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Human Culture and Environment

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ABSTRACT With the arrival of human beings (*Homo sapiens*) on earth the natural ecosystem started changing. Human created their own ecosystems - the agricultural ecosystem, the rural and urban ecosystems through their cultural and technological knowledge. Human beings act as the primary as well as the secondary consumer in the global ecosystem. With the rise in human population and cultivation of the culture of consumerism the consumers of global ecosystem threatens to overtake the producers (forests and farms) resulting into severe ecological imbalances. Moreover human beings need exceptionally high amounts of energy (mostly fossil fuels) to sustain their ecosystem, particularly the urban eco-system and also create large amounts of wastes (solid, liquid and gas) in the process, the disposal of which is posing a serious techno-economic problem for humanity. This is putting an additional stress on the environment. The future of human ecosystem on earth is at stake today. Humankind has to learn to live in harmony with nature, reduce their number of consumers, reuse and recycle their wastes and change their habit of consumerism if they have to survive.

INTRODUCTION

Humans, by their wit and intelligence have been reigning over the earth for several millenia. The early man appeared on the earth perhaps 5 lakhs of years ago in the central parts of Africa and it took a long time, probably more than 4 lakhs of years, to spread this species over all the continents. It was for a long time that man remained like any other animal and lived on wild fruits, berries and flesh. About 15,000 years ago, humans had learnt much about the edible species of plants and established five 'hearths' upon this planet - the Mediterranean, the Mesopotamian, the Chinese, the Indian and the South-Eash Asian, the areas which were fertile, rich in biodiversity and had wild growth of wheat, rice, maize and other edible cereals. But it was not until 10,000 years ago that humans learnt to live in organised settlements and only 5,000 years ago domesticated wild plants and animals for their livelihood.

ATTRIBUTES OF MAN

The history of man is therefore new and the process of civilization even newer. It is estimated that in 10,000 B.C. the total human population of the world was only about 4 million. This had increased to 5 million in 5000 B.C. due to the spread of agriculture and better means of sustenance. With the growth of civilization and development of culture, the absolute numbers went on increasing. In 2nd Century B.C. the world population had increased to 150 million and in 200 A.D. to 190 million. Since then the population has been increasing gradually upto the 17th Century when it was in lag phase. After that the human population grew rapidly in exponential manner and reached an all time high of 5 billion in 1988. It is estimated that there will be nearly 8 billion people on this earth by 2025.

Human interactions with natural environment in the past was very friendly and just like any other animal in nature. Basically humans are an animal but with very unique attributes. They have the highest brain volume and "capacity to think and plan" which makes them distinct from the rest of the animals. Above all, they have traditions and only they accumulate knowledge over successive generation through non-biological means. Although human evolution took place through the operation of the same forces which produced all other organ-

isms but their perpetuation of knowledge and education is taking place through inherited traditions not passed on only by "genes" (heredity units) but also by "words". This change over from merely biological to technological evolution has a great significance for the earth and environment. But today humans no longer belong to the natural settings. Human activities are alien and almost hostile to nature. With the advancement of *science* and *technology*, the medical science controlling human diseases and epidemics, natality and mortality; the engineering science forecasting and averting natural disasters; the agricultural science boosting food production and preventing the threats of famines and starvation, mankind appears to have escaped the Malthusian theory of "natural checks and balances" (Sinha, 1995). Human intervention into nature is radically disruptive. It is postulated that the rapid growth of human population and its cruel behaviour with nature may lead to starvation, exhaustion of water and land resources and the ultimate extinction of the human species. Urbanization, industrialization, extension of agriculture, use of lethal chemical and pesticides etc. have led to gross alteration of the natural environment and estrangement in relationship with nature. The human-directed system have taken long strides and dismantled the bio-environmental systems of earth (Fedrov, 1980).

HUMAN IMPACT ON ENVIRONMENT

Although basically human activities affecting environment have been a legitimate and positive process, there are several instances and evidences of extremely negative, rather destructive effects. Wholesale extermination of some animal species through uncontrolled hunting and habitat destruction; chemical and biological disintegration of soil through the misuse of land by indiscriminate use of agrochemicals, ambitious irrigation and overgrazing; loss of crop biodiversity due to monocultural cropping with high yielding varieties (HYV's); loss of some plant species of rare medicinal values due to their over-exploitation; are a few examples. Mankind has altered the environment to suit its own needs for millenia, causing some species to prosper and the others to suffer. Human activity is now changing the natural world at the rate unprecedented in evolutionary history and mass extinctions are apprehended. Seriousness of the problem is enormously multiplied as the conventional food plants get extinct because they form the "producer base" of the human ecosystem. When civilization started there were more than 50,000 varieties of rice but only few hundreds have remained today (Sharma et al., 1987).

Mankind systematically develops essentially new possibilities for satisfying their need. Interaction between humans and nature existed from the very beginning of humanity. Proliterate societies could exist only within a very narrow range of natural conditions, whereas today there is hardly any place on the earth's surface where human would not be able to live and work. Humankind have acquired the capability to transform nature at its will, have reached high in the space and down to the floor of ocean in search of new sources of survival, having largely thrown off the constraints on their activities originally imposed by natural conditions.

Our planet has entered into a new stage of its history. The "biosphere" has changed into technosphere. We seem to be breaking through the confines of the earth as the geochemical and biochemical actions of the intelligence of modern man cannot be confined to the size of the planet earth. The transformation of the environment in course of human existence is inevitable. In fact every form of life affects environment with its activity as they draw essential materials for their survival from the environment and create its own "ecological nich" in the global ecosystem.

Long Term Human Impact on Environment

1. Change in the structure of earth's surface

due to indiscriminate mining and quarrying activities, drilling and other excavating operations;

2. Transformation of some of the natural ecosystem of world into human-made ecosystem for living (urbanisation) and obtaining food (farmization);
3. Reshaping of the topography of the earth due to change in landscape and contours resulting from large scale destruction of forest and vegetal cover;
4. Disruption of surface and ground water circulation resulting from faulty mining operations and quarrying activities, human made lakes, canals, water reservoirs and due to interference with the natural course of rivers and their diversion for creation of irrigation projects and dam building for hydroelectricity generation;
5. Reduction in the transparency of the atmosphere due to accumulation of "green house gases" *e.g.* carbon dioxide, nitrous oxide, methane, chlorofluorocarbon etc. and rise in the earth's temperature leading to "global warming";
6. Accumulation of "non-biodegradable" wastes such a plastics, chemicals and other synthetic materials. They would remain in the environment for decades without being degraded;
7. Destruction of wetlands, mangroves and tropical forest ecosystems of earth which are rich repositories of biodiversity;
8. Erosion of the earth, biodiversity and mass "extinction" of species. According to a conservative estimate every day a minimum of 3 species disappear from earth. It may become 3 species every hour in just 10 years if habitat destruction continues in the same manner; (Greenpeace Society)
9. Sinking of the earth in several big cities of the world. Bombay and Calcutta in India, Manila in Philippines, Jakarta in Indonesia and Bangkok in Thailand due to heavy discharge of underground water unaccompanied by recharge;
10. Soil erosion, salinization, creation of deserts and wastelands over several parts of earth. New deserts are being formed while the existing ones are marching;
11. Change in the "energy (heat) balance" of earth leading to global warming and climatic change;

Short Term Human Impact on Environment

1. Change in the nature of the biosphere, the atmosphere and hydrosphere. They are increasingly becoming a technosphere;
2. Contamination of air, water and soil by toxic pollutants and harmful pathogens;
3. Accumulation of solid wastes (including hazardous wastes) and sewage;
4. Birth of new kinds of harmful pathogens and organisms in the environment causing new human diseases;
5. Imbalances in the global terrestrial and aquatic ecosystems resulting from over-exploitation of forest resources, wildlife and marine life;
6. Depletion of the protective "ozone cover" in the earth's stratosphere due to accumulation of Chloro Fluoro Carbon from refrigeration and air-conditioning industries and flight of supersonic and jet aeroplanes at high altitudes.

CULTURAL ECOLOGY : THE IMPACT OF MODERN HUMAN CULTURE ON ENVIRONMENT

Human culture all over the world has put a significant impact on global ecology. History bears out that with onset of cultural evolution of mankind great ecological changes have occured in the earth's ecosystem.

The early human civilization of the hunting gathering stage, living in the remote forest with other wild creatures were friendly with their environment and had a symbiotic relationship with forest which provided them shelter and livelihood. But with cultural evolution, as they learnt the art of making tools, use of fire and

domestication of plants and animals to secure their food and living they started exploiting the nature. Hence with the beginning of agriculture the culture of food production on land and livestock rearing (around 7000 B.C.) large scale destruction and clearing of forest started for farming and rangeland development. Next was the need of secured dwelling for security against vagaries of nature and wild animals and with that came the "housing culture" and urbanization. This again put great stress on the forest and land.

With the technological revolution of 18th century - industrialization, mechanized farming, motorization and urbanization - came the "modern culture", - the dehumanized "machine culture" and the culture of "over-consumerism". This culture is very pervasive and is proving highly destructive to the environment. The "automobile culture" and the "chemical agriculture", unleashed from rapid industrialization, is playing havoc with both human and environment. The blatant environmental pollution; global warming and ozone depletion; rapid deforestation and desertification; resource depeletion and massive waste accumulation; ecological diseases and drudgery are all direct or indirect results of our so called modern culture (Sinha, 1996).

Our modern human society has become highly pervasive and a "throw away society". The culture of "over-consumerism", more prevalent in the Western societies, is ecologically "destructive" and "unsustainable". It is directly related to rapid resource exhaustion and waste generation. Every aspect of the modern culture - food growing (heavy use of chemical fertilizers and pesticides); food processing (use of canned and preserved foods); clothing (use of synthetic and non-biodegradable polyester clothes in place of cotton); shopping (use of non-biodegradable polythene bags); bathing and washing (heavy use of pure drinking water and chemical detergents); fast transport (use of fossil fuel driven automobile and consequent toxic emissions; modern housing (use of building materials like metals and timbers whose extraction and processing from nature leads to massive environmental destruction); living with more luxury and comfort (involving heavy use of scarce energy resources for lighting, heating, cooling and refrigeration whose utilization leads to severe toxic emissions; all have serious negative environmental impacts.

Whereas the traditional human culture was environmentally conservative, the modern culture is exploitative and destructive. In our modern culture we use much more of every environmental resources, *e.g.* more water for cleaning, washing and flushing and growing food; more energy for heating, cooling, transport and cooking; more metals for construction and canning; more glasses for bottling and in housing; more papers for writing, packing, cleaning and greeting; more timbers for furnitures, fixtures and construction; and more plastics for carrying, packing and rapping; more chemicals for perfumes, aerosols and as detergents and cleaning agents. And in the use of all these materials environment have suffered imminensely. The excessive use of 5 p's by the modern human society *i.e. paper, power, plastic, potable water* and *petrol* have enormously damaged the human environment by way of pollution, deforestation and waste generation. The use of paper and plastics in our modern society have particularly increased enormously. Frequent use of "greeting cards" on every social and national occasions; plastic bags in all shopping practices have become a common feature. Use of papers have direct impact on the forest solid waste generation and water pollution" (Sinha, 1996).

The dangerous phenomenon of drastic "Climatic Changes" owing to rise in earth's temperature and global warming due to green house effects and depletion of protective ozone cover in the stratosphere is the direct result of our modern way of living and lifestyle. The major green-house gases *e.g.* carbon dioxide and nitrogen oxides are result of boom in auto-

mobile population, and the major cause of ozone depletion, *i.e.* by chlorofluorocarbon (CFC), is related to our use of sprays and aerosols, refrigerators and air-conditioners in homes and offices.

Human culture has a definite role in shaping the future of earth and environment. Human kind has to change and pervasive modern culture and adopt a more environmentally friendly culture which should have reverence towards both the native and the nature. A progressive human civilization with ecologically destructive culture cannot last long (Anonymous, 1989).

THE HUMAN ECOSYSTEM

Human created their own ecosystems, *e.g.* the agriculture ecosystem, the industrial ecosystem, the rural and urban ecosystems, out of the natural ecosystems. The human ecosystem in the biosphere is unique among the other ecosystems on earth. Human beings are at the centre of this ecosystem working as both "first" as well as the "second consumer" (Omnivores) because they feed upon the plant products (cereals, pulses, fruits and vegetables) and the animal products (meat, milk, eggs etc.). Through agriculture, human have entered into the food chain of the natural ecosystem in an unusual way. Today, 30% of the photosynthate is used as human food and this represents 0.22% of the total solar energy received upon this planet. Further expansion of agriculture is constrained by the limited land resources, infertility of soil, lack of sources of irrigation and the need to protect natural ecosystem in areas of wilderness and high biodiversity.

Human ecosystem is highly energy-intensive and nature has to invest-large amount of energy to sustain this ecosystem on earth. In all other ecosystems the consumers feed upon the raw foods and the producers and consumers are in close proximity. The cultural, biological and social needs and demands of human beings are quite different and is increasing day by day with technological development and cultural evolution.

The human ecosystem, particularly dominated by the meat eating non-vegetarian human society, subsist upon heavy energy input from the environment. Our primary producers, the crop plants capitalizes, on the average, less than 1% of the incident solar radiation. In the human food chain from crops to cattle to humans or from crops to humans there is a tremendous loss of energy. Only 10% of energy transfers at each trophic level while 90% becomes unavailable to the next consumers. For every 1,000 calories of solar energy, there would be 100 calories of plant food, 10 calories of animal food, and only 1 calory of human. The relative inefficiency of energy transfer from one trophic level to the next imposes some natural limits on the growing human population. This ecological energetics of the human ecosystem determines that the same amount of food that would feed 210 millions of animal food based non-vegetarian human society would be enough to feed 1.5 billions of plant food based vegetarian human society (Kirk, 1972).

Conventional human food production (agriculture) is itself a highly energy consuming process. In fact more non-renewable energy is expended in the production, marketting and application of fertilizers; in irrigation of crop fields; in harvesting and threshing of food grains than new food energy is produced. According to one estimate the industrialized food systems in the modern human society requires 5 to 10 calories of energy (mostly non-renewable and polluting fossil fuels) to produce 1 calorie of food, while the primitive human societies produced 5 to 50 calories of food for each calorie of energy (mostly renewable and non-polluting bioenergy) expended (Kirk, 1972).

From growing food in the farms (involving heavy inputs of chemical fertilizers, pesticides and water) to transporting to homes and then cooking in the kitchen, all involves large in-

vestment of energy (mostly fossil fuels) and consequent pollution. This is still more blatant in case of the urban human ecosystem where food has to be transported from hundreds and hundreds of kilometres away from the farms located in the rural areas. Fertilizer production for agriculture is itself highly energy intensive and environmentally destructive process.

The new food culture of the modern human society - "fast foods" and eating of white rice grains, white flour and peeled fruits and potatoes are highly destructive to both human health and the environment. Procurement of fast foods entails heavy use of paper, plastics water and electricity and consequent waste generation. Milled and polished white rice grains and white flour are devoid of "vitamins" which goes as waste with the coat of rice and wheat grains. Similarly much of the vitamins are located in the peels of potato and other fruits and vegetables which is thrown away. Besides food, mankind draws several other essential materials from the nature's reservoir for their survival and existence on earth. These are primarily for urbanization (house buildings), and for transport and communications. And in all these cultural activities heavy investment of energy is involved which at the moment is primarily being maintained by the fossil fuels whose extraction and utilization itself entails heavy environmental damage through pollution, acid rains, deforestation and global warming. Moreover in the process of living on earth humankind generates huge amount of "wastes", both garbage, sewage and industrial wastes, whose magnitude is growing day by day with increasing culture of consumerism and threatening the environmental sanitation of earth. In natural ecosystems the organic "wastes" generated by the consumers (Herbivores and Carnivores) are assimilated and recycled back naturally into the global ecosystem through the "decomposer" soil microorganisms. But this is not being possible in case of the human ecosystem because the concentration and quantity of waste generated are accumulating beyond the "assimilating capacity" of the natural decomposers of the earth biosphere and hence spreading as toxic pollutants. Hence the sustenance of human ecosystem on earth is threatened both ways - one due to dwindling energy resources of the biosphere and the other due to poisoning of the biosphere itself (Sinha, 1991).

The greatest threat to human ecosystem comes from the overgrowing human and livestock population on earth. The population explosion threatens to jeopardise the human ecosystem. The human ecosystem on the earth will remain stable as long as the base of the ecosystem constituted by the land, forest and vegetation (the producers of the ecosystem) remains broadened and the head constituted by human, animals and livestock (consumers of the ecosystem) remains narrow in the shape of an upright pyramid. With the explosion of human and livestock population this situation is fast changing. The producer base is narrowing owing to massive deforestation and land degradation to accommodate the growing population while the consumer head is expanding. If the "consumers" in an ecological system overtakes the 'producers' it is bound to collapse in the same way as a market collapses if demands exceeds suply in an economic system. Also, the earth has a definite "carrying capacity" to support any population of living organisms within which it provides the necessary resources for their survival and also absorb and recycle all the "waste" created by that population. The modern human population is exerting tremendous pressure on the earth's ecosystem beyond its "carrying capacity". The growing human population has an analogy with the multiplying "yeast population". In a cup of grape juice the yeast multiply rapidly, eats up all the sugar and finally dies due to the "toxicity" of their own by-product, the "ethyl alcohol". The human population is also following the J-curve (inverted V) of yeast and heading for a collapse (Kirk, 1972). They are out to consume all the earth's natural resources rap-

idly and would die finally under the toxicity of their own creation - the pollution monster. The Malthusian theory of "natural checks and balances" of human population would then come true. If the present trends and characters of population growth, resource consumption and socio-economic development are retained, then in 50 to 70 years from now, the population of our planet, will begin to die out because of a shortage of resources and poisoning of the life supporting system - air, water and soil. Only after more than two-thirds of world population has perished will it be possible for the remaining one-third to subsist with any degree of hope for the future (UNEP Projection, 1992).

The Urban Human Ecosystem

Urban human ecosystem is already parasitic upon the rural human ecosystem for their very existence. All the basic needs of the urban society - food, fodder, firewood, fibre etc., are provided by the rural people. In terms of human ecology the rural people are the "producers" while the urban people are "consumers" of the human ecosystem. With phenomenon of mass migration from the rural to urban areas the erstwhile "producers" have also become "consumers" leading to severe imbalances in the urban-rural ecosystems.

If in any ecosystem the consumers "rise" while the producers "decline" the situation becomes disastrous and is bound to collapse. Moreover the urban ecosystem is highly energy dependent. From growing food to cooking in the urban kitchen, all require huge input of energy at every step. The modern urban skyrise buildings requires lots of energy for lifts, lighting, heating, cooling and boosting of water etc. In the face of declining availability of energy resources the sustainability of the urban human ecosystems is becoming a serious problem before the urban planners and developers (Sinha, 1994).

That apart, congregation of too many people in a too small urban area have other negative environmental consequences. It has led to huge piling of toxic wastes, garbage and sewage in cities; blatant air and noise pollution and related lung, respiratory and cardiac diseases in cities due to ever increasing number of automobiles and industries; depleting groundwater table and increasing scarcity of potable water; increasing incidences of contamination of drinking water and spread of water borne diseases.

CONCLUDING REMARKS

There is inherent in the of ecological processes a control of human destiny - a control that demands obedience and perhaps reverence on parts of every human beings born on this earth. The nature of ecological process controls human destiny along with the destiny of other living and non-living components of the biosphere. The control is a both way process. The human beings are an extreme case - the control we exert over the ecological process is unparalleled in the world of living things. Human control on nature is permanently disrupting the ecological process that have nurtured life on earth for billions of years now. Increasingly we find ourselves wondering about the repercussions of our own activities; increasingly the word "survival" makes us pause uneasily as we leave our imprint of environmental destruction on one ecosystem after another.

If humans are to defer their extinction, population has to be stablized at some point of time and the culture of "over-consumerism" and "throw-away" has to be given up completely. Humans have to arrest the erosion of earth's biodiversity and extinction of species. Every time a species goes extinct we are irreversibly impoverished. With every species disappearing from earth man moves one step closer to his doom. The earth's geological and biological resources have to be conserved and utilized more judiciously. This economy demands for the "reduction", "reuse" and "recycling" of all materials in development and a

total arrest of any wasteful use of natural resources. This economy of ecological equilibrium will basically require humans to return to nature and not to exploit it beyond the power of replenishment. To save both humans and the environment from ecological disaster, social and economic adjustments which are in consonance with nature will have to be made by the affluent human societies of world.

Human will have to adapt to a new type of economy called "Ecological-Economics", new type of economic development called "Eco-development" and build up a new human society called "Eco-society" which is totally divorced from the concept of 'over-consumerism', 'over-population' and 'exploitation' (Sinha, 1994). The future of humans would depend upon the maintenance of natural eco-systems of the earth and upon how judiciously and wisely they use the scarce natural resources. They have to realise the fact that they are just one among the many in the global ecosystem and that they have to depend upon all of them for survival. They cannot behave as the master of the living planet. No creature born on this earth has the moral right to encroach upon the living rights of others. We do not have a freehold on earth but mere "tenancy right". Our primary goal should be preservation of our species, the *Homo sapiens* and all those living species with which we are interrelated in the complex web of human ecosystem. What is done to nature must be considered in terms of its real, potential or even suspected effect in our survival.

The biggest challenge facing the human civilization today is how to overcome the problems of pollution and ecological destruction while keeping the pace of economic development. While technology provides expensive methods of pollution control and abatement, only human ecology can provide a final solution. Pollution is directly related to resources consumption and as long as "human greed" for rapid economic development, culture of over-consumerism and luxurious living prevails in the human society no technology can restore the earth as pollution free zone. There has to be a cultural change in life-style and change in the attitude of thinking of humans towards the environment. Human Ecology calls for symbiotic relationship between man and environment and for a sustainable human society based on rationality on consumption of environmental resources and reduction in waste generation.

In future the demands of natural resources of the civilization is likely to escalate several fold with growing population and continuation of the present culture of "over-consumerism" of the affluent society. *Mother earth does have the necessary resources to meet the "need" of every human born on this earth but not to satisfy his "greed"*, said Mahatma Gandhi. We have developed enough technology to meet all our needs but we have not accordingly brought in changes in the social, political and economic system to equitably distribute and absorb the fruits of the technological development without harming both the man and the environment. Technology can only help within the "carrying capacity" of the earth and not beyond that. Soon some other natural factor starts putting constraints and impose a limiting factor. The agro-chemicals boosted productivity of land and increased its carrying capacity (food producing capacity) to manifold but soon the ill effects of chemicals on soil started putting a limit to further use of agro-chemicals and increase productivity (Sinha, 1996).

Hence mankind has to learn to live ecologically on earth, minimise their material demands of luxurious living and give up the culture of greed and over-consumerism. "Conservation" of resources and "consumption according to need" and the environmental philosophy of 3 R's (reduction, reuse and recycling) with regard to resource consumption and waste generation are key words and golden rules for human survival on earth. Crisis confronting the human race calls for a revolutionary change in the attitude of present generation of human

beings. A new pact with nature that has more to give than to take from nature has to be developed, otherwise the *Homo sapiens* may end up the only species that minutely monitored its own extinction.

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