nut, tubers etc.

This era which roughly covers a period from 7 million BP to about 10,000 BP was punctuated with glacial periods when temperatures became low, freezing water and sending glaciers towards warmer zones. Human groups and animals migrated too as glaciers advanced and retreated. By using fire humans kept themselves warm, baked their food and cleared forests over vast regions converting forest to savanna and grasslands where distinct animal genera evolved. Through group action they could even hunt large animals like buffalo and bison. The sea level used to drop during glacial periods enabling them to wade and navigate in shallow seas to penetrate distant lands. Human beings radiated from Africa, entered southern Europe, occupied much of Asia and probably even reached America.

Over much of this period humans were hunter-gatherers. They acquired higher and higher sophistication in their life style as their brain-size increased. They were principally nomads though towards the end of this period some sedentary communities practicing rudimentary agriculture emerged.

According to researchers who probed this era, hunting-gathering life-style was the happiest period in human evolution.
As land-man ratio was more than one (1 human being to 26 sq. km. area), gathering food was no problem. It was a healthy lifestyle too as hunger and diseases were rare. As group action demanded cooperation and sharing the produce, unhealthy competition and greed were unusual. Moreover, the sense of individual property, the prime cause of strife and violence in human societies, was not developed. (Simmons I.G. 1989)

**Persons who profess a Holistic Point of View do not belittle the importance of this ‘Aboriginal’ life-style. In fact they believe that it provides an eye-opener to modern societies based on acute competition, greed and avarice and accumulation of wealth and property. They prescribe that while a spirit of cooperation and sharing be encouraged, limits should be placed on individual accumulation of wealth and their transfer to descendants.**

**Economics**

**Barter**

Barter probably began during the hunting-gathering stage. It may depend on fortuitous discovery of two exchangeable items or may involve deliberate effort to find or locate such items. The former case involves no costs as the discovery of tradeable items depended on chance. In the latter case time and labour have to be spent in locating and later perhaps crafting a tradeable item. This means less time available for hunting, gathering and doing other things for the family or the group. The person who indulges in spending labour-time in finding a good or a commodity and crafting it, has to sacrifice some amount of food, leisure or other necessary family-group activities. An element of cost, therefore, enters in this case.

Persons indulging in barter believe that the transaction compensates them fully and costs involved in labour-time are recovered. They may also believe that the compensation has given them something over and above the sacrifice involved. The sense or element of profit then becomes an ingredient of the transaction. The sense, initially, may be only psychological as long as medium of exchange is not involved. But grading or pricing will be there as one particular item may be exchanged against two of the other type etc. Pricing based on quality or
quantity becomes an essential feature in later stages.

Barter is still practiced in India and probably in other countries also where rural population is substantial. It is an ideal trading system for locally produced good used for local consumption. Many economists consider this to be an ideal form of exchange as it does not involve or create any fictitious wealth. Development of trade based on a medium of exchange really began after agriculture became sophisticated and covered a large area of the then known globe.

**But in local transactions, Holistic Point of View reckons, barter is an ideal system of trade.** The transaction costs are low; it encourages production of local variants and also encourages local craft. The Holistic Point of View considers that even in a monetary economy, barter has distinct advantages and should be retained. It helps proper distribution of wealth by decentralizing economic activity.

**Agriculture**

With the adoption of agriculture, the life-style of human beings underwent a fundamental change. The hunting gathering epoch, the happiest period in human evolution, lasting almost 400,000 years, came to an end. This happened barely 10,000 years ago. Why humans abandoned such a healthy, happy life still remains a question. There seems to be no satisfactory answer to it. Agriculture must have become popular as it realized large quantities of production. Between 10,000 and 8000 years BP, i.e. within a relatively short period, agriculture spread throughout the then known world. (Simmons ibid)

Ecologically speaking human beings were able to change life-style of some selected plants. Extensive experiments in selection and breeding must have preceded actual cultivation. A few plants were selected for breeding and care. Plants benefited as they escaped easy predation and obtained a regular feed supply. They reacted favourably by producing an abundant supply of fruit and seed. This became possible for the farmer eliminated competing plants and redirected energy flow (sun’s energy) and nutrient supply (from soil) exclusively to his/her favoured plants. (T. Bayliss-Smith 1982)

Ecologically speaking agriculture is also a monoculture as, in a given area, only one or a few plants are allowed to grow. Several
plants growing in an area are able to exploit the soil in an optimum manner, but a single plant may quickly deplete the soil of its nutrients. By utilizing all the sun’s energy that strikes a particular area, a single plant is able to provide abundant food. It is beneficial to human beings who selected the plant but beneficial also to the natural predators of the plant. An abundant food supply attracts these predators in numbers and extensive agriculture, a single crop grown over a large area, suffers from pest attacks.

Soil quality depletion and pest attack are dangers from which agriculture needs to be constantly saved.

Ideally agriculture needs to be practised in areas where: a) soils are deep and well-drained, b) where soils, after nutrient depletion by a crop, naturally regain their lost qualities, c) where assured water supply in the form of well-distributed rainfall throughout the year, is available and where, d) sufficiently cooler temperatures minimise pest attacks. Such ideal conditions are available in river valleys and flood plains in temperate zones. Here C3 plants can produce abundantly leading to large surpluses. Soil in these areas get a compulsory rest when it is covered with snow in winter. Soils then can replenish themselves even though they are away from flood plain areas. Flood plains naturally produce the best agricultural soils as annual river floods bring to them silt rich in nutrients. Input costs of agricultural operations can be kept very low in these ideal conditions, making the surplus immensely profitable.

In tropical climates also flood plain areas are ideal for practising agriculture. Ancient civilizations flourished in such areas in Egypt, West Asia (today’s Iraq) and India. But though soils are ideal, water supply throughout the year, through well-distributed rainfall, is not assured. Crops then have to be irrigated. No compulsory rest is available to soil which tends to be exploited throughout the year. Soils therefore, need artificial enrichment through fertilizers. Over-irrigation in anticipation of bumper crops is always a possibility. Warm temperatures mean evaporation of moisture from the soil which brings up salts through capillary action turning the soil saline. Over-irrigation and consequent salinity of soil destroyed the ancient civilizations!

In the tropical zone, soils away from flood plains are likely to be shallow, poor in organic content and likely to lose their
microbial activity quickly if exposed to intense sunlight. Exposure also disturbs soil structure through erosion. Moisture-holding capacity of the soil is then quickly lost.

Whether agriculture was adopted due to forced circumstances (increase in human population) or by free choice, is not known. Agriculture, landed property and sedentary lifestyle that goes with them, seems to have enamoured human beings so much that farming soon became the basic and even the dominant occupation of many human societies. Agricultural practices evolved to adapt to varied conditions of climate, landscape, soil and water supply. Today agriculture is practised from mountain top to valley floors, from deserts to wet areas along the coast, from humid and high rainfall equatorial zones to semi-arid zone where rainfall is low as well as extremely irregular. Increasing agricultural production seems to be the only answer to burgeoning human population. Till the turn of the century agricultural production barely kept pace with increasing population. It is reported that production in recent years is falling behind the growth of population (Hawken P.1993)

The idea of surplus is intimately connected with agriculture. The original surplus is produced by green plants through conversion of sun’s energy into food. The quantity of food produced is over and above the growth and maintenance needs of the plant. Yet this surplus quantity is quite small. 90% of the food produced is required by the plants themselves and only 10% is available as surplus. What agriculture achieves is to concentrate sun’s energy falling on a particular area, over a particular plant species preferred by human beings. On that piece of land no other plant species is allowed to grow. These other species may be the food of several other non-human beings. Agricultural surplus appears by denying food to non-human species; as such it is really a fictitious surplus.

The real net surplus will appear only if somehow human beings succeed in increasing the intensity of the process of photosynthesis. Today plants are able to convert only 2% of the solar energy that strikes the earth. If this proportion is increased to 3% or 4% and the growth and maintenance requirements of plants remain the same, a real surplus will result. Human beings, then probably, will be justified in increasing their population!

The present agricultural surplus is realized by denying space,
energy and matter to several non-human life forms. Clearing land for agriculture then results in reduction of biodiversity. To make room for agriculture humans have cleared forests, brush, grasslands, drained wetlands and even saline areas like mangroves and irrigated semi-arid areas and deserts. These activities have resulted in destruction of biodiversity on the one hand and on the other led to increase in human population. By clearing and burning vegetation carbon dioxide is released into the atmosphere and infiltration capacity of the soil, its capacity to hold moisture, its organic content and microbial activity have all been reduced. Today we are adding 9 crores of people every year to world’s population but also destroying 25 billion tons of soil every year! (Hawken P. ibid)

The surplus produced by agriculture can be called “fictitious” in yet another sense. It is well known that as this surplus became available to non-farmers, human society diversified, flourished, civilization flowered and priests, administrators, intellectuals, warriors, artisans and craftsmen, service people and a host of other professions became possible. Indeed it can very well be said that the development of human ingenuity, the growth of cities and urbanism, the success of military strategists and lastly the growth of trade, commerce and later manufacturing became possible due to agricultural surplus. Agriculture undoubtedly proved the prime mover of human social, economic and political organization. No wonder then agriculture was eulogized, glorified in most human cultures. The farmer was considered to be the epitome of simplicity, virtuosity and magnanimity. The farmer’s life-style based on care and cultivation of soil, his links with nature, his down to earth approach, and his hospitality and consideration of strangers was considered far superior to the commercialism, greed, profanity and anonymity of urban life.

History tells us that once this surplus became available, farmers were able to barter it, transport and market it, or store it and obtain the other necessities of life. Powers that be always eyed this surplus as the base of their wealth and strength. In earlier stages of human civilization it was appropriated by consent as by priests and religious leaders and later through administrative powers and political and military force. The quantum of this appropriation seems to have been judged on the
assumption that farmers should remain content with just the
necessities of life and should always lead a simple life! Unfortu-
nately vagaries of weather to which farmers are exposed
make creation of wealth an extremely difficult task for an average
farmer. No state or political power has made any comprehensive
and intelligent effort to come to the rescue of farmers. Co-
operative planning of crop pattern and marketing of produce at
village level may be a sure way of sharing and minimizing risks
and assuring a steady income from farming. This is true of India
and may be other less developed countries also. But the farmer’s
acute sense of property, his individualism and lack of proper
education mar the operation of cooperative effort. Though
developed countries have succeeded in substantially raising the
quantum of farm production, it is sustained only by a variety of
subsidies. Farmers constitute only a tiny proportion of their
population.

In India, fragmentation of land holdings is also a major
obstruction in implementing schemes of agricultural
development. Therefore, supportive occupations emanating from
care and quality development of local natural resources can also
be a good complement to farming. These include care and
maintenance of stream source regions and upper reaches of
streams, agroforestry, grassland development, care and breeding
of local cultivars, local breeds of animals, local specialities etc.
Proper education and institutional development based on co-
operation among farmers are needed to achieve such a
breakthrough!

This in brief, is the agricultural scenario. What the holistic
point of view has to say about agriculture as an activity, as a
profession and as a life-style? Risk is always present in
agriculture probably in a greater measure than any other
economic activity. This is because of the inseparable relation of
agriculture with climate. Weather may play truant even in
regions where conditions are ideal for practising agriculture.
Being a monoculture, agriculture is always prone to pest attacks.
Large scale, single crop agriculture should be taboo. Rainfed
agriculture is really a contradiction in terms. Risk factor is too
high to make it sustainable. Storage and marketing are also not
without risks. The main consideration should be control and
reduction of the risk factor in agriculture.
Co-operation at village level among farmers in planning of crop pattern, in allocation of water, in transport and marketing and in developing and maintaining a seed bank is the next cost-effective and sustainable solution to reduce risk and ensure a steady and viable income to farmers. Greater awareness through proper education and changes in the legal system to avoid fragmentation of land holdings are prerequisites to bring about effective cooperation. The holistic point of view will give top priority to these measures.

**Increasing diversity in agricultural operations should be the next priority from a Holistic Point of View.**

Single crop agriculture even in a given area should as far as possible be avoided. Cultivation in a single plot may cover grain, legume, leafy vegetables, tubers etc. to reduce risks of total crop failure and pest attacks. The pattern may differ from region to region and indeed may differ according to micro-climate. This diversity should be supplemented by diversity of supportive activities.

As sedentary pastoralism is a persistent feature of Indian agriculture, breeding and improvement of livestock, development of excellent forage in terms of agro-forestry, grassland and savanna development are necessary supportive activities. All these require adequate availability of land which can only become possible through village-level planning. Other supportive activities will include horticulture, floriculture, sericulture, apiculture, and vermiculture development and maintenance of a seed bank.

These supportive activities will need a well-developed infrastructure of local resources including trained manpower. The trend since Independence is to import agricultural technologies developed abroad. Indeed it is no exaggeration to say that in modern as different from traditional agriculture, we follow practices developed in temperate lands. We tend to forget or ignore the essential characteristics of a tropical environment. These are: 1) high temperatures, 2) a chronic scarcity of water and 3) high rates of erosion and of decomposition. Our agricultural practices therefore, should include control of high temperatures and intense sunlight through development of various vegetational cover types. These will also help in controlling erosion (apart from bunding), retain soil moisture and decelerate
intense decomposition.

Intelligent management of local vegetation, avoiding exotics and focusing training and research on local and regional vegetation are a necessary adjunct to holistic management of agriculture.

Our agriculture is always haunted by scarcity of water. The Holistic Point of View believes that it can only be averted by a composite treatment of all resources available locally.

This includes an intelligent management of physical features of a landscape like hill, hill-slopes, valley areas and plains as well as patches of local eco-systems, drainage patterns, and distribution of human settlements. Needs of river and stream ecology will have to be satisfied through intelligent management of landscape.

These needs include care of the source region, especially of vegetation cover there; management of upper reaches of stream to promote optimum velocity of flow, adequate vegetation buffers on banks to check erosion, add organic matter to the flow and increase infiltration, maintenance of riverine vegetation and in-stream habitats, protection of flood plains and deltas, maintenance of adequate flow in the channel and control of point and non-point pollution flows into rivers.

The Holistic Point of View requires care and intelligent management of each and every stream, big or small, through local initiative and a decentralised structure.

It does not favour large storages (reservoirs) to mainly supply the needs of large cities and to provide irrigation through surface canals. It prescribes eco-sensitive management of catchment areas of existing dams, of the dam site and the reservoir and of the command area of dam.

This will decentralise water distribution, make it more equitable and provide water supply to cities and villages and satisfy the needs of agriculture as well as its supportive activities, needs of all other natural resources and eco-system needs.

This is a tall order. It cannot be realised unless each and every stream is taken care of and habitats and eco-systems associated with it are kept in healthy conditions. Ecological Society’s Nirmal Ganga Abhiyan, a project designed to run for 3 years, will demonstrate what changes occur when streams are well cared.
The "holistic" measures suggested here are radical in every sense. In the present socio-economic milieu, fostering inequity, they are difficult to introduce. Price support, easy credit, waiver of credit repayment, concessional electricity and water supply, the peculiar operation of government schemes, have created in the villages a class of rich farmers and big landholders who corner subsidies and have a vested interest in maintaining the present inequitous environment in villages. Caste differences in villages only sharpen the inequitous distribution of wealth.

The present super-structure of subsidies needs to be dismantled and replaced by one which promotes community efforts and community organisations.

The Grampanchayat needs to be strengthened financially through human resource development. The adoption of Holistic Point of View needs decentralisation of authority and finance.

Politics, Engineering and Technology

Industrial Revolution inagurated the Machine Age. Machines are best suited for repetitive work which requires strength and uniformity in product quality. A class of trained operators is required to run the machines. In Europe Industrial Revolution was preceded by a general spread of education. Machines require a huge and uninterrupted flow of energy and materials. In earliest stages Industrial Revolution was given a momentum when abundant supplies of coal and iron were discovered which could be cheaply exploited through political control and cheap labour. Later the discovery of cheap oil consolidated the hold of machines and technology over human societies.

Machines basically convert matter through the use of energy. Research in various sciences has enabled human beings to produce a technology which aims constantly to enhance the scale and intensity of this conversion. Gignatic machines which gulp down enormous energy and can transform or move mountains of materials in a day are now in operation. It is however, barely recognized that these giants are being increasingly controlled by the 2nd Law of Thermodynamics (or entropy). Unknowingly human societies have handed over their destiny to the amoral and immutable operation of the 2nd Law!

According to the 2nd Law when any matter is converted with
the help of energy, more energy goes out as heat and more matter comes out as waste than the volume and weight of the finished product. If heat escapes into and waste deposited into the environment, entropy is increased and eco-systemic damage ensues.

From the economic point of view, heat released and matter coming out as waste are costs which need to be internalised, in determining the price. In earlier stages of Industrial Revolution as energy, raw material and labour were available at almost no cost or at throw-away prices, internalising these costs was the usual business practice. In their hurry to industrialize and create employment, developing nations also offered industries substantial subsidies in acquiring developed land, in procuring raw materials and in terms of tax concessions. This helped industries to offer competitive prices and still pocket substantial profits. The competitive edge continued as costs of entropy created in the environment were not internalized. These "extrenalities" were the cause of pollution in atmosphere, land and water. These were actually social and environmental costs as society and eco-systems had to suffer the effects of pollution.

If the history of industrial progress in the past 200 years is scrutinized, it reveals that industry has prospered, but environment got increasingly damaged. Industrial progress seems to be at the expense of the environment. In recent years in China, pollution became rampant as the rate of growth of GDP per annum soared. The situation is similar in India, today. It appears that the society has to suffer social and environmental costs if people wish to have industrial progress! People must realize that quantitative development alone is not sufficient. Development should be qualitative too. Good is not only contained in goods!

Why are we so conscious of quantitative development and negligent of qualitative one? The answer seems to be something like this: Spread of education among the general public did not precede our decision to industrialize and urbanize. In the early years of Independence, the decision makers thought that industrial progress was the only way to catch up with the west. Their reading of history did not give them the insight that western progress really began when Renaissance brought about a social and intellectual revolution; the society flung down the
yoke of papal authority; it embraced reason and began to probe nature and natural phenomena; it initiated spread of education among the general public; it laid the foundations of basic sciences; it induced a spirit of adventure and exploration; it developed new institutions to organize trade and commerce, to carry out expeditions and to develop research and enquiry in various scientific and cultural fields.

The invention of machines, technology and material and industrial progress was the culmination of all those movements. No such renaissance that envelops almost the whole society has as yet occurred in India. In early years of Independence Mahatma Gandhi had advocated a kind of renaissance which had its roots in our villages. He wanted our grassroots to be enlightened enough to understand the pros and cons of western industrialism. He was conscious of our environment and desired that our progress should be rooted in our soil, nurtured by our climate and based on solid foundations of development of local resources. He was least interested in catching up with the west. He wanted India to find its own way of development based on our culture, our social and religious diversity and varied natural conditions- a model which will lead to upliftment of the people of India in general.

Mahatma Gandhi’s vision however, was discarded in favour of a model put together by administrators, engineers and statisticians who came from a class trained by the British to further their interests. Many of them were trained abroad, had lost their roots in India’s soil and even tended to despise the teeming millions who were their brethren. They were eager to taste the fruits of Industrial progress and wanted to imitate western lifestyle.

They thought that once they established large scale industries and western style resource management, wealth, technical skills, and scientific and technological awareness would trickle down, forcing people to abandon their lethargy, superstition and nonchalant behaviour and induce a spirit of scientific enquiry, innovative ability and enterprise among the general public.

They did not consider that spread of education among the general public was a necessary pre-condition for such an awakening. Instead of encouragement to basic education, they established institutions of higher learning which basically
benefited their own class. These conditions continue even today!
(Bandyopadhyay S. 2004)

Industrialism was superimposed on Indian society. Its success depends on how many of us are prepared to be ingrained with western culture and standards. Modern industrialism is essentially rooted in western culture which includes not only renaissance but exploitative colonialism, racial superiority, resource intensive technology and an economic system geared to increasing creation of wealth (at all costs) but not interested in its just and equitable distribution. Our adoption of industrialism has forced us to proceed along the same path. But morally, intellectually, technically, culturally, politically, economically and militarily we are hardly prepared for it!

Our west-educated, western oriented elite class that influences today’s decision-makers, seems to be quite oblivious to the impacts of industrialism and its concomitant systems such as the exploitative technology, the inequitable economic system and the centralizing tendencies which tend to destroy local resources, natural systems and natural processes. They still have immense faith in trickle down theory and give priority to industrial production denying larger investments in health, education, development of local resources and to local initiative. They would still like to invest more in higher education than in basic education! They are not prepared to accept anything that goes against western industrialism.

Will the all-controlling 2nd Law of Thermodynamics hit them like a thunderbolt and bring them to senses? Only if the impacts are revealed forcefully and intelligently. The law pierces the very heart of industrialism by revealing that industrialism creates wealth that is only fictitious! It is nurtured only by paper money and grows particularly on never ending debts.

In effect industrialism and all that goes with it have a foundation of sand and rubble only!

As pollution became widespread, public opinion forced states to enact laws controlling it. Manufacturing companies were compelled to install pollution abatement equipment. Externalities no longer could be imposed on the general public or on nature. In the seventies of last century oil producing countries sharply increased prices of oil. Energy could no longer be obtained cheaply. Labour had already become expensive in
western countries. Manufacturing immediately became a loss-making proposition for many companies. It sharply brought out the stark reality: In large scale manufacturing profits are not possible. They can only be obtained if cheap energy, labour and raw material are available and externalities could be safely imposed on nature and the general public. Economic growth can be only achieved by depriving others of just remuneration and by destroying and imperiling health of the general public!

Existence of whole superstructure of modern civilization became questionable!

As the lead article in this Journal shows modern technology if it indulges in indiscriminate conversions of matter by using energy, increases losses manifold and can only be sustained through subsidies and denial of quality life support (health, education, clean air and water, uncontaminated food etc) to the general public. Even small is not beautiful!

In the 70’s of the last century, Dr Narinder Singh of Cambridge University had already shown that 70% of the products manufactured by industry contained substances poisonous to human life. Now it is common knowledge that all those who are enjoying modern life-style wholly or partly, daily ingest a variety of toxins in their bodies (Hawken P Ibid).

In the last decades of 20th century, environmental economists Herman Daly, Kenneth Boulding, Dr and Mrs Ehrlich, Ayers and others brought out the essential futility of modern economic growth. They showed that the very assumption, “aggregate wants are infinite and aggregate production could be made infinite by using modern technology”, was not only wrong but would bring in ultimate disaster and collapse!

In any economic activity, where energy is used to increase production, energy ratio on investment (EROI) is less than one. In temperate countries, modern agriculture using machinery, chemical fertilizers and insecticides, is almost 1500 times more productive as traditional agriculture. But in energy terms, one (1) input of energy produces 0.005 output, which is negative. (Bayliss - Smith T.P ibid).

Even traditional agriculture where bullock power is used but their dung is further used as fuel, gives a less than one energy ratio of 1 : 0.96. The ratio becomes more than one if cow dung is returned to soil as fertilizer. As modern industry cannot be run
without the application of fossil energy, the energy ratio becomes consistently less than one.

EROI of the use of non-conventional energy is also not positive (more than one) if investment in manufacturing solar panels, their installation, the requirement of dry cell battery and its replacement, the manufacturing cost of wind mills and their transport (in power generation through wind), the power needed to start these mills and bring them to a basic RPM rate are considered. The present techniques of power generation using solar panels and windmills thus give a less than one energy ratio. Similar are cases of power generation using atomic power and even hydro-power. If their social and environmental costs are internalised, these will never produce a more than one energy return on investment!

The conclusions seems to be inevitable: All power generation using modern technology and all manufacturing based on machines and large-scale use of energy are loss making and should be avoided!

These activities are being sustained at present by heavy subsidies from nature and the general public. It means loss of life-support for both!!

If the Laws of Thermodynamics (or Entropy) are well understood, the entire basis of modern life-style falls apart.

Then the question is why does it still persist? There are no doubt, experiments in America and Europe where communities are trying to cut away from the present economic system. Some of them even have their own currencies. Yet the social and economic significance of laws of thermodynamics (or entropy) is hardly known to the general public. Indeed it looks as if the present system has a vested interest in keeping this knowledge away from people. No reference is made to it even in higher education. When the physical and economic significance of conversion of matter from mechanical to electrical and again from electrical to mechanical and the loss of energy involved in each stage, was explained to some teachers from engineering college, they exclaimed, “Please do not tell this to our students!” The losses are of such magnitude that the whole engineering exercise becomes futile. Yet this is exactly what is practised in real life. Heavy losses are incurred all along the line. Ultimately these losses are to be suffered by nature and some sections of
human society!

Modern industrialism is not possible without degradation of nature, a declining human population and a constant rise in the cost of living. Scientists and administrators argue that human population will stabilize around 2050 A.D. What will be the state of natural eco-systems then? What will be the cost of living? Nobody seems to offer any forecast! Thinkers like Stephen Hawking are predicting end of the present human civilization much earlier!!

The Holistic Point of View therefore, advocates a radical change in the face of industrialism. Excessive use of energy must stop. Energy and natural resources must be priced properly.

At present their prices are forced down by various subsidies. This results in unessential conversions, production for production’s sake just to keep industrialism alive and manufacturing of unessential commodities (intermediate goods). Resulting pollution and waste degrades nature. The cost of restoration of nature and revival of natural eco-systems should be internalised.

This will force up the prices of natural resources including energy. Human labour should replace machines in many cases and should have a price less than that of raw materials and energy!

According to some writers (Hawken, Lovins, Armstrong, Bilani etc ) such changes are already happening in America, since the nineties of the last century. It is well known that a bulk of US industry has shifted to Mexico, China and some have entered India too. Foreign capital is welcome in many Asian, African and South American countries (the so called less developed nations ) and even “dirty” industries and dangerous (toxic) waste deposition are accepted.

According to these authors American economy is tending toward “a green” or “restoration economy” where repair, refabrication, restoration and revival are the key tasks. According to them more than 70,000 businesses of this type have already been established in the US. “First destroy and then restore” seems to be the motto of modern industrialism.

These efforts however, suffered a setback during the “Bush regime” when pollution control laws lost their teeth and
What can be the holistic point of view?

Industries were given subsidies and tax concessions, in the name of creating jobs and employment. The price of labour is artificially kept high. "Outsourcing" of labour then became a feature of US and indeed all developed economies!

India seems to be following the same path, making the same mistakes western developed countries committed. Since liberalisation of controls, "First destroy" seems the motto of government's policies. Air, surface and ground water, forest, fragile and ecologically sensitive areas, sea-shore and coastal areas are allowed to be exploited without restraint. Ministry of Environment has lost its importance, environmental impact assessment has become a mere farce and natural resources are allowed to be used without any thought of their conservation.

Bio-manipulation and biotechnology are being encouraged. Government of India policy resolution says that initiatives in the field of biotechnology include techniques for gene mapping, conservation of biodiversity and bio-indicators, research, special programmes for plantation crops, for the benefit of scheduled castes and tribes; cattle herd improvement through embryo transfer technology, in vitro propagation of disease resistant plant varieties for obtaining higher results and development of vaccines. The government says that the country's resources will be used to derive maximum output.

The official approach seems to be basically exploitative in tune with the government's emphasis on engineering and technological solutions to problems. Many people are concluding that this approach is increasing economic inequalities in India ("Disequalising growth", several articles appearing in newspapers and several letters to editors expressing concern).

To reduce inequalities, the gap between rich and the poor, can there be an alternative path of development? Writers who have expressed concern, have unfortunately not laid out an alternative path. Such a path should be focused on judicious and sustainable management of our natural resources - atmosphere, water, soil, forest and grasslands and other vegetation, minerals and coastal and marine areas.

The essential steps to progress along this path include: 1) Restoration and revival of these resources; 2) establishing grass roots institutions to manage these resources at village level; 3) organize basic and higher education in judicious management
and restoration of natural resources and 4) introducing village
level planning in management of these resources and marketing
their produce. The goal should be to enhance and use local
resources to satisfy local needs on a priority basis.

The present mindset focusing exclusively on engineering and
technology needs change. As technology is power, it inevitably
leads to centralizing of authority, of decision-making and of
investment. Instead what is required is decentralization and
investment in restoration, revival and judicious and sustainable
management. Change in the present educational pattern is also
necessary. Introduction of environment in the curriculum in a
disjointed manner should be replaced by a holistic treatment
connecting various physical and social sciences as is attempted
in the present essay.

A Holistic Point of View, treatment of our problems in a
holistic manner, is required to achieve welfare for all - humans
and non-humans!

Warning: Conflicts and violence are imminent as we
irreversibly degrade our soil and water resources!

Prakash Gole