

SOCIAL SCIENCE PERSPECTIVES ON ENVIRONMENT AND SUSTAINABLE DEVELOPMENT

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Introduction

This paper attempts to weave the main threads of the seven papers dealing with the global perspective, the economic approach, demographic dimensions, sociological perspective, geographical impacts, and law as a social instrument which were presented at the seminar on Social Science Perspectives on Environment and Sustainable Development organised by the Natural Resources, Energy and Science Authority of Sri Lanka (NARESA) in February 1993 and published in this volume. The discussion based on these papers also elicited other interesting perspectives. The seminar disclosed a large area of consensus but divergent views, approaches and perspectives also emerged. This paper attempts to capture the most salient concepts presented in the papers and the discussion at this seminar rather than present a logical and consistent approach to the issue of sustainable development and the environment.. The author has also drawn on other Sri Lankan contributions to the issue.

It may be appropriate to mention that a large number of Sri Lankan social scientists have been actively involved in diverse activities to promote sustainable development. They have contributed to the evolution and operationalisation of the concept of sustainable development globally¹ defined the concept in the Sri Lankan social, economic, political and cultural contexts² promoted the need for environmental concerns in schools and educational institutions³ undertaken studies and socio-economic surveys; drafted environment protection legislation⁴ and been active in the implementation of environmental legislation and rules and regulations.

Global Perspective

The very unequal world in which we live results in the interpretation of sustainable development being biased toward the needs of developed countries. This bias, Wijesinghe pointed out, is seen in the greater concern with issues such as bio-diversity, climatic change, ozone depletion, trans-boundary waste movement, and trade in endangered species, rather than in the economic and social dimension, which is of greater concern to sustainable development and the environment in developing countries. A more comprehensive approach, which includes socio-economic issues such as poverty, and a strategy which is truly global is needed to ensure sustainable development for developing countries.

Sustainable development to be meaningful to the vast numbers in developing countries must pre-suppose a global development model which is replicable. A concept

of sustainable development which is based on the rich countries maintaining or enhancing their standards of living by consuming a disproportionate share of natural resources at a per capita level several fold higher than the poor countries, while poor countries are expected to curtail or contain their already low levels of consumption is quite unacceptable. (Wijesinghe 1993:1)

Wijesinghe went on to say that, sustainable development to be meaningful to poor countries requires the fundamental causes of environmental degradation to be dealt with rather than look at the symptoms. He argued that such an approach requires that development should be economically, socially and ecologically sustainable. In his words:

It demands a more equitable sharing of the earth's resources than we have today. And this means that national and international policies for sustainable development will have any meaning only if they are linked to economic, fiscal, trade, energy, agricultural and industrial policies. (Wijesinghe 1993:3)

Demographic pressures, poverty and unemployment pose the most serious threats to the environment. Inadequate financial resources to implement environmentally sound policies and generate economic growth, to provide employment opportunities and alleviate poverty, are seen as the biggest constraints on the ability of developing countries to support environmentally sound policies. To ensure sustainable development throughout the world, there must be a large net flow of financial resources to the developing countries. In order to achieve a "socially necessary growth rate for developing countries" and simultaneously support the protection of the environment, WIDER has estimated an additional net capital inflow of US\$ 140 billion by the year 2000. (WIDER, 1991:3) In addition it is necessary to transfer environmentally sound technologies, and obtain better prices for raw materials and low value-added industrial products exported by developing countries. Wijesinghe suggests a tax on the discharge of carbon dioxide, the discharge of which is one form of using up ecological or environmental space and the introduction of debt swaps or a transformation of Third World debts into investments. These could be of significant support in sustainable development.

Lower growth in developed countries is not an option as lesser growth in developed countries would be to the detriment of growth in developing countries which must continue to depend heavily on access to the markets of developed countries, whose growth would assist poor countries. But developed countries must use the option of more efficient use of resources which could save the consumption of non-renewable resources.

The comprehensive approach to sustainable development must incorporate the whole gamut of issues bearing on environment and development, if it is to be meaningful to developing countries. As Wijesinghe argued:

Mankind's efforts towards achieving sustainable development must be a global effort. And the global effort must go well beyond a narrow agenda for saving the environment. The many environment-related conventions on biodiversity, climate change, ozone depletion, transboundary movements of wastes, trade in endangered species, conservation of wetlands, etc., are all sound and very necessary. But they do not add up to a global agenda for saving the planet's environment. The global effort must be much more comprehensive. It must address the wide spectrum of issues covering all areas of environment and development. It must focus on the economic, ecological and social dimensions of the problems of achieving the goal of sustainable development. And it must be a truly global effort where all countries have a distinct role to play each according to its capability and responsibility. (Wijesinghe 1993:10)

This would require *inter alia* new approaches to trade, aid, industrialization, poverty alleviation, and technology transfers. Sustainable development in a global context requires a comprehensive approach to the problems of development and cannot be confined to the issues of the environment alone.

Historical Perspective

Historical research supports the view that Sri Lanka's pre-colonial agriculture was based on traditional wisdom and technological skills which were not harmful to the environment. Ancient Sri Lanka is renowned for its large irrigation reservoirs (tanks) built by impounding and storing water. These were utilized mainly for rice cultivation in the low-lying areas. The high lands were either left in forest or sparsely cleared for the cultivation of other food crops. Where slash and burn cultivation, known as Chena, was practiced, the long period of fallow of this rotational system did not endanger the forest cover. Home gardens were cultivated with a wide variety of trees and often displayed a multi-storied structure replicating a natural eco-system. Rice cultivation in the montane areas was on terraced fields which conserved both soil and water. Forests in the wet zone, particularly the mountain region, were left intact.

Till the 19th century, Sri Lanka had a very large forest cover (84 per cent in 1881), which preserved the main watershed in the country. It was only with the colonial exploitation of the montane region and wet zone for commercial cultivation of export crops that the eco-system and the forest cover was eroded. More recently, from the 1930s, the excessive population pressure on land in the wet zone necessitated the expansion and deployment of the dry zone resulting in a depletion of the forest cover and the use of environmentally unsound systems of farming. (Ministry of Environment and Parliamentary Affairs 1992).

Ancient Sri Lanka had two basic types of irrigation, gravity fed river diversion systems and storage reservoirs. From about 300 BC small, medium and large reservoirs were built. However, modern engineers have tended to misinterpret the water conservation methods based on both river diversion and storage systems, which had proved

their sustainability through more than a millennium and a half, from the 6th century B.C. till their decline in the 12th century. Mendis points out that Historians and Archaeologists have fallen into the trap of interpreting the ancient irrigation works with the pre-conceptions of hydraulic engineers. The most pronounced misinterpretation being that storage reservoirs were the earliest stage of a man-made water conservation system for crop production. River diversion systems, both natural and man induced, pre-date any storage reservoir based system for crop production. In fact, ancient systems evolved in harmony with the natural environment and consequently its sustainability spans over several centuries. (Mendis 1993)

In pre colonial Sri Lanka land was held by the king, by temples, communally and by individuals. Lands held by the king were treated as a trusteeship for the use of his people. The king was the *bhupathy* (Lord of the earth) who held the land for the benefit of the people. This concept of land tenure was particularly significant for forest lands. As Lalanath de Silva states:

The vast tracts of forest then available were never treated as the personal domain of the king but rather as property held by the king for the people. Within this context individuals and communities (i.e. often villages) had usufructuary rights in these forests. (Lalanath de Silva 1993:4)

By a single piece of legislation, The Waste Lands Ordinance of 1840, the British totally ignored the indigenous concept of land tenure and vested all "forest, waste, unoccupied or uncultivated land or *chena*" in the British Crown. This conceptualization of land ownership enabled the British to sell the forests for the harvesting of timber and the establishment of coffee and tea plantations. The need for the protection of forests springs from this historical development.

The scientific and technological systems, the mode of production and styles of living of the past tamed nature in an environmentally friendly manner. No doubt the largely subsistence nature of cultivation, perhaps the lesser demographic pressures and a philosophy of life based on simple living, ensured that any damage to the environment was inconsequential.

Demographic Developments

The demographic dimension is undoubtedly one of the most important in explaining Sri Lanka's post independent environmental reality. Improvements in public health in the 1930s and 1940s and the eradication of malaria in the mid'forties resulted in "an amazing decline in mortality" in 1945-46. Consequently annual population growth reached 2.8 per cent in the 1950s and continued to be high in the 1960s and 1970s. Although population growth declined in the 1980s, the impact of the earlier rapid population growth left an indelible mark on the country's environment.

Today the country has a population density of over 260 persons per square kilometer, the per capita arable land extent is only about 0.30 hectares, and per capita agricultural land availability is a mere 0.2 hectares, when allowance is made for forest and wild life reserves at present levels. The population of over 17.6 Million use resources and generate waste faster than ever before. Although the rate of growth of population has declined, mainly due to the fall in fertility and secondarily due to increased out-migration, still the increase in annual population is more than 200,000 persons. This number is the same as that which was added to the population in the 1950s. when the growth rate was at its highest - 2.8 per cent. (Abeykoon 1993:3)

The continued growth of population, even at the current low rate of 1.4 per cent, would double the population to 35 Million around the year 2040. However, if fertility declines to a replacement level at the end of this decade, as expected by demographers, the population will stabilize at about 25 million (about 1 1/2 times the present population) around 2040. (Abeykoon 1993, Korale 1990). Even with such a favourable demographic scenario, the pressures of population on land, the need to create new employment opportunities, the urgency for rapid industrialization and the waste generated by the larger population, would exert stresses on the environment.

An indication of the demographic pressures on food production is evident from the fact that although Sri Lanka achieved an eight fold increase in rice production over a period of 40 years, the country has still not reached self-sufficiency. Despite the remarkable increase in paddy production, the output per person increased at a much lower pace. (Abeykoon 1993:4-5). The expansion in the land area under food crop cultivation has nearly reached its limits. Consequently increased paddy and food crop production has to be from increased productivity through the application of chemical fertilizers and use of chemical insecticides and pesticides which are hazardous to the environment. The deteriorating man: land ratio has led to indiscriminate chena cultivation with very short fallow periods. This has resulted in a loss of forest cover in the dry zone and degradation of soil fertility.

The rapid growth in population of the recent past results in a very large increase in the annual labour force. While the current population growth rate is around 1.4 per cent, the labour force increase is higher at 2.2 per cent. The annual inflow into the labour force is far in excess of the outflow. While about 280,000 young people enter the labour force, only about 120,000 withdraw from it. Abeykoon estimates that the net addition to the labour force is around 160,000 per year (Abeykoon 1993:6). Other estimates place it around 130,000 to 140,000 persons per year. Given a context in which the accumulated unemployed is estimated at around 1 million, this annual inflow into the labour market creates a need to generate about 200,000 new jobs each year. This implies that industrialization is indispensable. And rapid industrialization could endanger the environment, unless there is environmentally sound industrial planning and legislation.

The rapid increase in population has resulted in stresses on both renewable and non-renewable resources such as on forest resources and the coral reef. In the south western coast the problem of coastal erosion has been aggravated by about 3000 persons being directly engaged in coral mining and nearly 8000 persons being indirectly dependent on this activity. (Abeykoon 1993;7) It has also been estimated that the population growth in the coastal areas would be in excess of the average growth in the country and consequently the environmental stress on coastal resources would be particularly sharp. (The Coastal Resources Management Project Sri Lanka 1993)

Population pressure has also contributed to deforestation by increasing the demand for fuel wood and timber. About 25 per cent of fuel wood requirements are from high forests, which are also felled for the timber requirements of a rapidly expanding construction industry. These population pressures are mainly responsible for the natural forest cover, estimated at 84 per cent of the land area in 1881, declining to about 24 per cent in 1991.

There is a strong consensus that, despite the decline in the rate of growth of population, demographic factors, which have had a distinct impact on environment in the past, will continue to exert a strong impact in the next few decades. Therefore, Abeykoon argues that:

.... both population and environmental concerns must be integrated into social and economic development plans for development to be sustainable. As certain environmental problems may not be visible in the short run, for purposes of environmental and population planning, a longer term approach should be taken in addition to short term plans. (Abeykoon 1993:8)

Further population control measures would be necessary to ensure a continued deceleration of population and its stabilization as early as possible.

The Geographical Perspective

From a Geographer's point of view Sri Lanka's environment contains a wide diversity of critical habitats. The problems that have cropped up are in the changes in land forms, soils, water and climatic elements. Land degradation, soil erosion, salinity, siltation, deforestation and loss of bio-diversity are some of the environmental hazards in Sri Lanka.

One of the critical habitats is the coastal zone of Sri Lanka where both resource depletion and pollution are significant problems. The coastal zone itself contains a diversity of critical habitats, such as lagoons, estuaries, mangroves, coral reefs, salt marshes and sand bars. These are critical habitats as they are small in extent and highly vulnerable to degradation. They provide shelter to aquatic life and act as a buffer zone in protecting the land from the sea. (J de Silva 1993)

Developmental activities, which are clearly concentrated in the coastal zone, have been threats to coastal resources. Development projects which have had a particular impact on the coastal zone include the expanding tourist industry, rapid housing development, expansion of infrastructural facilities, industrialization, expansion of urban centres and aqua culture projects. These development programmes have tended to create several problems such as the depletion of the coral reef, incursion into the beaches by hotels, the inaccessibility of fishermen to these beaches for their livelihood, excessive mining of sand and removal of mangroves. (J de Silva 1993)

The sustainability of the coastal zone depends very much on the adoption of preventive and mitigatory measures. Most of the environmental problems are due to haphazard exploitation and inadequate planning. Inadequate planning has denied the country ecologically less damaging options. There is a need for more detailed information of coastal habitats and resources to enable the planning and management of coastal zones. The environment carrying capacity of the coastal area should be evaluated, particularly with respect to tourist development and related activities. The provision of alternate employment facilities for those depleting the non-renewable coastal resources, such as the coral reef for lime for the construction industry and excessive removal of sand for construction purposes imply a need for identification of construction techniques requiring less of these resources. Measures to prevent the over crowding of population in the coastal zone would also be useful in minimising the population pressure on existing resources. An environment impact assessment must be a mandatory requirement for all coastal zone development projects. The improvement of the legislative framework and its implementation could also assist in minimizing ecological damage. (J. de Silva)

Economic Perspectives

Although the terms economics and ecology have their roots in the Greek word *Oikos* meaning house, the two approaches have deviated substantially. While economics has given primacy to increasing wealth, maximising output and using and allocating scarce resources to increase consumption, ecology is concerned with the conservation of resources. Until environmental issues came to the forefront and the concept of sustainable economic development gained acceptance, mainstream economics did not take into account environmental concerns. More recently environmental economics has adapted the tools of economic analysis to incorporate environmental outcomes. Sri Lanka's economic strategy which emphasised growth, urbanization, increased agricultural production and output, large irrigation schemes and land settlement, foreign exchange earnings through tourism, development of economic infrastructure and housing construction, paid little heed to environmental concerns and long term adverse impacts of these policies on the environment. However, there is a new sensitivity to environmental concerns which are increasingly incorporated into economic decision making. Yet, the pressing economic problems of poverty, low incomes and high rate of unemployment, tend to stress growth at the expense of environmental concerns.

The new environmental economics has many tools of analysis which incorporate environmental losses into economic evaluations. The roots of the new analyses are in externality theories, the public goods theories, the general equilibrium theory and the applied field of cost: benefit analysis. Externality when applied to environmental problems requires the gaining party which produced the undesirable effects to be taxed or to compensate the aggrieved party, if identifiable. (Abeygunawardena 1993) For instance, the conventional benefit: cost (BC) analysis has been modified to incorporate environmental losses and gains. The extended benefit: cost (EBC) analysis adapts the original formulation of:

$$B - C > 0$$

to

$$(B + EB) - (C + EC) > 0$$

where B = Benefits
 EB = Environmental Benefits
 C = Costs
 EC = Environmental Costs

While conceptually this is sound, the problems arise when estimates have to be made of environmental gains and losses. These could be subjective and those wishing to clear a project may introduce values which would give the desired result.

There has been a growing realization of the need to incorporate environmental values in the decision making process. Techniques for economic valuation of environmental resources are being developed. However, such valuation poses problems in view of unquantifiable gains and losses of certain natural resources. In cases such as the preservation of bio-diversity, destruction of irreplaceable natural resources like coral reefs or the preservation of a particular species, monetary valuations are not possible. Such resources which are "beyond price" or have an "infinite" price cannot be allowed to be depleted. In others, the attribution of a high positive cost could reduce the depletion to manageable proportions in order to ensure that the depletion is in tandem with their renewability.

There are, however, many areas where the environmental cost can be calculated in terms of the economic costs of the action or economic benefits by its inaction. The incorporation of such costs would help in improving the environment. "Although all aspects of environmental changes cannot be valued", Abeygunawardena points out that, "an effort has been made to value several environmental goods and services in Sri Lanka". These include the valuation of the Peradeniya Botanical Gardens, non-timber forest products and non-market commodities of coconut based farming systems. "If decision makers use such information at least as minimum values for environmental goods and services," Abeygunawardena contends "it makes it much easier for them to make more objective decisions leaving much less room for value judgements". (Abeygunawardena 1993:14).

In certain development projects, where alternate possibilities are available, there has been no effort to evaluate the alternate environmental costs with a view to adopting the environmentally least damaging option. The construction of a highway through coconut lands and residential properties to the Colombo Airport, has been preferred to a fast railway track without environmental costs. For whatever reasons, such decision making appears to not take into consideration environmental concerns. This, despite a mandatory requirement of an Environmental Impact Assessment (EIA) for all development projects. Although an EIA is mandatory for all new economic projects, Abeygunawardena contends that the lack of familiarity with EIA techniques renders such evaluation inadequate to achieve the objectives.

National decision making is weighted against environmental concerns owing to the prevailing System of National Accounting (SNA of the UN), which is inadequate and inconsistent with the concept of sustainable development. The current accounting procedures "sends misleading signals to policy makers and validates the idea that rapid economic growth can be achieved and maintained by exploiting natural resources. This can result in illusory gains in current income and permanent losses in wealth and future incomes". (Abeygunawardena 1993:15)

This deficiency is manifest in Sri Lanka. Agricultural growth has been at the expense of loss of top soil, soil erosion, loss of forest cover and land degradation. Gem mining has been at the expense of health hazards, construction at the expense of depletion of forests, excessive mining of sand and coral reefs causing coastal erosion. Industrialization has been at the expense of pollution of rivers and water ways and tourist development at the expense of health, coastal erosion, and pollution. All these negative impacts are not captured in the national accounts nor attributed to the development in other economic indicators.

It is recognised that until a new system of national accounts incorporating the environmental losses are developed, Sri Lanka would not be able to adopt her own system owing to the needs of international comparability and conformity with international standards and definitions. It is therefore more feasible to develop a satellite account on the basis of the concept of sustainable development as proposed by the UN, System of National Accounts Framework for Integrated Environmental and Economic Accounting. Even a rough estimate of a Sustainable Gross Domestic Product (SGD) at an early date could be a useful corrective to Sri Lanka's GDP and a useful indicator of environmental depletion. (Sanderatne 1993)

Considering the important contributions which environmental economics could play in ensuring a process of sustainable development, there is a need for professionals in related disciplines in the natural sciences to have a continuous and constructive dialogue with those involved in environmental economics. The basic tools of analysis of environmental economics and its perspectives should be conveyed to natural scientists and policy makers.

Sociological Issues

The change in the mode of agricultural production with the introduction of plantation agriculture on large estates, and the more recent market oriented agricultural production, are crucial changes affecting man's relationship to nature. The shift from a subsistence mode of production, where the farmer had a relationship with nature, understood it and utilized it with careful husbandry, preserved natural resources. In contrast, the agricultural labourer working for his wages has no such bond with nature. Instead he is concerned only with maximising his income, either by increasing his work output or by a bargaining process. (Hettige 1993:2-4)

The shift away from subsistence agriculture to commercial agriculture has brought about an alienation of the farmer from the land. The farmer engaged in commercial agriculture exploits the land he cultivates to satisfy a market demand, rather than to ensure the best form of cultivation for the soil. While subsistence farming requires the cultivation of a variety of crops to meet the farmer's household requirements of food, in a commercial oriented agriculture monoculture is more profitable. (Hettige 1993:loc cit.) Consequently, unlike the farming systems of the past, which is well illustrated in the Kandyan home gardens, which grew a multiplicity of crops replicating a natural eco-system, the modern farmer even degrades the soil, as in the case of tobacco cultivation, in order to maximise his profit.

Similarly the owners of plantations were concerned with maximising profits rather than the renewal of resources and maintenance of the ecological balance. This over-riding concern with maximizing profits became a short term objective when owners of plantations became uncertain in continuing to own the plantations, with threats of nationalisation particularly since 1956. Consequently, the planning horizon of plantation agriculture was reduced to a duration which hardly motivated owners to adopt cultural practices which ensured the preservation of soil fertility, maintained a dense plant cover and took preventive measures on soil erosion. Although such measures would have ensured higher productivity over a long period of time, they required additional costs without commensurate gains in the short-term. The recent policy of giving management contracts to estates for a limited period could create the same pressures for the exploitation of estate lands in an ecologically unsound manner.

Increased locational mobility is another social structural change having a bearing on the environment. The resettlement of people from the densely populated wet zone to the dry zone involves an uprooting of people from their familiar habitats to unfamiliar surroundings. Such uprooting of individuals from their accustomed social and physical environments results in an environmentally unfriendly behaviour of the settlers in their new locations, where the destruction of forest land and indigenous vegetation might occur. The social void of the new settlers would further reinforce the tendency to exploit their new environment immediately for economic gain, rather than tender it with care for their long run gain. (Hettige 1992:4-5)

Another adverse development in the environmental pattern occurs with the shift of rural population to urban areas. Such migrations result in overcrowding, poor housing, deplorable sanitary conditions and environmental pollution. The population which drifts from the rural areas to urban cities neither have the resources nor the values and psychological orientation for orderly living in urban conditions. (Hettige 1993:5-6)

Urbanisation also creates new demands which indirectly affect the environment. The higher consumption of energy, higher per capita consumption levels and greater waste disposal of urban dwellers are factors creating pollution in the cities. Often the rapid expansion of cities far outpaces the administration's capacity to provide the essential services of urban living, such as water supply, energy and garbage disposal. Consequently, cities demonstrate a lesser ability to manage their environments: they are less tidy and more polluting in character. The adoption of western life styles, consumption patterns of the elites and the newly acquired consumerism of the large number of workers returning from the Middle East, imply a larger per capita consumption and consequent environmental degradation (Hettige 1993:7-8). On the one hand, such styles of living impose a great strain on natural resources, and on the other hand, create conditions of pollution such as non-disposal of garbage materials, high smoke emissions and over-crowding.

The environment can be better preserved if social values which restrain excessive consumption and adopt simpler life styles are encouraged. Just as much as it has been pointed out that the styles and consumption levels of developed countries cannot be replicated throughout the globe without environmental disturbances, in the developing countries themselves, the life styles of the rich and urban elite cannot be replicated without serious environmental problems in the country. Therefore an attempt to inject new values of a simple life with limited wants and a return to the old values of ones own culture may be an essential strategy for environmental preservation. The adoption of the correct attitudes and system of values consistent with the preservation of the environment is important. (Hettige 1993:10-11)

The creation of an environmentally conscious and sensitive population with a different set of values toward the material world could be an important way of minimising environmental degradation. More careful use of resources, a consumption pattern with more limited wants and biased towards the use of renewable resources and lesser use of non-renewable resources are advocated as a means by which the environmental damage could be contained. Yet, given the consumer oriented systems, which are constantly brought before the people through the T.V. screen and other media, such a process of education becomes a formidable task unless these influences are similarly moderated and curtailed. The inculcation of environmentally friendly values in schools could have a far reaching impact. (Hettige 1993: 14-15)

The relationship between the mode of agricultural production and the value orientations which they inevitably entail, the impact of migration to new environs and

the stresses arising from higher standards of consumption are important factors in environmental depletion and degradation. The sociological perspective brought out the importance of social and cultural values and education as an important component of environmental preservation. The question was however posed as to whether the changes in the mode of production and consumption were the inevitable developments of demographic developments and technological change. The return to a simpler form of living, however laudable, may not be a realisable goal. Perhaps an inadequate appreciation of the "limits to growth" is the underlying factor which does not lead to a curtailment of consumption to levels more consistent with environmental imperatives.

Law as a Social Instrument

Despite a surfeit of legislation to manage the environment, environmental problems have increased rather than declined. In Lalanath De Silva's words:

If the common conception that environmental issues can be solved by law were true, Sri Lanka would rank among those countries with a very high environmental rating. Sri Lanka counts well over 100 statutes directly or indirectly dealing with environmental matters.....Yet, Sri Lanka's environmental problems have not gone away, rather they have in many instances, consolidated themselves and become chronic. (Lalanath de Silva 1993:1)

Although Sri Lankan legislation has been made more drastic by increasing penalties and changing substantive procedural changes, such as putting the burden of proof in respect of offences under the Forest Ordinance on the accused, still the problems of illicit felling of forests continue. In De Silva's view: "It is manifest that complex environmental issues cannot be solved by law but rather through the law." (Lalanath de Silva 1993:2) He argues that the law must address itself to the real causes, examine the real objectives and see whether these are consistent with current needs and examine how effective they are for the solutions contained in the Ordinance. De Silva is of the view that the prevailing perspective of lawyers is inadequate:

Sri Lankan lawyers posed with such questions would analyse the law, the judgements and juristic opinions and come to findings. The traditional way in which law has been taught in Sri Lanka tends to narrow the perspective of lawyers to evaluating legal issues within the four corners of the statute. Entrenched in the Austinian module, legal reform tends to become a matter of degrees within a command and control module. All too often the social, economic and anthropological dimensions of the law are ignored or inadequately addressed in legal reforms. (Lalanath de Silva 1993:2)

Environmental legislation does not reflect current thinking and the broader socio-economic, anthropological and cultural thinking. The laws are outmoded and reflect the dominant interests rather than the environmental requirements of today. De Silva is of the view that the country's legislation requires to be reformed:

In this context, many natural resource and environmental laws in Sri Lanka are out dated, and far removed from the current social, environmental, anthropological, and economic context, and cry for reform. (Lalanath de Silva 1993:11)

But such reform will not take place as long as the dominant interests do not see these reforms as being in their own interests or unless countervailing pressures are strong enough to change the legal system. In de Silva's words:

That reform will not come until the dominant classes of society begin to see resource conservation as essential for the protection and preservations of their interests. Alternately, other classes in our society must begin to use the legal system in a creative way, articulating the resource conflict and expanding the legal frontiers. (Lalanath de Silva 1993:11)

In de Silva's view environmental legislation must be conceived of as a social engineering process. An innovative legal strategy for the protection of the environment would take into account the state of knowledge on ecology, as well as the multi disciplinary requirements for a creative legal approach to environmental issues. Such an approach requires anthropological, sociological and ecological evaluations and data. " In the absence of such data and analysis the law will simply follow traditional patterns based on the command module". (Lalanath de Silva 1993:9)

Summing Up

In a historical context spanning over three millennia, Sri Lanka's environmental problems are comparatively recent. Deforestation to cultivate commercial plantation crops in the mid nineteenth century, commercial agriculture supplanting subsistence farming, the rapid increase in population in the 1950s and the consequent increased demand on Sri Lanka's non-renewable and slow renewable resources, recent urbanisation and industrialisation are among the factors responsible for the deterioration of the environment.

Historically, the systems of irrigation, agriculture and the mode of agricultural production ensured the taming of natural resources in a manner which was environmentally friendly. Forest cover was high, agricultural land had periods of fallow, multi-cropping systems replicated natural eco-systems, and subsistence agriculture ensured farming systems which preserved soil fertility. These systems have been significantly replaced by plantation agriculture, which at first reduced forests, and later led to poor cultivation practices that have led to soil erosion. Excessive slash and burn, (*chena*) cultivation has destroyed the bush and eroded the fertility in the dry zone areas. Cultivation of commercial crops like tobacco has sapped soil fertility and prevented soil renewal.

Demographic pressures, especially arising from the drastic decline in population in the 1950s have put enormous strain on natural resources. The high man: land ratio, the inflow of nearly 160,000 persons into the labour force, and the population increase outpacing food production, despite significant increases in rice production, are some of the consequences of the population increase. Many of the country's environmental problems, such as the excessive exploitation of the land, deforestation, the destruction of the coral reef, urban pollution and poverty, may be viewed as consequences flowing from demographic pressures.

These changes and development projects have created a number of environmental problems. The coastal region, which has the highest population pressures, the biggest concentration of development projects and the highest degree of industrialisation and urbanisation, exhibits a number of critical habitats. These critical habitats, which include lagoons, estuaries, mangroves, coral reefs, sand bars and salt marshes, are small and highly vulnerable to exploitation and degradation. Since they shelter valuable species of aquatic life, are buffer zones for protection from coastal erosion and have rich non-renewable or slow renewable natural resources, they require to be protected by stringent application of laws, provision of alternate employment opportunities, development of substitute materials and reduced population pressures.

Many of the changes that have occurred can be viewed as arising from changes in the mode of agricultural production which has resulted in different attitudes to natural resources. The subsistence farmer had a close bond with nature and tended the land he tilled carefully. The commercial farmer or wage labourer, in contrast, is more concerned with the highest return from the land, rather than the preservation of the land for future use. The value orientations of migrant population to new areas of the country through land settlement schemes have resulted in a lesser attachment to the new environment. The drift of rural population to urban areas have also resulted in inappropriate value orientations to cope with urban living. New life styles imitative of Western styles of living and consumption styles supported by advertising and the media, have compounded the environmental problems through their higher per capita consumption. Migrant labour returnees from the Middle East with imitative consumption levels are a part of this problem. The development of a set of values consistent with ecological sustainability and a simple life style, which consumes less resources, are needed for sustainable development. A change of mind induced by an educational programme would be needed to achieve this.

Economic perspectives and techniques of economic appraisal have been detrimental to sustainable development. The System of National Accounting and the market based costing of non-renewable resources have sent misleading signals which promote economic development at the expense of the environment. A revised SNA, or at least a satellite national accounting system, which adjusts output by the amount of depletion of natural resources in the process of producing the output, and places a cost on environmental damage, is much needed. Meanwhile efforts have been made to value

natural resources like the Botanical gardens, in order to give policy makers a better basis for decision making on the use of these natural resources.

Sri Lanka has a large body of laws to protect the environment. Recently substantive legal procedures have been changed to enhance their effectiveness and penalties have been increased. Yet these are inadequate to protect the environment. Complex environmental issues require lawyers to understand the real causes and objectives of environmental concerns and not interpret the law within a command and control module, which ignores social, economic and anthropological dimensions. Legal reforms must approach environmental issues from a broader perspective of the social sciences. But such reform is unlikely as long as the dominant classes of society do not think of resource conservation as needed for the protection of their interests. In such a context, other classes of society require to use the legal system in innovative and creative ways to protect the environment and extend the legal system's frontiers.

Demographic pressures, unemployment, poverty, and development needs are serious threats to Sri Lanka's environment. In the context of the country's limited resources and economic pressures, the realistic alternative for the country is a balance between growth and environmental preservation. The realisable objective would be to contain ecological damage to manageable proportions. Reducing population growth further; adopting a life style which reduces the consumption of non renewable resources; adopting technological alternatives which are ecologically sound; using development alternatives which are less damaging to the environment; and developing the appropriate regulatory framework are the means through which this objective must be achieved. A new value orientation and sensitivity to environmental concerns, generation of data and information to assess environmental issues, the education of the community on environmental problems and their active involvement in protecting the environment are needed to ensure sustainable development. Interdisciplinary knowledge, creative thinking and innovative approaches among social scientists, and the interaction and dialogue between social scientists and natural scientists, are essential to achieve substantial results in ensuring sustainable development.

Sustainable development can only be achieved by a comprehensive global effort which goes beyond environment-related issues. The global effort must address itself to the total gamut of issues bearing on development; issues of poverty, population, trade, aid, debt, and technology *inter alia*. Unless there is a truly global effort encompassing these socio-economic issues, the concept of sustainable development will not be very meaningful to developing countries.

Notes

1. Gamani Corea has contributed the concept of replicable growth and challenged the view that sustainable development should not imply limitation of development of poor countries, while rich countries maintain their high standards of consump-

tion. See, South Centre, *Environment and Development, Towards a Common Strategy of the South in the UNCED Negotiations and Beyond*, Geneva, 1991. Other Sri Lankans who have made significant contributions to the environmental debate include Mohan Munasinghe of the World Bank (see M. Munasinghe *Economic Development and Environment*, World Bank Washington DC 1992) and Lal Jayawardena of the World Institute of Development Economic Research (WIDER) in Helsinki. See, L. Jayawardena *A Global Environmental Compact for Sustainable Development: Resource Requirements and Mechanisms*, WIDER Helsinki 1991 and *The Macroeconomics of Sustainable Development* WIDER, Helsinki 1990.

2. For instance, Marga, *Economic Policies for Sustainable Development*, Colombo 1991 and Ministry of Environment and Parliamentary Affairs, *UNCED, Sri Lanka National Report* and a large body of literature on conservation and environment protection.
3. See, Central Environmental Authority, *Seminar on Environmental Educaiton in Sri Lanka*, Colombo 1988.
4. See, Lalanath de Silva, "Environment Law in Sri Lanka", Paper presented to the National Law Conference 1991, Colombo 1991.
5. The page number references of papers presented at the National seminar on Environment and Sustainable Development: Social Science Perspectives, NARESA are those of the original paper and not the page numbers in this issue of the Journal in which most papers have been published in a revised form.

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