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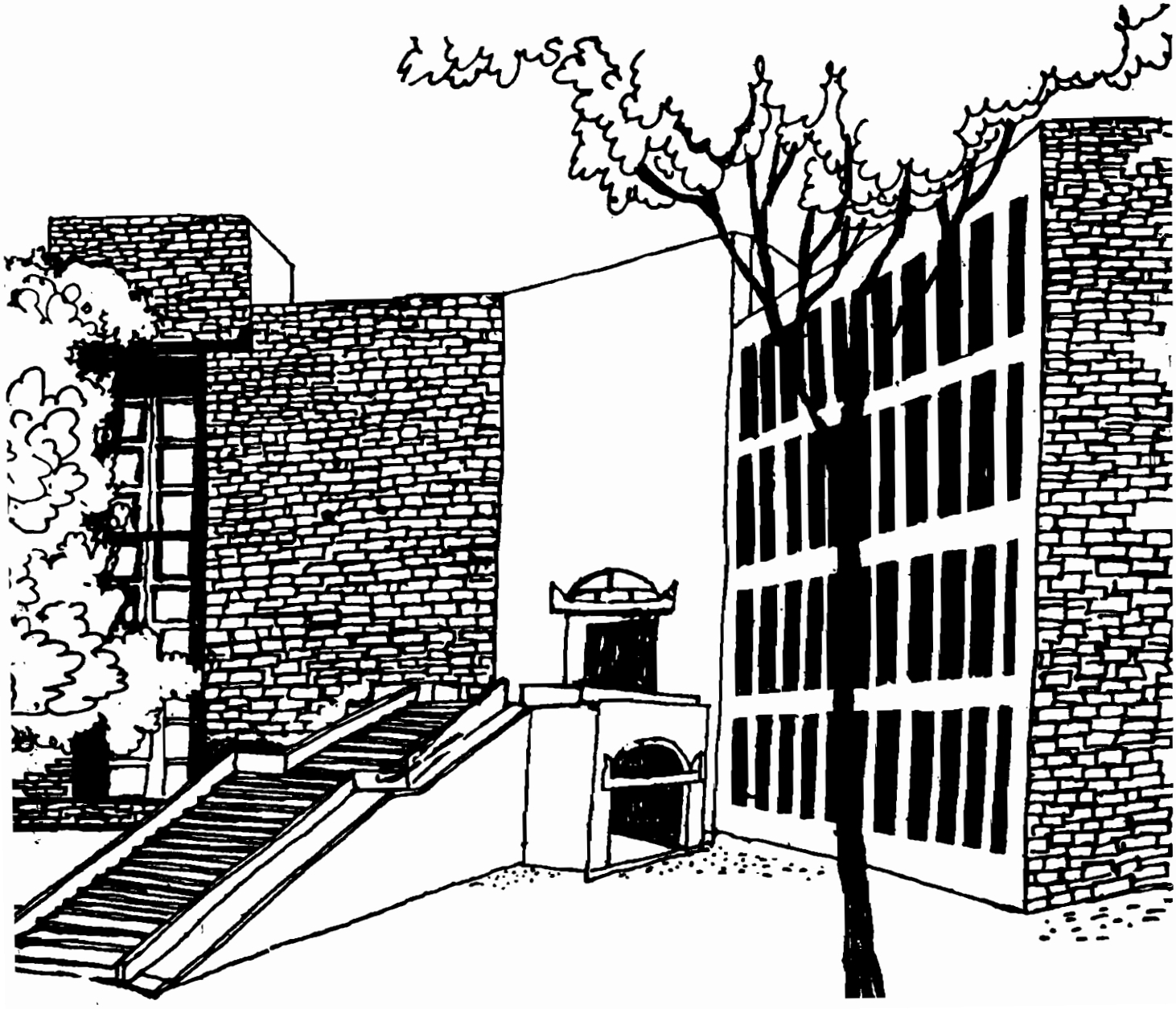

PARADIGM OF SUSTAINABLE DEVELOPMENT PROGRAMME IN INDIA

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1.0 Introduction

In recent years, particularly since the publication of *Our Common Future* by the Brundtland Commission in the eighties, there has been a great deal of concern all the worlds over about sustainable development. India, like many developing countries, joined herself with the 'sustainability' debate with equal vigour and concern. But unlike the developed industrialized countries with high standard of living and well being, the 'sustainability' debate in countries like India has been consistently fraught with difficult operational issues because of the nature of its internal situations and external linkages. Widespread poverty, for example, is the endemic socio-economic problem of India. And it has been duly recognized even by the Brundtland Commission that poverty is the singular most important impediment for sustainability. This means that for a large mass of poor people in India, the immediacy of concern is for today's and tomorrow's lunch, not what will happen in the future. As a result, the critical operational parameter for defining 'sustainability' in the Indian context is the intra generational aspect rather than inter-generational issues which is often focused as the core, at least in the context of industrialized developed countries.

2.0 Paradigm of Sustainability

Thus to put it simply, the conceptual and operational parameter for defining 'sustainability' for a country like India takes the primacy in importance of the issues on intra-generational equity with secondary position to inter-generational equity. In other words, the operational concept of sustainability is defined and understood as a development process to maximize output of a given resource base in a situation or a locality in order to satisfy the needs of the people concerned, equally to all sections to the fullest extent without harming the resource base for equal or even greater production

prospects for the future generations as compared to the present one. The important point to note here is the primacy of the condition that such a process should have to first satisfy equally the present need of the intra- generations to the maximum extent. The immediate constraint for operating such development process is the limit in the capabilities of the biophysical resource base, which cannot be exploited indefinitely without irreversible and harmful changes.

In the context of the foregoing debate, Jodha,[1] after reviewing the work of a number of internationally known authors[2] defined sustainability in relation to specific situations as:

> "The ability of a system to maintain a certain well-defined level of performance (output) over time, and if required, to enhance the same, including through linkages with other systems, without damaging essential ecological integrity of the system. Because of the time factor involved and the systems responsiveness to changing requirements, `sustainability' is a dynamic (as against static) phenomenon. This distinguishes sustainability from mere subsistence and makes it compatible with development."

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[1] N.S.Jodha, "*Sustainable Agriculture in Fragile Resource Zones: Technological Imperatives*," Economic and Political Weekly, March 30, 1991.

[2] Conway, G.R. "*Agricultural Ecology and Farming System Research*" in Remenyi, J.V. (ed.) *Agricultural System Research for Developing Countries*, Canberra, Australian Centre of International Agricultural Research, 1985.
Raoburn, J.R. *Agriculture Foundations, Principles and Development*, New York, John Wiley & Sons. 1984, Seirand, R.C. "*Sustained Food Production in Upland: Making Hilly Lands Pay*" in the PACARRD Monitor, Vol.12 (3), 1984.
Tolba, M.K. *Sustainable Development: Constraints and Opportunities*, London: Butterworths, 1987;
Tidell, C. *Sustainable Development: Differing Perspectives of Ecologists and Economists, and Relevance of Less Development Countries*, in World Development, 16 (3), 1988.

In elaborating the definition, Jodha emphasized the links between short-term intra-generational issues (poverty, inequality, etc.) and long-term inter-generational issues. For, as he points out, the sustainability/unsustainability is the outcome of the interaction between the basic characteristics of the natural resource components and pattern and methods of their utilization. Jodha summarized the implication of such an operating definition stating that "sustainability" (i.e. sustained or increased level of production performance) is conditioned by the capacities of the biophysical resource base to withstand high use intensity; to absorb high quantities of complementary inputs; to tolerate periodical shocks disturbances without facing permanent damages; to ensure gains associated with the scale of operation and infrastructural logistics; and to form linkages/exchanges with other (wider) systems.

The above definition, as explained by Jodha, seems to satisfy all the necessary elements of sustainability, except for the fact that it emphasizes more the technological aspect in relation to exploitation of the potentiality of a resource base over a time than the socio-economic structural issues like poverty and equity. Decades of development experience, particularly, the experience of green revolution have convinced many that poverty and inequity is not a short-term issue, but have a tendency to not only continue but also aggravate over a time unless the development process specifically addressed itself to them. Also, 'sustainability' being a situation location-specific issue, poverty and inequality inevitably assert themselves in preventing the self-sustaining aspect of the process of sustainable development efforts on a long-term perspective. As a result it usually and necessarily creates a dependence in the sense that it needs a continuous external prop even to maintain a semblance of a partial effort without total people' participation, which ultimately leads to unsustainable development.

Hence Khosla[3] characterized sustainable development designed with factors like resource conserving, equitable, economically efficient, waste reducing, socially compatible, enjoyment generating, self-reliant and need fulfilling. In fact, echoing a similar concern, the conference in Ottawa[4] clearly suggested five elements of the sustainable development paradigm, which need to be addressed to through proper strategies and tools:

- Integration of conservation and development;
- Satisfaction of basic human needs;
- Achievement of equity and social justice;
- Provision for self-determination and cultural diversity; and
- Maintenance of ecological integrity

Having reviewed the conceptual and defintional issues of 'sustainability' in the Indian context, it is possible now to examine the strategic implication in implementing sustainable development programmes in some important resources, such as land, water, energy and forests.

3.0 Issues on Some Critical Resources

3.1 Land

Land is the most critical resource based for any country, but more so far India. More than 70 per cent of India's population lives in the villages, where agriculture continues to be almost the only source of livelihood. And the dependence of agriculture on biophysical resource factors, particularly, land is more direct and critical than other

[3] Khosla Ashok, "*Alternative Strategies for Achieving Sustainable Development*" in P.Jacobs and D.A.Munro (eds.) *Conservation with Equity: Strategies for Sustainable Development*, Ottawa, Canada, 1987.

[4] P.Jacobs, Julia Gardner and David A.Munro, "*Sustainable and Equitable Development: An Emerging Paradigm*" in P.Jacobs and D.A.Munro (1987), op.cit

economic activities. Thus the primacy of land as the foremost candidate for sustainable development hardly needs emphasis.

In order to clearly comprehend the strategic issues in relation to sustainability of land in India, it is important to briefly point out some of its critical aspects. First, with the phenomenal population growth (about 89.8 per cent increase in 30 years) the land: man ratio decreased drastically leading to an adverse ecological balance. In fact, in many instances, particularly, in fragile land areas, irreversible damage has already been set in motion. Second, with the existing highly skewed land distribution in India, access to land is denied to a large mass of rural population (about 1/3rd are landless). Of the total of 140 million hectares of net sown area in India, about 75% are small and marginal farmers owning less than 2 hectares comprising about 28% of the total land, while only 24% farmers with holdings of more than 2 hectares controlled 72% of the land. Third, most of India's cultivated area is rainfed with only about 33% under irrigation. Lastly, with the available land structure and irrigation facilities, India produces about 170 million tonnes of foodgrains (1988-89), 11 million tonnes of pulses, and 12.4 million tonnes of oilseeds. As far as foodgrains are concerned, India is reported to be self-sufficient although access to required amount of foodgrains is denied to more than 40% of the population (below poverty line) because of inequity in income (lack of purchasing power) and access to productive asses like land.

The relentless increasing pressure of demand from land has been and in across the hierarchy of the socio-politics-administrative structure. At the macro level it has been, since independence a strenuous search for freeing India from hunger, self-sufficiency in food production and doing away with the humiliating political dependence on PL-480 food aid. Green revolution technologies in the 60's have largely achieved some of those

politics-economic goals. Since then, there is no stopping in pursuance purchase of the goals scaling still higher. Thus the macro level government policy is aimed not only at achieving self-sufficiency in food production but also to attain increasing exportable surplus. This means spreading of high-input-intensive green -revaluation technologies to wider areas, increasing cropping intensity and irrigation facilities, higher inputs of fertilizers, bringing more land under cultivation, etc. In fact, the progress of Indian agriculture is often measured by the area covered under green revolution technologies. Given such a politics-economic policy imperatives at the macro level, any measure or a technology which threatens to decrease the output, whether they are sustainable or not, is likely to be rejected or not likely to be even considered as a plausible alternative.

Similar compulsion as in the macro level permeates, with stronger force, at the micro levels, be it village or individuals. Hence, the primary motive of the will-of land owning group is to maximize output of the land in order to generate marketable surplus to gain highest possible income with little concern for inter-generational issue of maintaining productivity of the land for the future. On the other hand, the small and marginal farmers are hard pressed to ensure subsistence need first, even if it means adoption of farming practices detrimental to the long-term sustainability of their land. Also to be noted is the fact that the small and marginal farmers, a steadily increasing number in India who, for their survival, have to use animal husbandry as complementary and supplementary to farming and therefore necessarily depend on the common property resources (CPR). They just do not have sufficient land to divert for fodder cultivation. The tragedy of the CPR lands is that there is inequity in terms of access to them in the sense most of it has gone under the control of the village elite or are with the government. The rich in the village certainly do not need CPR land to diversity their economic activities, while the

poor survive on them. As a result of this nexus, there is overgrazing, general neglect of the CPR and grazing leading to heavy degradation and shrinkage of CPR lands. Sustainability and raising productivity of CPR lands, a matter for the survival of the poor, is the crucial issue for land resource in India, which essentially would mean the sacrifice (or sharing equitably) and the initiative of the rural rich.

It is in the context of prevailing utilization of resources in India and food production, an interesting argument is often made. In spite of green revolution, India suffers from low agricultural productivity. Considering the potentialities and possibilities for irrigated land, it is argued that productivity in such land can be increased to 4 tonnes per hectare. If such an increase in productivity can be achieved, then the available 55 million hectares of irrigated area can produce more than the present level of production of 170 million tonnes. This would open up the possibility to release vase land resources for corrective inter-generational future requirements. On the face of it, the proposed scheme seems to be theoretically an attractive alternative. But operationlization of this scheme depends on several factors which seems to be difficult, if not impossible, to obtain in India in the near future. For, it would not only require assured distribution on equitable basis to all section of people, but also to ensure that all of them have sufficient purchasing power. Simply, by legislation it would be impossible to prevent people from farming their land. The question of equity will also be a major issue in operating the scheme. The impact of green revolution and intensive agricultural development area scheme in India in terms of widening income disparity is a clear pointer in this regard.

3.2 Water

Like land, water is the other key resource for ensuring sustainable development. There is hardly any economic activity, which does not require water. In fact, the evolution of

great civilization were always found to be centered around water resources. However, our immediate concern about use of water is for irrigation and drinking.

India is perhaps one of the wettest countries in the world with an average rainfall of 1, 170 mm. Today, India uses only one tenth of the rainfall it receives and even 40 years from now, it will be using, given the present trends, only a quarter. The world's most severe upland watershed problem is in the Himalayan range. How much of the water flows from the land to the streams immediately after rains, and how much sinks into the ground determine to a great extent both the incidence and intensity of floods and droughts. Forests and vegetation play a critical role in controlling both floods and droughts, in the sense that they protect soil from being washed away by the rain and also provides decaying organic matter in the form of leaf litter, which holds the rainwater and allows it to enter the ground water. It has been observed in India that after the start of rainfall, water begin to gush out of a deforested watershed within half an hour and in four hours, the entire water had drained away. On the contrary, no water came out of a forested watershed for two hours after the start of rain and even then maximum flow of water was only 40% of that from the deforested watershed. Of the 5,334 million tonnes of soil eroded every year, 20% goes to the sea, 10% gets deposited in dams reducing their storage capacity by 1-2 per cent per year, and 61% gets transported from one place to another, much of it settling on river beds.[5]

Deforestation, overgrazing and the expansion of rainfed agriculture in India have severely degraded many watersheds and accelerated soil erosion. According to study by FAO, the maximum loss in soil productivity owing to land degradation is noticed in tropical humid

[5] Centre for Science and Environment, *The Wrath of Nature: The Impact of Environment: Destruction on Floods and Droughts*, Delhi, April 1987.

region of the developing countries like India. If soil erosion were to continue unchecked the FAO estimated that rainfed crop productivity could decline by 38.6%[6] - a phenomenon increasingly observed in many rainfed areas in India.

While on the one hand there is this problem of desertification, on the other there is widespread ill-management of water for irrigation. Lack of judicious and optimal use of water supply for irrigation has been a serious problem in India in the sense that there seems to be a psychic response to an in built fact of uncertainty while using water for irrigation apart from reasons like lack of education and proper understanding of the use of scarce resource. Thus, in the canal irrigated area, the problem of inadequate supply of water to the tailender due to blockade or over use of water at the head is very common, often leading to litigation and serious conflicts. Also in the canal irrigated area, high dose of water use without any proper drainage facilities is not only causing salinity-alkalinity of the soil, but also raising the ground water level almost to the water logging level. IN some o the canal irrigated sugarcane growing areas like Gujarat, the farmers are experiencing better yield during drought due to high water table and less canal water use. On the other hand, there are instances where an indiscriminate and increased used of ground water by lift irrigation (pumping) have pushed down the water table rendering once fertile land-resource into cultivable waste.

Without going into the controversy about the rationale for big dams. It is argued with confidence hat sufficient water can be harnessed by small check-dams, proper watershed planning, percolation tanks, etc. Experts, for example, calculate that tanks built over 3%

[6] Alan Grainger, *Desertification*, London, IIED, 1982.

of India's land area could store a quarter of its rainfall. Unfortunately, the practice of ancient India to store water in tanks ponds has been badly neglected.

Pollution and scarcity of water in large parts of India, particularly in the rural areas, are the vital issues as far as one important aspect of sustainable development is concerned. The well-off families in urban areas in India, consume about 180 ltrs. of water everyday whereas in many villages people do not even get 18 ltrs. a day.

3.3. Forest

"Water is the essence of earth, plants are the essence of water" - The Upanishad. The importance of vegetation cover, particularly forests and grasses in maintaining sustainability in humid tropic regions hardly needs any emphasis. A tree or a grass cover is not only an economic commodity, but also a source of fuelwood, a form of protection for watershed and soil erosion, a genetic resource and a contributor to climatic stability. The alarmingly increasing rate of deforestation and devegetation in India are caused by a complex set of factors, such as spread of agriculture, high population densities, high rate of urbanization, increasing use of timber for construction, industries and use as fuel sources. The important point to note here is the fact that while at the macro national level there is immediate concern to halt the process of deforestation and devegetation, at the micro level, particularly, at the individual user level there is he compulsion to meet immediate needs as well as to take advantage of the market demands. In the process, an individual user becomes alarmed only when the situation become conspicuously irretrievable or bad, hurting his/her stake, which often takes relatively longer time deferring the perception of impending danger of loss of stake in the short run. In other words an individual user's concern or stake in the short run does not match with the nation's long-term concern.

In 1984-85, India is reported to have 67.2 million hectare of land under forest, which mean 19.5 per cent of the total geographical area under forest cover. However, it is only 10.9 per cent of the total geographical area, which has a good tree cover. The latest satellite data confirm that India is losing 1.3 million hectares of forest every year, nearly eight times the annual rate suggested by the forest department.

One of the serious problems with afforestation is the long gestation period. This means long wait for deferred gratification which is obviously a least preferred option for the people particularly the poor. As a result, there is a general preference for quick-growing varieties of trees like eucalyptus, if at all afforestation programme is taken up either privately or by the government department. In fact, the government sponsored social forestry programmes are often criticized as under the programme trees are planted as commercial investment (largely quick growing varieties like eucalyptus) and not to fulfil the basic needs to provide fuel and fodder.

3.4 Energy

Energy is the key central input and motive force for all developmental activities. In fact, "so important is energy to human society that the magnitude of energy consumed per capita became one of the indicators of a country's `modernization'. In the process, the appetite for energy often exceeded the capacity of local sources of energy"[7].

Recognizing the importance of energy input, the Brundtland report suggested:

> "A safe sustainable energy development we have not yet found. Rates of increase in energy use have been declining. However, the

[7] J.Goldenberg, T.B. Johansson, A.K.N. Reddy and R.H.Williams, *Energy for a Sustainable World*, Wiley Eastern Limited, 1990.

> industrialization, agricultural development, and rapidly growing populations of developing nations will need more energy. Thus any realistic global energy scenario must provide for sustainability increased primary energy use by developing countries."[8]

Developing countries like India cannot, of necessity, slow down the process of economic growth and development. This means more energy input. It was rightly argued that the inertia, the very process of the development trends over the four decades will have their own economic and political compulsions in India in the sense that certain minimum growth in all sectors have to be achieved in order to increase the existing low levels of energy consumption, to supply basic human needs, and to offer gainful employment to a large mass of the very low income population. There seems to be no escape from the increasing consumption of energy just to maintain a necessary minimum economic growth rate. In operational terms, this means, ensuring first and foremost adequate supply of energy to meet the increasing demand. Along with this should be attempt to manage the energy demand most efficiently though proper mix of energy conservation measures. This goal is easier to set than to achieve. As the Brundtland Report categorically stated: "We have not yet found it (sustainable energy pathway)".

The problem of finding sustainable energy pathway could be appreciated if we analyze briefly the rural energy scenario in India. Cooking and heating are the prime ne4ed in rural India comprising more than 75% of the total energy need, while the balance 25% is other needs like water pumping , lighting, etc., of which pumping water is the main

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[8] Our Common Future, *The world Commission on Environment and Development*, Oxford University Press, 1988.

component. Apart from these needs for direct energy input, there is the increasing demand for indirect energy input in terms of fertilizers and pesticides. However, it must be noted that most of the primary energy need for cooking and heating in rural India is met from biomass sources like firewood, dungcake and vegetable waste (see table 1) while the other needs like water pumping and lighting are met by fossil fuel based commercial energy sources.

Obviously the immediate focus for intervention is to meet the energy demand for cooking and heating in rural India in order not only to save important biomass resources but also to use them efficiently for sustainable development.

Table 1: Forecasts of Energy Requirements in India in 1999-2000

	Consuming Sector				
	Household	Agriculture	Industry	Transport	Total
Non-Commercial					
Fuelwood (Mn.t)	192	---	---	---	192
Dung Cake (Mnt.t)	105	---	---	---	105
Vegetable Waste (Mn.t)	59	---	---	---	59
Commercial					
Electricity (Bn.Kwh)	81-84	41-42	249-283	8-9	424-465
Coal (Mn.t)	14	---	161	8	188
Oil (Mn t)	18	8	12	30	73

The most appropriate technology could be the biogas system. But at the present level of development of biogas technology, it faces a limitation in terms of dependence on cattle dung as feedstock. India has about 2-25 million households having the required number of cattleheads to operate a biogas system efficiently. By itself 20-25 million households is sizeable potential number, but it fails to cover the majority of the rural households. This means that unless either a technology based on affordable and accessible diversified feedstock is developed or most rural households have required number of cattleheads,

biogas technology would be able to cover only a small section of the rural households, solving only partially the problems of energy needs for cooking and heating.

Other technologies being promoted like smokeless woodstove, solar cooker and solar heater could at best reduce the use of biomass marginally, if promoted on a large scale.

The importance constraint of renewable energy technologies - the most talked about solution towards sustainable development is the high initial investment cost. This is important for a developing country like India with a large population below poverty line, particularly, for those investments for energy needs like cooking and heating which can still be met by the individual end-users at almost zero private cost. Besides there are technological problems for the available renewable energy technologies. Thus the Brundtland Report on an optimistic note states:

> "Most of these sources are currently problematic, but given innovative development they could supply the same amount of primary energy the plant now consumes. However, achieving these use levels will require a programme of coordinated research, development and demonstration projects commanding funding necessary to ensure the rapid development of renewable energy".

The point, however, remains that short of such development as suggested by the Brundtland Report, a country like India will be critically dependent on inefficient and harmful use of biomass resources for her energy needs particularly in relation to cooking and heating.

One of the important energy input requirements in agriculture is chemical fertilizer - an indirect energy source based on fossil fuel. The harmful effect of increasing use of chemical fertilizers without necessary corrective measures (such as, adequate organic matter application, resting the soil, appropriate crop rotations and mixed cropping etc.) has been well known and duly emphasized by the experts. On the other hand, it is also true that the average fertilizer input into Indian agriculture is still far below the levels found in many developed countries. In fact, it is often argued that India should aim for higher rate fertilizer input to achieve a far greater potential of food production, say, 300 million tonnes. Equally important is the fact that the farmers in irrigated and green revolution areas with increased cropping intensities are in continuous process of using higher doses of fertilizer input. This is clearly borne out by the increasing growth rate of energy input demand in terms of fertilizers in Indian agriculture.[9]

Given the situation, it is often argued by experts of sustainable development about the necessity for switching over the low or zero fertilizer input organic farming. But the problem of organic farming is the loss of productivity at least for the initial years, which for obvious reasons is not easily acceptable to Indian farmers. Perhaps this would have been acceptable to some Indian farmers, if like in many developed industrialized countries, the consequent loss in production was compensated by the government incentive policy and the higher market price of the produce of organic farming and popularity of them among the environmentally conscious consumers (fearful about the health hazard of high chemical input intensive crop production).

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[9] T.K.Moulik, B.H. Dholakia and P.R.Shukla, *Energy Demand in Indian Agriculture*, Oxford & IBH, Delhi, 1991.

Lastly it must be noted that there is an elemental relationship between energy and environment. Any plan for energy supply and usage will lead to greater or lesser environmental impacts. There are no energy systems which are environmentally and therefore, in terms of sustainability, flawless. Thus, there is a cost associated in making an energy plan less environmentally damaging and that cost can be relatively high. To illustrate, it was found that in an exercise of integrated energy supply model at the decentralized village or block level in India, in which attempt was made to maximize the use of renewable biomass based energy sources to meet the local energy demand and minimize the cost for reducing one unit of pollution effect was to the tune of 20,000/tonnes of SO_2 and Rs.100/tonnes of CO_2.[10]

4.0 Implementation Strategy

The foregoing brief discussion on the issues related to some critical resources clearly signify some broad strategic parameters for the implementation of the alternative approach towards sustainable development.

4.1 Education

The people, mainly the end users, should have a clear understanding about the criticality of the issue of sustainability in relation to resource management. This understanding should not only focus on the long term inter-generational requirements for future generations but also equally, if not more emphatically, ingrained with the immediate short term intra generational requirements. In operational terms, this means a planned and deliberate educational campaign to bring about understanding and consciousness at the

[10] T.K. Moulik and P.R. Shukla, *Interactive Model for Energy and Environmental Planning*, 1990.

grass root end user level. The process necessarily requires active peoples' participation at the local decentralized level in reference to the resources in their immediate environment.

4.2 Technologies

A package of appropriate technologies suited to varying local conditions should be available or else must be developed through R&D efforts if they are not readily available. The important characteristics of these technologies should not be only to ensure sustainability of the critical resources, but also be equally accessible and affordable to all sections of the local population. In other words ensuring sustainability is only a necessary condition but not sufficient for the technologies to be promoted. But the moot important bottom line for selecting and promoting a package of technology is its ability to not merely maintain for increase the productivity of the resources in the short as well as in the long run. For, an individual or a group of end users at the local level will agree to "cooperate" for the collective good provided (a) such action is expected to bring a substantial magnitude of benefits to the individual and to the group as a whole both in relation to the size and diversity of the group and to the costs involved: (b) the sharing of costs and extra benefits resulting form such individual and collective action is seen by the group to be "fair" and (c) the arrangements for ensuring that the agreed sharing of costs and benefits will be effectively enforced.[11]

4.3 Units of Action Plan

Given the widespread diversity in relation to available resources, agro-climatic conditions and socio-economic division, no single pattern of intervention is possible. This does not suggest that there is no use of planning for broadly divided agro-climatic zones, as being

[11] A. Vaidhyanathan, *Integrated Watershed Development: Some Major Issues,"* Society of Wastelands Development, New Delhi, May 1, 1991.

presently attempted in India. Apart from providing broad guidelines regarding available and appropriate technologies for different zones, such a plan would not be able to provide operating principles for implementation in specific situations. For, because of the diversities as mentioned above, the problems and issues are most often unique and situation specific. This means translating the broad macro-level plan parameters into locally situated action-interventions at the decentralized level. It is in this sense that the most appropriate unit of action for the implementation strategy should be local water shed area, covering a group of villages and even one single village.

4.4 Integrated Plan

As discussed earlier, the available resources in a given watershed area is not only diversified in their use pattern, ownership, etc., but also they are directly or indirectly interlinked resulting in a combined effect on sustainability. Interventions on any one resource-use pattern would likely to have impact on other resources. The agenda for action in a local watershed are: "to improve the moisture retention capacity of the soil, to evolve ways to retain the limited moisture that nature bestows over a period of two to three months by the construction of small weirs, check dams, ponds, et al. What is necessary is land levelling and reshaping and planting of grass to prevent run-off of the top soil with rain. What is required is the planning of trees to both fruit (and timber and fuel wood for masses). What is required a larger use of organic fertilizers (easily available in most areas). What is required is better crop planning to suit the soil conditions in each area."[12]

One may add to the list the use of renewable energy technologies like biogas, solar system wind systems, etc., better irrigation management and many others. What this

action agenda signifies is the fact that while there is a necessity for sectoral plan for each resource-use, all these sectoral plans should subsume into an integrated developed plan rather than be mere isolated activities. It is this meaningful integration of all the sectoral activities which should be the basis for implementation strategy in order to maximize achievement of the objectives of sustainability.

4.5 Dynamic Plan Model

It is abundantly clear that the integrated plan model that we are talking is fairly complex having multiple objectives and requiring multi-disciplinary expertise. The task becomes more complex and difficult because of the situation-specificity of the local watershed area. No single blue print of model plan would be enough to operate in al situations. This necessitates formulating a fairly *dynamic plan model* with a number of scenario analysis varying the input parameters in the model. Such a dynamic plan model then becomes the basis for realistically working out an implementable plan taking unique characteristics of a local watershed area. It should be emphasized that such an "approach cannot be effective unless the benefits of this approach are convincingly demonstrated on a sufficiently large scale and in diverse situations."[13]

4.6 People's participation and NGOs

There is a broad consensus that such a programme requires active people's participation to succeed. The beneficiaries, the local government institutions, the government functionaries and non-governmental organizations (NGOs) must become the involved stakeholder in the implementation and success of such a programme. This does not,

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[12] A. Ghosh, "*India: Big World's view of Small World,*" Economic and Political Weekly, Jne 1-8, 1991.
[13] A. Vaidhyanathan, *op.cit.* 1991.

however, mean that all the stake-holders in the programme can work independently of government politics.

The favourable and definite government policies are extremely important base to build people's involvement among the stake-holders. Given the inherent characteristics of the government bureaucracy, it is perhaps unrealistic to expect the kind of the time-commitment and dedication required to implement such plan with continuous and coordinated interface with the beneficiaries and local institutions. It is the NGOs and the self-government institutions which are rightly placed to assume the pivotal role in implementing the programme. Neither is it necessary to create a separate government bureaucracy for implementing such programme. For, there are already existing departmental bureaucracies operating related sectoral development programmes. What is important is to find an organizational mechanism by which these sectoral programmes along with its staff coordinated in the implementation of the dynamic plan model with close collaboration with the NGOs and local institutions. The immediate implication of such coordination is the necessity to change the attitude of the bureaucracy or strategies towards NGOs and allowing a great deal of freedom to NGOs and local institutions for deciding the scope and content of a particular area plan, for experimentation with various alternative scenarios and learning from experiences. The flexibility and dynamism of the plan model and the required people's involvement are the factors which can best be satisfied by the NGOs rather than in a bureaucratic framework.