VIDA 1-3-1

comment

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During the late fifties and the sixties, several groups of scientists as well as others in the developing countries focused attention on the adverse effects of rapid expansion of Agriculture and Industry on the Environment. "Pollution" became a crucial area of concern in these countries. The situation in the less developed countries was very different. Here, the prime concern was the provision of basic necessities like food, clothing and shelter for rapidly expanding populations. Attention in these countries was focused on clean water, food, public health, housing, population, etc. The problems in these countries were essentially those of poverty in contrast to those in the developed countries which were by large due to affluence.

The Founex Report on "Development and Environment" helped to a large extent to reconcile the two concepts. This report was followed by four study groups appointed by the Regional Economic Commissions of the U.N. These reports and several others, too numerous to mention, served as inputs to the U.N. conference on the Human Environment, held in Stockholm from 5-16 June 1972.

Science and Technology will have to play a leading role if we are to look after this crucial area on Environment in a country such as Sri Lanka. For the purpose of this comment, I would like to quote from the resolutions of the U.N. General Assembly and principles adopted at the Stockholm conference.

Below are some extracts.

"U.N. Resolutions Regarding the Environment

Below are some extracts from the U.N. General Assembly resolutions that ultimately led up to the establishment of the U.N. Environment Programme.

(A) Resolution No. 2398 (XXIII), December 3, 1968 — On Problems of the Human Environment.

The General Assembly.

Noting that the relationship between man and his environment is undergoing profound changes in the wake of modern scientific technological developments,

.....

Aware of the important work being done on the problems of the human environment by governments as well as by intergovernmental organizations such as the Organization of African Unity and non-governmental organizations such as the International Union for the Conservation of Nature and Natural Resources, the International Council of Scientific Unions and the International Biological Programme,

Bearing in mind the recommendations of the Inter-governmental Conference of Experts on the Scientific Basis for Rational Use and Conservation of the Resources of the Biosphere, convened by the United Nations Educational, Scientific and Cultural Organization with the participation of the United Nations, the Food and Agriculture Organization of the United Nations and the World Health Organization.

.....

1. **Decides,** in furtherance of the objectives set out above, to convene in 1972 a United Nations Conference on the Human Environment.

2. **Requests** the Secretary-General, in consultation with the Advisory Committee on the Application of Science and Technology to Development to submit to the General Assembly.....a report concerning

.....

(B) Resolution No. 2581 (XXIV), December 15, 1969——Calling for a 1972 Conference on the Human Environment.

The General Assembly,

.....

Recognizing the important work on the problems of the human environment that is at present being undertaken and planned by the organizations in the United Nations system, other intergovernmental organizations, non-governmental organizations and national governments,

.....

6. **Further requests** the Secretary-General to pursue the consultations on the preparations for the Conference, undertaken by him in accordance with the General Assembly resolution 2398 (XXIII), to take account of the results of other international conferences such as the Conference on the Problems of Environment organized by the Economic Commission for Europe and scheduled to take place at Prague in 1971, and to draw on contributions from appropriate intergovernmental and non-governmental organizations.

7. **Invites** the specialized agencies, the International Atomic Energy Agency and the Advisory Committee on the Application of Science and Technology to Development to collaborate closely with the Secretary-General in the preparations for the Conference and to assist, as appropriate, in the work of the Preparatory Committee.

8. **Invites** the intergovernmental and non-governmental organizations concerned to lend every possible assistance in the preparations for the Conference.

(C) Resolution No. 2997 (XXVII), December 15, 1972—— On Institutional and Financial Arrangements for International Environmental Cooperation.

The General Assembly,

.....

Emphasizing that problems of the human environment constitute a new and important area for international co-operation and that the complexity and interdependence of such problems require new approaches,

Recognizing that the relevant international scientific and other professional communities can make an important contribution to international cooperation in the field of human environment,

.....

1. **Decides** to establish the governing council for environmental programmes.....

18. **Invites also** other inter-governmental and those non-governmental organizations which have an interest in the field of the environment to lend their full support and collaboration to the United Nations with a view to achieveing the largest possible degree of co-operation and co-ordination.

19. **Calls upon** Governments to ensure that appropriate national institutions shall be entrusted with the task of co-ordination of environmental action, both national and international.

.....

Further, below are some extracts from the Declaration adopted at the U.N. Conference on the Human Environment——Stockholm 5-16 June 1972, incorporating the modifications made by the U.N. General Assembly.

PRINCIPLES

States the common conviction that:

Principle 6

The discharge of toxic substances or of other substances and the release of heat, in such quantities or concentrations as to exceed the capacity of the environment to render them harmless, must be halted in order to ensure that serious or irreversible damage is not inflicted upon ecosystems. The just struggle of the peoples of all countries against pollution should be supported.

Principle 7

States shall take all possible steps to prevent pollution of the seas by substances that are liable to create hazards to human health, to harm living resources and marine life, to damage amenities or to interfere with other legitimate uses of the sea.

Principle 17

Appropriate national institutions must be entrusted with the task of planning, managing or controlling the environmental resources of States with the view to enhancing environmental quality.

Principle 18

Science and technology, as part of their contributions to economic and social development, must be applied to the identification, avoidance and control of environmental risks and the solution of environmental problems and for the common good of mankind.

Principle 20

Scientific research and development in the context of environmental problems, both national and multi-national must be promoted in all countries, especially the developing countries. In this connection, the free flow of up-to-date scientific information and transfer of experience must be supported and assisted, to facilitate the solution of environmental problems; environmental technologies should be made available to developing countries on terms which would encourage their wide dissemination without constituting an economic burden on the developing countries.

The Stockholm Conference adopted 109 recommendations.

These have been classified under the following heads:-

(*a*) Planning and Management of Human Settlements for Environmental Quality.

(*b*) Environmental Aspects of Natural Resources Management.

(*c*) Identification and Control of Pollutants of Broad International Significance.
A. Pollution generally
B. Marine Pollution

(*d*) Educational, Informational, Social and Cultural Aspects of Environmental Issues.

(*e*) Development and Environment."

It would thus be abundantly clear from the above U.N. General Assembly resolutions and the principles and recommendations adopted at the Stockholm Conference that science and technology will have to play a vital role in environmental management.

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Artificial Rain: Is it Feasible?

Osmund Jayaratne
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In view of the recurring droughts that have occurred in recent years, questions have been raised in many quarters regarding the possibility of producing artificial rain over the "dry zones" of the island by the seeding of cloud systems. This proposal was once made by a late Minister of the former U.N.P. Government, but his interest waned when it was pointed out to him that a certain period of preliminary research was necessary before any opinion could be given about the feasibility of the project. According to press reports the question has once again been raised by the present Minister of Irrigation, Highways and Power.

In the circumstances, the National Science Council of Sri Lanka has appointed an *ad hoc* Committee consisting of representatives of the Departments of Meteorology, Irrigation, the Water Resources Board and the National Science Council to study the question and prepare a report which will be submitted to Government in due course.

The views expressed in this article are personal to the author and do not commit any of the organisations above mentioned.

From time immemorial men have tried to "harvest" the clouds by such techniques as the firing of cannon, the ringing of church bells and other magical rites. These were *ad hoc* pre-scientific techniques, which on occasion, did yield rain showers—which, however, could be easily explained by natural causes without any reference to the superstitious methods adopted.

The first serious studies of the micro-physics of clouds arose during the 2nd World War as a result of investigations relating to the icing of aircraft flying through cold clouds, which provided a serious hazard. Since then, Cloud Physics has developed into an important scientific discipline, dealing with the particles constituting clouds, their origin, growth and decay, precipitation processes as well as the phenomena of lightning and the electrification of clouds.

We will not deal here in any detail with the classification of cloud forms: *stratus* clouds, forming at low and middle altitudes, layer-like and with horizontal extensions sometimes stretching to hundreds of miles; *cirrus* clouds, limited to high altitudes, feathery and sometimes veil-like in appearance; and *cumulus* clouds, with considerable vertical extension, cotton-woolly and turreted. These three main categories have been sub-divided into various genera and species. We shall limit ourselves here to *cumulus* and *cumulo-nimbus* clouds, those that produce heavy rain showers—grey and foreboding, rising up sometimes to elevations of 50,000 ft., often anvil-shaped at their summits on account of the strong winds prevalent at these altitudes. Lightning and thunderstorms are often associated with the latter species.

Another significant classification of clouds, important for "rain-makers" is based on the nature of their particulate composition. On the one hand, we have *water clouds*, consisting exclusively of minute water droplets ranging through a spectrum of sizes. On the other hand, there are the *super-cooled ice clouds*—clouds consisting of a mixture of minute ice crystals and super-cooled water droplets which often remain in the liquid state down to temperatures of -40°C. The nature of these clouds naturally depends upon the ambient temperatures — water clouds perhaps predominating over tropical countries such as Sri Lanka.

Water droplets in clouds are formed by the condensation of the water vapour present, and ice crystals by the freezing of these droplets. These processes are naturally dependent upon the prevailing relative humidity and the ambient temperatures. However, even under suitable external physical conditions, the condensation of water vapour into droplets and the freezing of the latter into ice crystals does not occur *per se*. Both processes require for their initiation minute solid particles normally present in the atmosphere, around which the condensation and freezing processes can make a start. *Condensation nuclei* are believed to be produced from fine particulate matter wafted into the atmosphere by winds, dust storms, industrial smoke, etc. Particles of sodium chloride resulting from, the evaporation of fine droplets rising from the oceans also constitute a significant part of these condensation nuclei. *Ice nuclei* have been found to consist of mineral matter, particularly of kaolin particles.

Natural rain is produced from clouds by two processes, as far as our present knowledge goes: the *Coalescence Process*, dominant in warm, water clouds, and the *Bergeron-Findeisen Process*, operative in super-cooled ice-water clouds. In the coalescence process, larger cloud droplets fall faster towards the ground than smaller droplets, as a result of atmospheric viscosity. The resulting collisions with smaller droplets produce still larger drops which may attain such sizes (approx. 2.5 mm. radius) that they fall out of the cloud base and reach the ground without evaporation as rain. The initiation of this processes, therefore, requires the presence of a sufficient number of large droplets.

In super-cooled clouds, where minute ice crystals co-exist with super-cooled water droplets, differential water vapour pressures over water and ice surfaces

lead to the evaporation of water droplets and the growth of ice crystals. When the latter grow sufficiently large, they fall under gravity, linking with other ice crystals to form snowflakes. If ground temperatures are below 0°C, snowfalls occur. Otherwise, the snowflakes melt at the 0°C. level, are transformed into water drops and produce rain. This is the Bergeron-Findeisen process.

Our current knowledge of these natural processes has led to attempts to replicate nature and produce rain from clouds that would normally not have resulted in precipitation. In spite of the presence of sufficient water vapour in many clouds the reason why precipitation does not result is the absence of sufficiently large water droplets or ice crystals. Nature has then to be given a helping hand.

In 1946, Vonnegut in the U.S.A. found that particles of silver iodide, acting as ice nuclei, were capable of forming ice crystals out of water droplets at a temperature of —4°C. In the same year Vincent Schaefer, also in the U.S.A. discovered that dry ice (solid carbon dioxide), which exists below —70°C, when crushed and scattered in a cloud of super-cooled water droplets, produces ice particles which multiply very rapidly in numbers. Field experiments conducted by Langmuir and Schaefer showed that these techniques were reasonably successful in producing some degree of precipitation from ordinarily non-precipitating cumulus clouds.

Several techniques have been used in the "seeding" of ice clouds. For instance, fine particles of silver iodide or dry ice have been scattered from air-craft *flying at cloud base*, the reason being that the updroughts in the clouds tend to carry the seeding particles upwards and hence prolonging their life-time, and effiicacy within a particular cloud. In other experiments solutions of silver iodide in acetone have been burned by ground-based burners and the smoke allowed to rise into selected clouds. One gramme of silver iodide in such solution tends to produce 10^{16} particles of silver iodide smoke.

However, the techniques have to be quite different when dealing with warm, tropical water clouds. Here, much of the work has been conducted by the CSIRO in Australia. The techniques used depend on the spraying at cloud base of fine water sprays or scattering fine particles of hygroscopic sodium chloride in order to produce the large water droplets necessary to initiate the *coalescence process* which is dominant in tropical clouds.

A vast volume of data is necessary before any cloud-seeding venture could be embarked on. This includes cloud characteristics (including the particulate nature of clouds, temperature levels in the atmosphere, wind strengths and directions etc.) Up to date, scientists are grappling with the questions as to whether the results of their field trials have been the result of artificial cloud seeding, or whether they were the consequences of natural climatic and other factors. Statistics seem to show that artificial cloud seeding *does* have positive effects. But whether these effects can be differentiated from monsoonal and other natural factors affecting rainfall still remains at the statistical level.

Sri Lanka is a small island. Without a proper understanding of cloud dynamics, the large-scale character and movement of cloud systems, the meteorological factors involved, *ad hoc* attempts to produce rain cannot be properly assessed. For instance, the seeding of clouds over the "dry zone" may well result in enhanced rainfall over the Indian Ocean! Cloud Physics is still in its infancy. Nature does not respond to human efforts with ease, despite pressing political needs! A few years of research in the field are necessary before even the economic feasibility of artificial rain-making can be assessed. In the author's view, it is valuable and necessary to set up a network of observation stations which will collect data over a period of years. Our scientists are capable of such an exercise, provided the necessary facilities are provided. Impressionistic attitudes and hopes arising from results obtained in other countries are not sufficient. We have to make a feasibility study of conditions *in our own country*. Time, patience and funds are necessary before we can even think of artificial rain-making in Sri Lanka. We hope that scientific realities rather than short-term electoral hopes will guide the powers that be!

The Role of Plants in Man's environment

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> "Everywhere in nature, life is a collective enterprise. Man is dependent not only an other human beings and the physical world but also on all other creatures, — animals, plants and microbes, that have evolved together with him. Man will ultimately destroy himself if he thoughtlessly eliminates the organisms that constitute essential links in the complex and delicate web of life of which he is a part."
>
> **Rene Dubos'.**

Plants form one of the commonest features in man's environment and they figure prominently in many of his activities. At times they have had a powerful, even dominating, influence over his mode of life, his philosophy and his cultural activities. This is not surprising when we consider how dependent he is on the plant world.

Plants are useful to man in many ways. They are, and always have been, directly or indirectly his only source of food. Much of his shelter and clothing comes

from plants. Wood still continues to be the cheapest and most readily available fuel. Vegetable fats, medicines, spices, perfumes, dyes, gums and resins, fibres and a host of other products needed by man come from plants. Technological advances have not reduced this dependence. On the countrary, industry itself now draws much of its raw material and its energy requirements from the products of the plant world. With the rising populations and the resulting increasing demands for food, shelter, clothing and other basic amenities all national development plans call for greater production and this, too, will have to come mainly from plant sources and the world's vegetation.

Less obvious and much less known is our dependence on plants for their role in the development and the maintenance of man's environment. The primeval earth was no home for man. It was rough and desolate and marked by turbulence and disorder. Life first arose in the oceans and later, some 400 million years ago, spread over to the land. Green plants then enriched the air with oxygen, regulated the flow of water, and stabilized the earth's surface, thus providing a life supporting atmosphere as-well as a fertile soil. It was in this environment that man arose about a million years ago.

Organisms and their physical environments, or habitats, are interrelated and interdependent and they function together as integrated units or ecosystems. In each ecosystem, the habitat provides the living space, radiant energy, air, water and minerals. The organisms, between themselves, fix solar energy, produce organic compounds, organise them into living matter, and decompose all wastes and dead matter into simple minerals which could be used over again. Predators and parasites regulate populations at levels which the systems can support. The end products of one set of organisms serve as the raw materials for the activities of another. The "building-up" and the "breaking-down" processes are complementary and balance one another. Continuity of life is made possible by the parallel continuity of death. The closed cycling of matter and its continuous use and reuse make possible the perpetuation of life in a system with finite resources.

The Role of Plants

Plants play the principal productive and protective role in ecosystems. In general, plant reactions modify local environmental conditions and improve them bringing them up to the most favourable levels possible under their respective climates. Once these levels are reached they counteract the basic tendency in all systems to "run down", and they help to maintain the system in a state of dynamic equilibrium or a steady state.

Organic matter production

Plants are the only organisms that can harness the sun's energy and combine it with elements from air, water and minerals to form organic matter and living tissues. They thus provide the sustenance to all other forms of life. In the process of doing this they also purify the air by removing the carbondioxide and enriching it with oxygen.

Soil

Soil is not a simple function of bedrock and climate. To these have to be added the protection by a plant cover. Higher plants, however, cannot grow on bare rocks. Even under our humid climates a sloping surface of a bare rock becomes totally dry almost within minutes after a rain ceases. Crustose lichens which form the familiar orange or grey patches on old rocks, are about the only plants which can successfully grow on them. They initiate the formation of soil by etching into the rocks they cover and by binding the resulting particles with their organic wastes and exudates. Mosses then enter and spread out to form compact cushions which have high water-holding powers. This makes the habitat less susceptible to drought and it enables hardy herbs and wiry grasses, and in due course, shrubs and trees, to colonise the area. These successive waves of plant groups progressively build up the soils, step by step, until a soil and a vegetation that is in equilibrium with the physical environment ultimately develops. The whole sequence from the bare rock to the development of the balanced condition or *climax* may take several decades to several thousands of years depending on the climate, the nature of the bedrock, and the topography of the land.

Even after the stable condition or climax has developed, the soil and the vegetation remain interdependent. Neither can exist alone by itself. In a forest, the soil supports the trees and the trees in turn maintain the soils. The tree cover shields the soil from sun and rain, and any adverse effects of wind action. Leaf litter forms a protective covering on the forest floor, and on their decay adds humus and minerals to the soil. This humus and channels created by decaying roots make the soil loose, porous and permeable; and the network of roots assisted by the dead organic matter bind the soil particles together and check erosion.

Climate

Vegetation generally has a moderating influence on local climates. This effect is especially great at or near the soil surface, the region most important for soil micro-organisms and for the early stages of development of the higher plants.

A plant cover, by shielding the soil from intense solar radiation during the daytime and by reducing the outward radiation of heat during the night, lowers both the maximum and the minimum temperatures. In tropical lowlands, the daily range of temperature of fully exposed soil may often exceed 30°C on a bright sunny day, but the same type of soil with a good plant cover may have a range of only 2°C to 5°C.

Forest trees reduce wind velocities within the forests as well as on their leeward sides. In Sri Lanka, in the Uva basin planted tree belts have converted barren grasslands into prosperous areas of vegetable cultivation almost within a decade or two.

Relative humidities are generally higher under vegetation than in the open. In rain forests, at or near ground level, the air remains nearly saturated with water vapour almost right through the year.

Foresters have claimed that "forests increase both the abundance and the frequency of local precipitation over the areas they occupy," but most meteorologists consider that the forests have little or no effect on rainfall. Evidence on this is inconclusive.

In mountains and mountain valleys with frequent fogs or fine misty rains, however, a forest cover is said to increase the precipitation reaching the ground by amounts 2 to 3 times that in the open. Even in lowlands, where the daily temperature range is wide enough, much dew may be intercepted by the trees on cool nights. Koelmayer (1961) says that occult precipitation of this type is "quite prominent in our dry zone forests where a steady drip of water is experienced in the early hours of the morning during the drought."

Water balance

Even though forests may not increase the total rainfall they certainly increase the usefulness to organisms of whatever rain that does come down. The global water cycle may roughly be divided into four processes:- (i) evaporation from the sea and the land, (ii) transport of vapour in the atmosphere, (iii) precipitation on the land as rain, mist or dew, and (iv) the flow back over and areas to the sea. It is chiefly during the last stage that water is available for use of life on land. Bare rocks hold little or no water. Water falling on them runs off and flows back rapidly to the seas but vegetation delays this flow and enables terrestrial life to use it for longer periods.

In a forest little or no rain comes down directly to the soil. It is almost completely intercepted by the canopy of the tree leaves and branches. A part of the rain goes back to the atmosphere as transpired water. A part is absorbed by the vegetation. The balance flows down tree trunks or drips from the leaves to the forest floor and filters down through the litter and the network of roots into the porous soil below. Underground seepage then carries it gradually into the springs or to rivulets and streams from where it finally flows back to the sea.

The almost complete absence of surface runoff delays the return flow, and water is stored for some time by the vegetation and the soil as by a massive sponge or reservoir which fills up with excess water during heavy rains. This reduces peak flows after storms and the water held back is gradually released to the waterways for several days or even weeks after the rains cease. Forests thus regulate waterflow. They reduce the intensity of floods and may at times prevent them altogether and they increase the dry weather flows.

Evapotranspiration from forests is generally greater than evaporation from comparable areas of denuded soils. This loss is more than offset by the much larger amounts held back by forests and forest soils. In general, taller, fast-growing trees lose more water than shorter, slow growing ones and the species combinations present in natural forest ecosystems maintain the most favourable moisture conditions in their particular ecosystems.

Stability of ecosystems

Plants form the base of all food chains. The diversity of plant species sustains a corresponding diversity of animal species. By the checks and balances they collectively exert, population levels of all organisms are kept within the limits of the carrying capacities of the various habitats. In the tropical rain forest, for example, the multitude of species present maintains a stable equilibrium and pest outbreaks or population explosions are practically unknown.

Effects of the removal of vegetation

Removal of the plant cover without providing for an adequate artificial equivalent brings about a complete change in the soil microclimate and this leads to a very rapid deterioration of the soils. Exposure to the direct sun and to air movements make the soils heat up and dry. An upward movement of water and the resulting physico-chemical changes make the soils hard and impervious. The nutrient cycle breaks down with the loss of the products of leaf falls, and humus and minerals are no longer added to the soils. Any residual organic matter that may still be left in the soil rapidly disappears due to photochemical decomposition. The bare and hardened soil becomes subject to the full force of falling raindrops. The water does not infiltrate into the soils but drains off and causes severe erosion. The soil removed in this manner from cleared hill slopes may be as much as 25 to 30 times that from similar but forested soils. The soil brought down from the highlands may then cause silting of rivers and streams and may even cover lowland vegetation or cultivated fields bringing about their destruction as well.

With the removal of the plant cover and the erosion of soils the highlands cease to serve as natural reservoirs. The regulated flow of water is replaced by destructive floods and even a few days of drought may cause all natural waterways to run dry. The impoverishment and the erosion of soils make the habitats more susceptible to extremes of climate, and in regions with a marginal or low rainfall, may even cause a progressive desiccation of the land.

Land Use and Conservation

Our value systems have often been almost totally blind to the realities of the biophysical world. What nature has provided free has been ignored and taken for granted. The protective and ameliorative values of forests have been considered as irrelevant or unimportant as these cannot be readily quantified in economic terms. Misuse of land and overexploitation of forests for private gain have damaged or destroyed much of our land and this now constitutes our biggest environmental problem.

Sri Lanka has a total land area of about 16 million acres. The Report of the Land Utilization Committee (1968) gives the forest area in the Island as 44 per cent or nearly 7 million acres. These figures look very impressive but in fact only about a tenth of this is actual productive forest. The balance nine-tenths constitute waste lands with secondary jungle or low scrub. This area is so degraded that its average yield of usable timber is as low as 0.3 cu.ft. per acre per year. (Koelmeyer 1961). In addition to this several hundred thousand acres are covered by the weedy grasses *mana* and *illuk*. Climatic factors do not preclude the presence of forest in these grassland areas. Historical and experimental evidence seem to indicate that much of this, too, is man made and created by deforestation and subsequent soil impoverishment. Frequent firing is now causing further degradation of soils, and on steep slopes heavy erosion is even causing the exposure of underlying rocks in some areas.

Ours is primarily an agricultural country and all agriculture depends on soil and water. The minimum extent of land that should be under forest for efficient soil and water conservation is, according to foresters, at least 25 per cent. In the wet zone of Sri Lanka, where with heavy rains protective forest is most needed, we now have only about 9 per cent, and in the montane catchment of the Mahaveli Ganga it is as low as 8.5 per cent. Well managed tea does conserve the soil very effectively but appears to be less efficient than forests for regulating water flows. To ensure a regular dry weather flow from the rivers and to minimize flood damage total protection of the few existing forests and more reforestation are very essential.

Land use and conservation need not be antagonistic. They both now claim to have the same objective, namely "the rational use of the earth's resources to achieve the highest quality of living for mankind". Land can be used without destroying it. Biological resources under proper management are renewable and some can even be made more productive with use. In Sri Lanka the lands still available and suitable for development are in the dry zone plains. Nearly all this area was once cultivated and is now under secondary jungle or unproductive scrub. Nothing would be gained by retaining them as they are. Opening up of such lands would provide new opportunities for both agriculture and reforestation, and for rational land management where none existed earlier.

Rational land management, however, requires the preservation of natural landscapes as well. Natural areas relatively undisturbed by man are becoming more and more scarce, and every effort should be made to preserve what is still left. At most we now have only about 50,000 acres and this is less than 0.3 per cent of the Island's total areas. They can provide us with much valuable information as to how we can manage our cultivated areas best and they are the only standards or baselines by which we can judge our man-made ecosystems. They can also serve as refuges for endangered species and provide necessary material for future genetic improvements and biological controls.

Natural landscapes have important aesthetic and recreational values as well. They provide man an escape from the pressures and cares of crowded cities. Psychologists attribute anxiety and despair and the breakdown in human relationships to a breakdown in relationships between man and his environment. Today, urban man spends much of his time in environments created by technology where his contacts with nature are almost distorted. Even in the midst of peace and plenty, man is anxious, because the world around him separates him from the world he evolved in and fails to satisfy his basic psychological requirements. "Modern man", says Dubos, "is like a wild animal in a zoo fed abundantly, protected from inclemencies, but deprived of the natural stimuli essential for the many functions of his body and mind."[2]

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Trees, Forests and the Biosphere

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With increasing interest now being shown, almost universally, in matters of the environment we often come across terms like the biosphere, ecosystems, the balance of nature and so on. Sometimes such terms may be used without a clear idea of what they mean. The biosphere is simply that part of our planet, including its atmosphere in which life exists. This region, the biosphere, consists of the upper layers of the soil where there is a vast population of living things and where plants are rooted, the surface of the land on which man and a large proportion of animals live, and the atmosphere which we breathe and where the plants manufacture

food by trapping solar energy and wherein also live countless billions of bacteria. The oceans too, to various depths, from part of the biosphere.

Two of the characteristic features of the biosphere is the presence of water in the liquid form and the presence of energy from an external source. The biosphere contains a vast number of living things of great diversity and occupying every conceivable place within it. But the biosphere was not always so. What we now have is the result of an evolutionary process which began several millions of years ago.

An ecosystem is any unit of the biosphere. We have natural ecosystems such as the tropical rainforest of which Sinharaja is the best known though by no means the only one in Sri Lanka. Then we can have derived ecosystems such as a pasture field. Ecosystems can be large or small. The biosphere then is made up of the sum total of all the ecosystems of the earth.

The biosphere is what it is because of the sustaining influence of solar energy. The mechanism of trapping solar energy and making it available to all living things in the biosphere is and has been down the ages photo-synthesis. This is a unique function processed by all green plants. So in any ecosystem it is the plants whether they are the trees and herbs in a forest or the grass in a pasture field or the paddy plants in a rice field or the countless millions of microscopic algae in the open sea, which form the link between the sun from where energy is derived and the animals which cannot directly utilise solar energy. The green plants are the producers in the biosphere and the animals, including man, as well as non-green plants like moulds and bacteria are the consumers. Ecosystems may be self-sustaining when the energy fixed by the producers is equal to or more than the energy used by the producers themselves as well as by the consumers. In fact until the advent of civilized man on this planet all major ecosystesm were self-sustaining. In the energy budget of the biosphere before the advent of modern man there was actually a large surplus of energy which was stored in the coal and oil deposits.

The progress of human development has caused great disturbances in the natural ecosystems of the biosphere. Forests which are typical self-sustaining natural ecosystems have been destroyed to make way for urban and rural development and for the raising of food crops. The vast amounts of energy in the form of oil and coal that have been stored for millions of years have been ruthlessly exploited. In fact the degree of exploitation of natural resources has unfortunately been taken as a measure of development. New ecosystems have been developed in place of the natural ones.

Let us examine the nature of derived ecosystems of man-made ecosystems by taking two examples with which we are familiar. One, a village in the North Central Province, for example. Here there will be extensive areas of paddy. The paddy plants are the producers in the rural community. A large amount of energy is stored in the rice. The rice goes to feed the members of the community. The straw, also containing fixed energy, may be fed to cattle which in turn pass on some of the energy which they consume to the farmer in the form of milk. When the farmer eats the rice he is in the role of a 1st level consumer and when he drinks the milk he is in the role of a 2nd level consumer in this ecosystem. But what is important in this ecosystem is that there is an energy surplus and this surplus is exported to other communities — to other ecosystems — which have deficit budgets as far as energy is concerned.

A city is another man-made ecosystem. Here the roads are paved, the sidewalks are paved, and plant life is scanty. There is a vast population of human beings and a fair number of domesticated animals. These are all consumers. Production is very low. There may be a few trees, a few vegetable plots, but little else to trap solar energy. This ecosystem is not self sustaining; it is heavily dependent on energy imported from other ecosystems primarily the rural ones. The grain (rice) comes in and so does the meat and fish. Even the fuel wood comes from rural areas. A city is therefore, ecologically, a heavily subsidized ecosystem.

Both these ecosystems are man-made. Natural or semi-natural ecosystems are the forests. Forests occupy about 1/10th of the earth's surface and account for about 1/2 the energy fixed by the biosphere. In the process of energy fixation there is an all important function carried out by green plants. That is the purification of the atmosphere or specifically keeping the level of oxygen stable despite the fact that this gas is constantly being used by all living things for respiration.

In Sri Lanka, as in many parts of the world, the natural ecosystem is forest. [illegible] everywhere, and Sri Lanka is no exception, natural ecosystems have been modified or changed in order to provide man with a better life. This is essential for human progress. If we take the stand that natural forests or natural ecosystems should not be interfered with at all we are equating man to the beast and we are not making allowance for his superior intellect. Natural ecosystems have been cleared to make provision for farms, plantations, food crops and for human settlement. The crux of the matter is how far can we go on exploiting the resources of the environment without causing changes that will eventually be detrimental to man. In many industrialized countries the natural ecosystems have been too far and too drastically changed, and environmental pollution is one of the resulting problems. In developing countries, changes are taking place in pursuit of development and similar problems could crop up.

There are complex issues, and I can in this paper only touch on the question from the point of view of the forester.

form of subsistence agriculture. However, chena cultivation if allowed should be confined to the areas which have already been cultivated; that is, once a chena is cultivated and abandoned a scrub growth comes up in the area and the area could be re-cultivated in 10 — 15 years. Clearing of the limited extents of natural high forest in the dry zone for chena cultivation cannot be justified at all.

When seminars are held by scientific bodies like the Sri Lanka Association for the Advancement of Science on the preservation of forests, the conservation of natural resources and other allied subjects the audience is generally one that is already convinced of the importance of conservation. What is important is that this message should be taken to those who have yet to be convinced and, in this, voluntary organizations, mass media, schools, etc. will be able to do much.

The following comments are excerpted from the 'World of Life' by Alfred Russel Wallace, F.R.S., published in 1914 by Chapman & Hall, London.

Surely, before it is too late, our Minister for the Colonies should be urged without delay to give stringent orders that in all the protected Malay States, in British Guiana, Trinidad, Jamaica, *Ceylon*, Burma, etc., a suitable provision shall be made of forest or mountain "reserves," not for the purpose of forestry and timber cutting only, but in order to preserve adequate and even abundant examples of those most glorious and entrancing features of our earth, its native forests, woods, mountain slopes, and alpine pastures in every country under our control. It is not only our duty to posterity that such reserves should be made for the purpose of enjoyment and study by future generations, but it is absolutely necessary in order to *prevent further deterioration of the climate and destruction of the fertility of the soil, which has already taken place in Ceylon* and some parts of India to a most deplorable extent. For this end not only must timber-producing forests of an ample size be secured, but on all mountain slopes continuous belts at least 400 or 500 yards wide should be reserved wherever forests still exist or where they have been already lost be reproduced as soon as possible, so as to form retainers of moisture by the surface vegetation, checks to evaporation by the shade of the trees, guards against torrential rains, mud slides, snow slides where such are prevalent, and protection against winds. On level or nearly level ground, where such varied uses would not be required, similar belts at greater distances apart should be saved for local uses and amelioration of climate, besides "botanical reserves" of adequate extent to give a representation of each type of vegetation in the country.

I would also strongly urge that, in all countries where there are still vast areas of tropical forests, as in British Guiana, Burma, etc., all future sales or concessions of land for any purpose should be limited to belts of moderate breadth, say half a mile or less, to be followed by a belt of forest of the same width; and further, that at every mile or half-mile, and especially where streams cross the belts, transverse patches of forest, from one to two furlongs wide, shall be reserved, to remain public property and to be utilised in the public interest. Thus only can the salubrity and general amenity of such countries be handed on to our successors. Of course the general position of these belts and clearings should be determined by local conditions; but there should be no exception to the rule that all rivers and streams except the very smallest should be reserved as public property and absolutely secured against pollution; while all natural features of especial interest or beauty should also be maintained for public use and enjoyment.

Some aspects of Environmental Pollution in Sri Lanka

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Pollution is one of the aspects of population pressure on the environment, and man's use and mismanagement of land and water resources. This is seen in the use of modern methods of agriculture with high inputs of fertilizers and pesticides in problems of sewage and waste disposal caused by the increasing shift of the population from the countryside to the towns, and in new industrial technologies whose wastes are dumped on to the land, into surface waters or the ambient air.

Only a limited amount of data has been gathered on pollution in Sri Lanka. Even though it is less developed than many other countries in many respects, there can be no doubt that even here, pollution affects the quality of human life and if not controlled can cause irreversible changes in the environment and even bring about ecological disaster.

Air Pollution

The main air pollutants are smoke, dust (cement factories etc.), sulphur dioxide (petroleum refinery), carbon monoxide, nitrogen oxides and their poisonous products (emanating from automobile engines), noxious fumes of lead and other heavy metals (from electroplating smelting of type in the printing industry, accumulator manufacture) and chlorine — the poison gas of World War I (from caustic soda manufacture). Many of these are being brought under control — at least within the factory with respect to the workers' health — but we are still subject to noise, smoke, and fumes from belching buses while the Chemical Corporation is in the course of doubling its capacity for producing caustic soda as well as chlorine.

Eutrophication of Lakes, etc.

The effect of fertilizer run-offs on to surface waters is the increase of nitrogen (and phosphorus) compounds in the water. The nitrogen is made available as nitrate to algae through microbial action. In turn these multiply even to the extent of forming vast areas of water bloom on lakes. On their death, microbes decompose the cell materials, causing depletion of the oxygen in the water, causing death of fish and other animals, putrefaction, etc. and the lake proceeds to die. Castlereagh and Mousekelle are already subject to this process — while the Beira, Kandy and Lake Gregory have preceded them greatly aided by extra dosages of human wastes.

Pesticides

Another aspect is the heavy use of pesticides and the consequent harmful changes in the different ecosystems in which they have been employed. (Those who took the decision to eradicate the coconut pest *Promecotheca cumingii* using only biological methods are to be heartily congratulated.)

The contamination of vegetables by using pesticides without the respective precautions and conditions is evidently known by the market gardener who grows vegetables for his own use in a separate plot without employing these sprays. At a laboratory session of an international training course the Sri Lanka participant was found to have the highest blood level of DDT among those present!

Industrial Wastes and Sewage

Surface waters and the sea have long been used as dumps for waste. The most striking example we have of an open sewer is the Wellawatte Canal and the periodical stink which those who live around it are subject to. In this particular instance the chief causes are sewage from the city sewer/storm water overflow and from shanty dwellers along the canal banks together with organic waste effluents (milk, fruit and textile processing) which fertilise microbial growth which causes corresponding depletion of oxygen in the water. In addition, sea water gains entry and the sulphates are under these conditions reduced microbially to the malodorous hydrogen sulphide.

A study carried out on the water quality of the Kelani river shows that the last few miles of the river is subject to pollution by the effluents from a number of industries as well as city sewage. This area has a history of a dwindling fish population and an increasing pollution index stemming from chromium (leather factory) petroleum and other wastes. Computer programming of the data obtained indicates that at the present rate, within a few years the Kelani as it flows past the city will acquire the dubious distinction of becoming a highly polluted surface water. Meanwhile Colombo tap water (obtained from the Kelani) often tests for presence of faecal bacteria and there is a rise in the incidence of cholera and enteric fevers and viral hepatitis.

What is most disheartening is the callousness with which some factory effluent treatment plants have been left out in the open to rust and deteriorate without even being installed, while those in the vicinity have to suffer from a polluted water supply for drinking and domestic purposes and for irrigation of crops.

These are some of the areas where there is significant pollution in this country. Much more data have still to be obtained. Very little effort is at present expended in environmental monitoring and predicting the changes which can take place through the action of pollutants. It is only as a result of these that (environmental) scientists can place the facts before the citizens of the country in order that they may take action to see that the environment not only merely sustains life but enriches it, harmonising the efforts of man and nature for the greater good of all, including the generations yet to be born.

VIDU 1-3-12

Random Observations

Irangani Serasinghe
Hony. Secretary, Ruk Rakaganno- The Tree Society of Sri Lanka.

During my last vacation I took a trip through a part of the country I knew fairly well some years ago. The road lead from Tissamaharama to Tanamalwila, a left turn to Timbolketiya, down to Embilipitiya and left again to Panamure, and up past Kolonne to Rakwana.

Panamure, some may remember, was the site of many a elephant kraal. Around this little hamlet the jungle stretched for miles — from East across the Walawe to West where it met the Sinharaja Adaviya, and South from Weeraketiya to North up past Rakwana. The vegetation and character of the jungle changed immensely, animal and bird life were plentiful and the streams ran pure and clear and fish of varying sizes swam about your feet.

Today, from Tissamaharama to Uda Walawe, it would be a relief to see four or five trees standing together — but we are denied this relief till we reach the Teak Plantations of the Forest Department at Uda Walawe. Angunukolapelessa will soon become a Sahalian landscape, and from Panamure to Kolonne there is no reminder of the jungle that was — only grass and dark boulders. At Kolonne a few huge towering trees by the roadside, which have miraculously escaped the axe, cause a hopeful flutter in the heart, only to let you down fast with a thump.

And so we climb the once breathtakingly beautiful and still quite lovely Bulutota Pass and hope that the little fringes of forest surviving on the crests of precipitous mountains may remain unreachable. But this is a forlorn hope remembering other equally precipitous mountains where nature has not been a barrier against the greed and ruthlessness of Man.

Returning to Tissamaharama I took another road— a disaster just about completed—the Kataragama— Buttala Road. This is the thin end of the wedge which is already firmly pushing into the Ruhunu National Park. Chena cultivation has begun and soon there will be a chain of chenas leading into the very heart of the Park. Do we really understand the neccessity of preserving our Wild Life? What should we do to correct the lop-sided thinking and education of our planners and policy-makers? These are some thoughts which crossed my mind as I drove through.

The jungles of Moneragala and Wellawaya are so denuded that the Forest Department can no longer supply the wood fuel from these forests to the tea estates who are demanding more and more firewood as they switch over from diesel to wood for all their purposes. The tea estates—and indeed the jungles— are now at the mercy of private contractors who have no scruples about what species or what girth they fell.

All the way from Haldumulla (famous for landslides) and then on to Balangoda, no indigenous forests worth talking about are to be seen. If you have not been that way for some time it is a jolting experience to see pine-clad hills in Sri Lanka. They crawl all the way up the slopes of Belihuloya to the borders of the Horton Plains. The Forest Department has put the pines there because the indigenous forests having been clear felled or burnt and the soil is too degraded for anything other than this species. At least it stops further erosion and goes a long way in providing the country with much needed timber.

At Balangoda I climbed Pettigala hill and regarded the surrounding countryside through a pair of binoculars. The Mahawelatenne plateau stretched before me— brown and denuded except for very tiny pocket-handkerchiefs of green paddyfields. The efforts to grow tea in places unfit for tea have ended in disaster. The whole scene was depressing in the utmost. My mind went to the man-made deserts of Mesapotamia, Syria and the Gobi desert of China. Can we never learn?

The next days journey down to Kaltota did not lift up my spirits—just further depression for my memories were there—of thickly wooded hills, the thrilling anticipation of meeting a herd of elephants, the calls of a myriad birds.....Now the hills are bare, the elephants are seen no more and the calls of the birds are few and far between.

The only relief came when we reached the valley of Uggalkaltota where the fields were lush and green. Looking up at the hills surrounding them we saw the forest still intact and said a silent prayer that for the sake of the now prosperous peasants living in that valley they would remain untouched.

Relief also came in the tiniest of hamlets enclosed by a beautiful escarpment at the back and patches of jungles on either side, where the chief cultivator assured us that he would not permit anyone to touch that jungle for that was the life-blood of his fields. Much to our joy, he gave us a lecture on erosion and siltation. Alas! that the people of Warakapola do not have that age-old wisdom.

Yesterday, I took a trip to Kandy and back. On the way up in the morning it was bright and sunny and the new paddy looked fresh and healthy. But further up, nearing Warakapola there were unsown fields which had instead of rich brown mud, large patches of sand in the middle of the field, and there was evidence of breached bunds.

In the afternoon we started our journey back with a moderate shower accompanying us till Kadawatha. It was a moderate shower but all the way the streams were gushing reddish brown, spilling over into the fields which looked like seas of diluted mud. Where there was terracing the spill over through the 'vakkades' appeared like stunted waterfalls. In some places little village houses had been already reached by the racing waters.

One may not think this is something worth talking about, but when you consider that this had happened between 11.00 a.m. and 4.00 p.m. then I think it is not only worth talking about but also doing something about. Look up at the hills around Warakapola and further on right up to Kandy (and indeed up to notoriously eroded Gampola and beyond) and you will find the reason for these devastating flash floods. It is also the reason for the large areas of sand instead of rich brown mud in the paddy fields around Warakapola and Nelundeniya.

It is estimated that to put up a very modest little house we need one 20-year-old mango tree and we need 53,000 such houses per year. We also need 20 class rooms per day if we are to accomodate the growing army of children, and each class room would use up two 20-year-old mango trees (i.e. per day).

Is the message not loud and clear? Can we possibly talk of development while giving such scant attention to population and conservation as we are giving now? Must we leave ourselves open to the curses of the generations to come for allowing the beauty and fertility of this land of ours to become a mere legend?

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සී. විජයවික්‍රම ශ්‍රී ලංකා ජාතික විද්‍යා සභාව,

1976 ජූනි 5 දා ලෝක පරිසර දිනය විය. එක්සත් ජාතීන්ගේ මහා සමුළුව 1972 වර්ෂයේ දී පැවැත් වූ එහි 27 වෙනි සැසිවාරයේ දී එක්සත් ජාතීන්ගේ පරිසර වැඩ සටහන නිර්මාණය කරන ලදී. මෙම වර්ෂයේ දෙසැම්බර් මාසයේ දී ජාතික ගස සිටුවීමේ දිප ව්‍යාප්ත ව්‍යාපාරයක් ආරම්භ කරන ලදී. පරිසර සංරක්ෂණයේ අවශ්‍යතාව මැනවින් වැටහීගොස් ඇති මෙවැනි අවස්ථාවක පරිසර පාලන හා පරිපාලන නීතියේ ප්‍රධාන ලක්ෂණ විමසා බැලීම හිතකර ය. දිවයිනේ වත්මන් සමාජ හා ආර්ථික රටාව පරිණාමය වීමේ දී පරිසරය හා ඉඩම් නීතිමය විධිවිධාන ඒ හා සම්බන්ධ වූ ආකාරය කෙටියෙන් විග්‍රහ කිරීමට මෙහි දී තැත් කරනු ලැබේ.

මිනිසා පරිසරයේ කොටසක් ලෙස හෝ නැතහොත් පරිසරය හැඩගස්වන්නකු ලෙස සැලකේ. ස්වභාවික පරිසරය නිරන්තරයෙන් වෙනස්වන සුලු ස්වභාවයක් ගනී. මිනිසාගේ මැදිහත්වීමෙන් සිදුවනුයේ මෙම වෙනස්වීමේ පරිමාණය හා වේගය තීව්‍රවීම මෙන් ම ඇතැම් අවස්ථාවලදී වෙනස්වීම් නැවත යථා තත්වයට ආපසු ගෙන ආ නොහැකි තත්වයකට පත්වීමත්ය. යම් මිනිස් සමාජ සංවිධානයක 'පරිසරය' කුමක්දයන්න එම සමාජයේ සංස්කෘතික දියුණුව හා අදහස්කරන සාපේක්ෂ අර්ථ යකින් යුක්ත වන බව පෙනේ. ඓතිහාසික වශයෙන් සලකන විට ලෝකයේ නොයෙක් සමාජ අතර හුදකලා මෙන්ම සීමිත පරිසර පැවතුනද, විද්‍යාව හා තාක්ෂණික ඥානය ඉදිරියේ ක්‍රම යෙන් හැකිලී ගිය ලොවක පරිසරය යන්නට ඇත අභ්‍යාවකාශයද ඇතුලත් විය හැකිසේය. සංස්කෘතික හා භෞතික හෙවත් ස්වභාවික පරිසරය යනුවෙන් කරනු ලබන ගතානුගතික පරිසර බෙදුම යම් වැදගත්කමකින් යුක්ත වෙන සේ පෙනෙනුයේ සංස්කෘතික දියුණු දෙන් (විද්‍යා තාක්ෂණික) ඉහළ යන්ම භෞතික පරිසරය කෙරෙහි වන බලපෑම හෝ හානිය ද ක්‍රමයෙන් වැඩි වන බව පෙනී යන හෙයිනි. මිනිසා අති විශාල බලයක් ලබා ගන්නා ගමන්ම අති විශාල වගකීමක්ද ඉදිරිය යුතු අයෙකු වී ඇත.

ස්වභාවික පරිසරය එයටම ආවේණික වූ සමතුලිතතාවයකින් හා චක්‍රිය ස්වභාවයකින් යුක්ත වන බවත් එම පරිසරයෙන්ම පරිණාමය වූ මිනිසාගේ මැදිහත්වීමෙන් මෙම සමබරතාවය නැතිව යන බවත් පැවසේ. පෘථිවියේ සම්භවය හා සවභාව ධර්මයේ කාල සටහන හා සඳහන් විට මිනිසාගේ පරිණාමයේ ආරම්භය හා මිනිස් ශිෂ්ටාචාරයේ ආරම්භයත් විශේෂයෙන්ම කාර්මික විප්ලවයේ ආරම්භයත් දැනට ස්වල්ප වේලාවකට පෙර ඇති වූවක් වැනි වේ. මෙසේ මිනිසාගේ ක්ෂණික හානි මහින් සිදුවන අසමබරතාවය නැවත සමතුලිතතාවයට ගෙන ඒමේ මහක් කලකට පෙර මෝල්තස් දක්වන ලද නමුත් එය පරිසරය යථා තත්වයට ගෙන ඒමක් නොව හානි කළ අය නැතිකර දැමීමක් විය. සීමිත සම්පත් ඉදිරියේ ජන සංඛ්‍යා ප්‍රසාරණයක් වැලැක්වීමේ අවශ්‍යතාවය පෙන්වා දුන් ලේඛකයින් හැරුන විට මෑතක් වන තුරුම (හැබිටැට් සමුළු) පරිසරය සංරක්ෂණය කිරීමේ වැදගත්කම පෙරමුණට පැමිණියේ නැත.

අතීතයේ දී විදේශිකයන් විසින් උයන්වතු වලින් යුත් රමණීය දිවයිනක් ලෙස කීපවරක්ම හඳුන්වා දී ඇති ශ්‍රී ලංකාවේ දගැබ හැටි මත පදනම් වූ සම ජාවාදීක ක්‍රමයක්ම පරිසර පාලනයේ මුල් බීජ හඹුවිනම් එය පුදුමයට කරුණක් නොවේ. ඉන්දියාවේ හටගත් නොයෙක් දර්ශන වාද අනුදින් පෙන ආගමෙන් අන්තවාදීව නොවේ තමන්ට සෙවන දෙන ගස් වැල් කෙරෙහි පවා කළගුණ සැලකීමේ භික්ෂු භාවය බෞද්ධ දර්ශනයෙන් පිළිගැනිනි. සිංහල රජ දරුවන්ගේ ඇතැම් ශිලා ලිපි අනුව ඇතැම් සතුන්ට හානි කිරීම දඬුවම් ලැබිය යුතු අපරාධයක් විය. මෑතක දී වුවද පරිසරය රැකගැනීමේ උත්සාහය දී මෙම සංස්කෘතික වටිනාකම් උපයෝගී කර ගත හැකිවනු නොඅනුමානය. ලෝකයේ ඉතා දියුණු රටවල මෙන් මනාව සංගෘහිත පරිසර ආරක්ෂණ නීති පද්ධතියක් හෝ පරිසර පරිපාලන දක්ෂකාරියක් හෝ නැතත් දිවයිනේ විශ්වවිද්‍යාල සංග්‍රහයේ පරිසර පාලනය හා සංරක්ෂණය හා කෙලින්ම මෙන්ම වක්‍රව සම්බන්ධ නීති විධිවිධානවල හිඟයක්

නොමැත. එහෙත් පරිසරය පරිපාලනය කිරීමෙහිලා අවශ්‍යතාව යක් නොදැනුනු හෙයින්දෝ මෙම නීතිවලට ඊට අවශ්‍ය සද වාරාත්මක අනුබලය නොහිබුණ සේය. බොහෝ පනත් හා විධිවිධාන හුදෙක් අකුරුවලට ම සීමා වූ මළ පනත් වැනි විය. වඩා වැදගත් සේ සැලකූ වෙනත් විවිධ සම්ප ආර්ථික අරමුණු ඉටුකර ගැනීමට යාමේදී මතුවූ කරුණක් වශයෙන් මිස පරිසරය කෙරෙහි මිනිසාගේ මැදිහත්වීම ක්‍රමවත් හා පරිපාලනය කිරීමේ අරමුනකින් බොහෝවිට මෙම විධිවිධාන නොපැනෙන්න. මේ හේතුවෙන් ක්‍රියාත්මක හා ප්‍රයෝගික අංශයෙන් මේවායේ සංර්ථකත්වය හා කාර්යක්ෂමතාවය අගය කිරීමේ හෝ විග්‍රහ කිරීමේ අවශ්‍යතාවයක් හෝ ආයතනයක් හෝ නොවීන.

රටේ භූ භෞතික පදනම අනුව බණිජ සම්පත් නිහවීමත් විවිධ දේශගුණික පරිසර දක්නට ලැබීමත් නිසා භූමිය වැදගත්ම සම්පත සේ සලකුණි. දිවයිනේ දක්නට ලැබෙන කෘෂිකාර්මික ආර්ථිකයේ ද්විත්වය (Dualism) එනම් ඉහා දියුණු වතුවගා ක්‍රමයක් හා නොදියුණු ප රිභෝගික ගැම් ගෙවතු වගාව ද අනුව සලකා බලන විට 1920 ගණන්වල සිටම තේ, රබර් හා පොල් වගාව හා සම්බන්ධ පනත් රාශියක්ම දක්නට ලැබුණි. මෙම නොයෙක් පනත්වල විධිවිධාන හා රෙගුලාසි මඟින් ඉතා දියුණු විද්‍යාත්මක වගා ක්‍රමයක් බිහි කිරීමට හැකි විය. භූ විෂමතා ලක්ෂණ අනුව විශේෂයෙන් තේ හා රබර් වගා සම්බන්ධයෙන් පාංශු බාදනය වැලැක්වීමේ පිළිවෙවල් අත්‍යවශ්‍ය වූ අතර පාරිභෝගික ගෙවතු සම්බන්ධයෙන් මෙවැනි විශේෂ විධිවිධාන නයන් පැන වුනේ 1972 වර්ෂයේ කෘෂිකාර්මික ඵලදා වර්ධන පනත මඟිනි. මෙම කෙටස් රෙක අතරතුර ට වැටෙන කුඩා ඉඩම් හිමියන් 1950 ගණන්වල පැනවූ කුඩා ඉඩම් නැවත වගාකිරීමේ සහනාධාර පනත්වල විධිවිධානවලින් ආවරණය කරනු ලැබීය. 1970 න් පසු අවධිය පරිසර සංරක්ෂණය කිරීමේ අභිලාෂයක් පෙන්වූ තේ, රබර් හා පොල් වගා සම්බන්ධ පනත් රාශියකින් යුක්ත විය. 1975 දී තේ ඕණ්ඩල, පොල් සංවර්ධන, කුඩා තේ ඉඩම් සංවර්ධන නීති පනවීම නිදසුන්ය.

පරිසරය රැකීම හා බැඳුණු නොයෙක් නීතිරීති තිබුණත් ඒ පිළිබඳව ජාතික වශයෙන් අවධානයක් යොමු නොවූ බවට කදිම නිදසුනක් වනුයේ රටේ ආර්ථික සංවර්ධන සැලසුම්වලදී ඒ පිළිබඳව සඳහනක්වත් නොදීම ය. මෑත පස් අවුරුදු සැලැස්මේ දී (1972 – 76) වුව ද මෙහිලා වැදගත් අවධානයක දී ඇති බවක් නොපෙනේ. ව්‍යවස්ථාදායකය මඟින් ගත වූ කාලය තුළදී පැනවූ නොයෙක් පනත් මඟින් පිළිගෙන ඇති ප්‍රතිපත්තිය සේ පෙනෙනුයේ පෞද්ගලික දේපල අයිතිය හා පෞද්ගලික ව්‍යවසාය මත පදනම් වූ සම්පත් උපයා ගැනීමට ඉඩ සලසා දීම බව පෙනේ. මූලික වශයෙන් වගාව සඳහා භූමියෙද ගැනීම හැරුන විට බණිජ වස්තු (ඉල්ලම් ආකර හා බණිජ වස්තු පනත 1947) සීවර හා ආශ්‍රිත (හක් බෙල්ලන් පිළිබඳ අඳුණන හා පනත 1890/1953, මුතුපර 1925, තල්මසුන් 1936, සීවර ආඥා පනත 1940) වනාන්තර (වනාන්තර ආඥාදායක 1907, ප්‍රෞඩි සංරක්ෂණ ආඥාපනත 1924, ගස් කැපීම (පාලනය) විධිබඳ පනත 1951) යනාදිය හා සම්බන්ධ ව්‍යවස්ථා මෙහිලා නිදසුන් වශයෙන් සඳහන් කළ හැකිවේ. මෙවැනි අවධියක දී ස්වේච්ඡා සංවිධාන හා පුද්ගලයන් විසින් පරිසරය විධිබඳව දක්වන ලද උනන්දුව අගය කළ යුතුවේ. මුලදී (1894) විනෝදය සඳහා සතුන් රැකීමේ අරමුණින් ඇරඹුණු සංවිධානයක් පසුව (1930) ක්‍රීඩා හා සත්ව ආරක්ෂණ, (1957) වන සත්ව ආරක්ෂණ හා (1969) වන සත්ව හා ස්වභාවික පරිසරය ආරක්ෂා කිරීමේ සමිතිය වශයෙන් පරිණාමය විය. සත්වයින් හා වෘක්ෂ ආරක්ෂා කරගැනීමෙහි ලා නොයෙක් ව්‍යවස්ථා විධිවිධාන මෙන්ම පරිසර සංරක්ෂණය පිළිබඳ සෙසු පනත් කෙරෙහි ද මෙම සමිතියෙන් ඉටුවූයේ අනිමහත් සේවාවකි.

මූලික වශයෙන් මුඩුබිම් පනත් (1841, 1897) මඟින් ලබාදෙන ඉඩම්වල කෝපි හා පසුව තේ වගාව ඇරඹීමෙන් සමඟ ගෙනෙනු ලැබූ ඉන්දීය කම්කරුවන්ගේ සුභ සාධනය සඳහා පැනවූ විවිධ පනත්වල ඔවුන්ගේ සෞඛ්‍යය, ආනිපාරක්ෂාව හා සම්බන්ධවේමින් නොයෙකුත් පරිසර පාලන නීති පැනවීන. මේවා එක් අතකින් බලන විට වතුකරයේ නගර හා ග්‍රාම සැලසුම් විධිවිධානසේ හැඳින්විය හැකිය. මෙවැනි විධිවිධාන (බොහෝ විට ඉන්දීය රජයේ බලපෑම මත) වතුකරු (ඉන්දියානු) 1889 හා ඉන්දීය සංක්‍රමණ කම්කරු 1923 යන ආඥාපනත්වල දක්නට ලැබේ.

දිවයිනේ අපරාධ නීතියේ අංග වශයෙන් පරිසර පාලනය පිළිබඳ විධිවිධාන රැසක් දක්නට ලැබේ. අපරාධ නීතිය පිළිබඳ මූලික ව්‍යවස්ථාව වන දණ්ඩ නීති සංග්‍රහයේ (1883) 14 වන පරිච්ඡේදයේ මහජන සෞඛ්‍යය, ආරක්ෂාව, පහසුව සඟ්‍යත්වය හා සදාචාරය පිළිබඳ වැරදි සම්බන්ධයෙන් එහි 261 – 289 දක්වා වගන්ති අතර පෙදෙ උල්පත් හෝ ජලාශ අපවිත්‍ර කිරීම හා කිලුටු කිරීම, වාතාවරණය දූෂිත කිරීම, මහජනයාට කරදර වන වැරදි නිදසුන් වශයෙන් දක්විය හැකිය.
දණ්ඩ නීති සංග්‍රහයේ 408 වගන්තියෙන් දක්වෙන අනර්ථය නම් වරද යටතේ සතුන් මැරීම හෝ අංග විකල කිරීම, ගහකොට පාඩු කිරීම යනාදි වැරදි දක්වා ඇත. මීට පෙර 1862 දී පැන වූ පොදු පීඩා පිළිබඳ ආඥාපනතේ අරමුණ වූයේ පොදු සෞඛ්‍ය රැකගැනීමත් කරදර පීඩාවන් යටපත් කරගැනීමත් විය. ගෙවල් අපවිත්‍ර ලෙස තබාගැනීම, ජලය අපවිත්‍ර ලෙස රඳවා තැබීම, දියපාරවල් හා ජලාශවලට අපවිත්‍ර දෑ දැමීම, පාරවල් අපවිත්‍ර කිරීම යනාදි වැරදි මෙම පනතේ විශේෂයෙන්ම සඳහන් කර ඇත. පාරවල් පම්බන්ධයෙන් විශේෂ විධිවිධාන 1861 පොදු පාරවල් පිළිබඳ ආඥාපනතේ ද ඇතුලත්ව ඇත. මෝටර් ප්‍රවාහන පනතේද මෙවැනි පරිසරය අපවිත්‍ර කිරීමට අදාල පොදු වැරදි දක්වා ඇත. කලින් අපරාධ විධිවිධානසංග්‍රහයේ (1898) සමාජ යහපතට හානිවන කටයුතු (105, 106, 114 වගන්ති) වැලැක්වීමට මහේස්ත්‍රාත්වරුන්ට බලය දී තිබුනු අතර යුක්තිය පසිඳලීමේ නීතියේ (1973) 60 වන වගන්තිය මඟින් පරිසරය කෙරෙහි බලපාන පොදු හානිකර පීඩා වැලැක්වීමට විශේෂ බලතල මහේස්ත්‍රාත්වරුන්ට දී ඇත.

විශේෂයෙන් දෙවන ලෝක යුද්ධ කාලයේ දී 1940 ගණන්වල ඇතැම් කාර්මික භාණ්ඩවල හිහයක් ඇතිවීමත් සමඟ දිවයිනේ කර්මාන්ත අංශයක ආරම්භය හට ගැනිණ. 1942 කම්හල් ආඥාපනතෙන් කම්කරුවන්ගේ ආරක්ෂාව හා සුබසාධනය පිළිබඳ පැනවූ විධිවිධාන අතර වායුව අපිරිසිදු වීම, විෂ ද්‍රව්‍ය නිකුත්වීම යන කරුණු පිළිබඳව ද අවධානය යොමු වුනි. කෙසේ වෙතත් පරිසරය කෙරෙහි බෙහෙවින් බලපෑ මහා පරිමාණ කර්මාන්ත රැසක් බිහිවුනේ වඩා පසු අවධියක 'රාජ්‍ය සංස්ථා' වශයෙනි. සිමෙන්ති කඩදාසි, තුනිලෑලි, රසායන ද්‍රව්‍ය, හම් යන දිවයිනේ ආරම්භක කම්හල් දිහිටුවීමේ දී ඒවායින් පසුකලෙක වන පරිසර බලපෑම කෙරෙහි සැලකිල්ලක් දක්වා නොතිබුණි. පසු කලෙක ඉතා සීඝ්‍රයෙන් මතු වූ නොයෙක් කාර්මික සංස්ථා ද්‍රව්‍යමය දියුණුවක් ඉදිරියේ ස්වභාවික පරිසරයට අපමණ හානි කර ඇත. දිවයිනේ සමස්ත යහපත සලකන විට මෙම යෝධ කම්හල් 'කුඩා දෙය අලංකාරය' යන කෘතියේ ෂුමාකර් විසින් පෙන්වාදී ඇති ඇතැම් කරුණු සිහියට නංවයි. අඩුතරමින් මේවායින් කුමන තරාතිරමේ හානියක් වේද යන්න පිළිබඳවවත් ඉතා මැනක් වනතුරු කිසිවකුගේ අවධානයවත් යොමු වූයේ නැත.

කාර්මිකරණයේ ප්‍රතිඵලයක් වශයෙන් පැන වූ සුභ සාධක නීති මඟින් වක්‍රව සැලසුනු ඇතැම් ස්වල්ප විධිවිධාන මෙන් නොව නාගරීකරණය පරිසර පාලන පනත් රැසක් බිහි කළේ ය. ගම්සභා, නගර සභා, සුළු නගර සභා, මහ නගර සභා පනත්

මෙන් පලාත් පාලනආයතනවලට දෙන ලද බලතල හා යුතුකම් අතර පරිසර පාලන කටයුතු ද ඇතුලත් විය. නිවාස හා නගර වැඩි දියුණු කිරීමේ ආඥාපණත (1915) හා විශේෂයෙන් 1946 නගර හා ග්‍රාම නිර්මාණ ආඥාපණත සංස්කෘතික පරිසරය රක්ෂණය පිළිබඳ ප්‍රථම සවිස්තර පියවරක් වැනිය. සංස්කෘතික පරිසරය පාලනය කිරීමේ ලා පැනවූ නෙයෙකුත් පණත් අතර ලිං හා වලවල් පිළිබඳ ආඥාපණත (1884) . උතුරු පළාතේ වෙළඳ පොළවල් පිළිබඳ ආඥාපණත (1891), මස් මරණ ස්ථාන පිළිබඳ පණත (1893), මහ නගර (1896) හා උප නගර (1908) කිරි පට්ටි හා රෙදි සෝදන තැන් පිළිබඳ පණත් කොළඹ ජල කර්මාන්ත (1907) මඩකලපුව ජල කර්මාන්ත පණත (1925) හා විශේෂ ප්‍රදේශ (කොළඹ) සංවර්ධන පණත (1947) සඳහන් කළ හැකිවේ.

බොහෝ විට නාගරික ප්‍රදේශ කෙරෙහි බලපෑමේ අදහසින් පණවන ලද පොදු සෞඛ්‍යය, සනීපාරක්ෂාව හා ආරක්ෂාව සඳහා ඉනුවුනු පණත් රැසක පරිසර පාලනය කෙරෙහි බලපෑම විධිවිධාන ඇතුළත් විය. බෝවන රෝග (1866), වන්දනා ගමන් (1896), නිරෝධායන හා බෝවන රෝග වැලැක්වීමේ ආඥාපණත (1897), අන්තරාදයක සතුන් (1921), මත් ගංජා හා භයානක බෙහෙත් ද්‍රව්‍ය (1929) යන ආඥාපණත් නිදසුන් ලෙස දැක්විය හැකිය. ඓතිහාසික පරිසරය රැක ගැනීමේලා ගත් උත්සාහ ලෙස නිදන් වස්තු (1887), කැසි ආරක්ෂා කිරීමේ (1917), හා පුරා වස්තු (1940) පණත් වැදගත් වේ.

ගස්වැල් හා සතුන් පිළිබඳ පණත් රාශියක්ම දක්නට ලැබීම විශේෂ ලක්ෂණයකි. වනාන්තර (1907) සතුන්ට හානි කිරීමේ පණත (1907), දිය පැසි (1909), සත්ව ලෙඩ රෝග (1909), අලින් ඇල්ලීම (1912), පැලෑටි රක්ෂණ (1924), උද්භිද උද්‍යාන (1928), සත්ව හා වෘක්ෂ ආරක්ෂණ (1937), ඉඩම්වල බලෙන් පදී සිටීම (වැලැක්වීම) (1940), කිරිට ඉඩම් (1947), ගස්කැපීම (පාලනය කිරීම) (1951) , සත්ව පණත (1958) යනුවෙන් පණත් රාශියකි. ගංවතුර වැලැක්වීමේ (1924) හා පස සංරක්ෂණය කිරීමේ (1951) පණත්ද මෙයටම ඇතුළත් කළහැකිවේ.

රටක තෘතීය ආර්ථික කටයුත්තක් ලෙස සැලකෙන දේශ සංචාරක ව්‍යාපාරය කෙරෙහි 1960 දශකයේදී සිට යොමු වූ ජාත්‍යන්තර අවධානයේ ප්‍රතිඵලයක් වශයෙන් බෙහෙවින් ''බලවත්'' සංචාරක වර්ධන පණත (1967) බිහි විය. ස්වභාවික පරිසරයට වඩා මෙහි දී වැඩි සැලකිල්ලක් යොමු වනුයේ සංස්කෘතික පරිසරයට වුවත් පරිසර පරිපාලනය කෙරෙහිලැනන්දූවක් ඇති කරවීමේ ලා දේශ සංචාරක කර්මාන්තය බෙහෙවින් උපයෝගී විය. 1970 සිට සත්ව රක්ෂණ දෙපාර්තමේන්තුව නාවුක හා සංචාරක අමාත්‍යාංශය යටතට ගැනීම නිදසුනක් ලෙස දැක්විය හැකිය. රටේ පවතින චිරානුගත පරිපාලන ආයතන අභිබවා යන බලතල සහිත ආයතනයක් ඇති කරන මෙම පණත පරිසර පරිපාලන මණ්ඩලයක් අනාගතයේ දී ඇතිවුවහොත් ඊට ඒය යුතු කුමන බලතල ද යන්න සිතා ගැනීමට උපකාරී වේ.

පරිසර පාලනය හා සංරක්ෂණය සම්බන්ධ නොයෙක් විධිවිධාන යෙදවීම මූලික වශයෙන් රජයේ දෙපාර්තමේන්තු මාර්ගයෙන් කරනු ලැබිය යුතු විය. මීට වෙනස් වූයේ පලාත් පාලන ආයතනවල ඇතැම් අතුරු නීති ක්‍රියාත්මක කිරීම සම්බන්ධයෙන් පමණි. එහෙත් සංස්ථා සංකල්පය පැහැර යාමත් සමඟ පරිසර පාලන විෂයයන් කෙරෙහි ද සංස්ථා පිහිටුවීම ඇරඹින. ජල සම්පත් මණ්ඩලය (1964), කොළඹ දිස්ත්‍රික්කයේ (පහත් බිම් ප්‍රදේශ) ගොඩ කිරීමේ හා සංවර්ධනය කිරීමේ මණ්ඩලය (1968), ජලාපවාහන හා ජල සම්පාදන මණ්ඩලය (1974) මෙසේ ඇති කළ සංස්ථා විය. මෙම සංස්ථාවල අධ්‍යක්ෂ මණ්ඩල සංයුතිය සලකා බලන විට පරිසර සංරක්ෂණයේ ලා විවිධ විෂයයන් විෂය මූලිකව එක්කොට සලකා බැලීමේ ඇති අවශ්‍යතාව එලිදරව් වේ. තවත් අතකින් බලන විට ගල්ඔය සංවර්ධන මණ්ඩලය (1949) පසුව ගංඟා නිම්න සංවර්ධන මණ්ඩලය (1965) හා මහවැලි සංවර්ධන මණ්ඩලය (1970) භූගෝලීය පරිසර මූලිකව ගෙන සලකා බැලීමේ ලා ගත් උත්සාහයක් වැනිවේ.

ශ්‍රී ලංකා ජනරජය බිහිවීමත් සමඟ පරිසර පාලනය හා සම්බන්ධ නීති ඇංශයේ නව නැඹුමක් හටගෙන ඇතිසේ පෙනේ. මීට හේතුව සමහරවිට ජනරජ ව්‍යවස්ථාවේ දැක්වෙන රාජ්‍ය ප්‍රතිපත්ති මූල ධර්ම විශේෂයෙන් සමාජ ඵලය සමාන ලෙස බෙදා හැරීම, සාමූහික දේපල ක්‍රමය දියුණු කිරීම යන අංග හැරෙන විට ක්‍රමයෙන් වැඩිවන ආර්ථික දූෂකතා ඉදිරියේ සම්පත් මනාලෙස භාවිතා කිරීමේ හා රැක ගැනීමේ අවශ්‍යතාව දැනීයාමද විය හැකිය. මූලික මිනිස් නිදහස් හා අයිතිවාසිකම් යටතේ පුද්ගලික දේපල අයිතිය හඳුන ගෙන නොනිබීමත්, පොදු යහපත ඉදිරියේ, දී ඇති මූලික අයිතිවාසිකම් යටපත්වීමත් පසුව පැන වූ ජනරජ ව්‍යවස්ථා විධිවිධානවල අදමුණු වටහා ගැනීමේ දී වැදගත්වේ. කලින් පැවති නොයෙක් පණත් එක් කොට සමස්ත තනි පණතක් පැනවීම හෝ විවිධ පණත් යටතේ එන අධිකාරී කෙරෙහි බලපෑම තනි අධිකාරියක් පිහිටුවීම හෝ යල් පැන ගියාසේ පෙනෙන පණත් වෙනුවට අංග සම්පූර්ණ නව පනතක් හෝ නව අදහස් හා අවශ්‍යතාවයනට අනුව අනුරූප වනසේ පොදු ආයතන අළුතින් ස්ථාපනය කිරීම යනාදි වශයෙන් මෙසේ පසුගිය අවුරුදු තුන හතරක කාලය තුළ දී නීති රැසක්ම බිහිවිය. ගවයින් නිදුල්ලේ හැසිරීම (1876) ගවයින් හංදි ගැසීම, විකිණීම හා හුවමාරු කිරීම (1898) හා මී හරකුන් ආරක්ෂා කිරීම (1920) යන පණත් වෙනුවට එක්කොට පැනවූ සත්ව පණත (1958) පමණක් මීට ව්‍යාතිරේකයක් වශයෙන් සැලකිය හැකිවේ.

කෘෂිකාර්මික ඵලදැවර්ධන නීතිය (1972), පතල් හා බණිජ ද්‍රව්‍ය පණත (1973), තට්ටු නිවාස හිමිකම් හා පොදු පහසුකම් මණ්ඩල පණත් (1973), ශ්‍රී ලංකා තේ මණ්ඩල පණත (1975), පොල් සංවර්ධන නීතිය (1975), කුඩාතේ ඉඩම් සංවර්ධන නීතිය (1975), සාමූදික කලාප පිළිබඳ නීතිය (1976), ඉඩම් ප්‍රතිසංස්කරණ ගාස්තු නීතිය (1976) මෙසේ පැන වූ නීති අතර වේ. විද්‍යාත්මක ශිල්ප ක්‍රම, සංරක්ෂණ හා ක්‍රමවත් භාවිතය යනාදි අංග කෙරෙහි අවධානය යොමු කිරීම නිසා දැනට ලොව හටගෙන ඇති පරිසර ආරක්ෂණයේ අවශ්‍යතාවයේ බලපෑම පැහැදිලිවම දැනී ඇති බව මෙම නීති දෙස බැලීමේ දී පෙනේ. වෙරළ සංරක්ෂණය පිළිබඳ කෙටුම්පත් නීතියක් දැනට ඉදිරිපත් වී ඇති අතර මෙය අනාගතය දෙසට තබන ලද තවත් ඉදිරි පියවරක් ලෙස සැලකිය හැකි වනු නොඅනුමානය. කෙසේ වෙතත් බොහෝ වූ නීති නිබුණත් ඒවායින් අදහස් කළ කාර්ය ඉටු කරගැනීම සම්බන්ධයෙන් ඇති ආයතනික සංවිධානය සම්බන්ධයෙන් තවමත් එතරම් සැලකිල්ලක් යොමුව නැති බව පෙනේ. පරිසරය පිළිබඳ වෙනම දෙපාර්තමේන්තුවක් හෝ මණ්ඩලයක අවශ්‍යතාව මෙහි දී වැදගත් ය. පරිසරය පිළිබඳ දෙපාර්තමේන්තුවක් බිහිකිරීම ස්වභාවයේ පිහිටුවූයේ ද 1970 වර්ෂයේ දී බව සිතන විට මෙවැනි පරිසර ආයතනයක් පිහිටුවීමේ ලා අප එතරම් ප්‍රමාද වී ඇතැයි කිව නොහැකි ය.

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இலங்கையின் சுற்றுடலில் நிலவும் அசுத்த நிலைகளின் சில சிந்தனைகள்

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மக்களின் பெருக்கம் சுற்றுடலைத் தாக்குவதிலுலும், மனிதன் நீர் நிலைகளையும், நிலத்தினையையும் நெறி தவற நிர்வகிப்பதிலுலும் அசுத்தத்தன்மை உண்டாகி றது. இதனை நாம் விவசாயத்துறையில் காண முடிகி றது. புதிய குறைகளைப் பயன்படுத்தி அதிக செயற் கைப் பசளைப் பாவிப்பினுல் நிலமும் நீரும் அசுத்த மடைகின்றன. இதுமட்டுமன்று, கழிவுப் பொருட்களை அழிப்பதிலும், மலசலக்கழிவுகளை அகற்றுவதிலும் உள்ள பிரச்சனைகளுமுண்டு. கிராம மக்கள் படிப்படியாக பட் டினத்திற்கு சென்றுவாழத் தலைப்பட்டதினுல் மலசலக்க ழிவுப் பிரச்சனை அதிகப்பட்டிருக்கிறது. புதிய தொழில் நுட்பமுறைகளைப் பாவித்து கொள்வதிலுலும் தொழில் ஆலைகளிலிலிருந்து பெறப்படும் கழிவுகளை நிலத்தில் புதைப்பதிலுலும் நிலம், நீர், காற்று என்பவைகள் அசுத் தமாக்கப்படுகின்றன.

இலங்கையின் அசுத்த நிலைபற்றிய புள்ளிவிபரத் தக வல்கள் மிகக் குறைந்தளவு தான் கிடைக்கிறது. இலங்கை மற்றைய நாடுகளிலும் பார்க்க இந்த விஷயத் தில் குறைவாக இருந்தாலும், இங்கும் அசுத்தநிலை மக் களின் வாழ்க்கையில் தாக்கப்பட்டிருக்கிறது என்பதில் ஐயமில்லை. இந்த நிலைமையை நாம் ஒரு கட்டுப்பாட் டுக்குள் கொண்டுவந்தாலொழிய மீட்க முடியாத சுற்று டலின் மாற்றங்களால் இந்நாட்டின் தாவர உலகிற்கு பேராபத்து ஏற்பட்டுவிடும்.

காற்று அசுத்தம்

சுவாசிக்கும் காற்று மண்டலம் அசுத்தடைவதற்கு முக்கியமானவை பின்வருமாறு. எரிபொருள்களிலிருந்து எழும் புகைமண்டலம், தூசிகள்-சீமந்து ஆலைகளிலிருந்து எழுவன; பெற்ரோல் சுத்தகரிப்பு, வடி ஆலைகளிலிருந்து எழும் கெந்தக வாயுக்கள்; காபன் மொன ஒக்சைட், நைதரசன் இரு ஒக்சைட் வாயுக்கள்; இவைகளினுல் உருவாகும் நச்சு வாயுக்கள் முக்கியமாக மோட்டார் வாகனங்களிலிருந்து எழும் வாயுக்கள்; கொஸ்டிச்சோடா உற்பத்தி நிலையத்திலிருந்து வெளியேற்றப்படும் முதலாம் மகாயுத்தத்தில் நச்சுப்புகையாகப் பாவித்த குளோரின் வாயு என்பன வாகும்

இவைகளில் அதிகமாக நச்சு வாயுக்களை, நச்சுப் புகைகளை, அவ்வத் தொழிற்சாலைகள் தொழிலாற்றும் தொழிலாளிகளின் ஆரோக்கியத்திற்காகக் கட்டுப்பாட் டுக்குள் கொண்டுவரப்பட்டாலும், வெளிப்பரப்பில் தெருக்களில் செல்லும் போக்குவரத்துப் பஸ், லொறி கள் கக்கிச்செல்லும் கரிப்புகைகளும், எரி புகை மண்ட லங்களும் நல்ல பவனத்தினை அசுத்தமாக்கின்றன. இத் துடன் ரசாயன உற்பத்தி ஸ்தாபனங்கள் தங்கள் உற் பத்தியை இருமடங்காகக்கக் கங்கணம் கொண்டிருக்கும் பொழுது வெளியே காற்றில் விடப்படும் குளோரின் வாயுவைப்பற்றிச் சிந்திக்கவேண்டும்.

நீர்நிலை அசுத்தம்

பசளையிட்ட வயல், தோட்டங்களிலிருந்து வழிந்து வடிகால் மூலம் வெளியேறுகின்ற கழிவுநீர் ஆறு குளங் களை அடைகிறது. இக்கழிவு நீரில் நைதரசன் பாதிக் கப்படுகிறது. நீரின் மேல்பரப்பில் நுண்கிருமிகளின் தாக்கத்தினுல் நைதரசன் நைரேற்று உப்பாக மாறி அல்காக்கள் (Algae) வளர உணவளிக்கிறது. இதனுல் அல்காக்கள் வளர்ந்து படர்ந்து நீரின் மேற்பரப்பை மூடிக் குளங்களை அசுத்தப்படுத்துகிறது. இந்த அல்காக் கள் இறந்துபடுகின்ற நேரத்தில் சிதை வடைந்து நீரி லுள்ள பிராணவாயுவாகிய ஒக்ஸிசினை முற்றுகப்பா வித்துவிடுகின்றன. இதனுல் அந்நீரில் வாழ்ந்த மீன் போன்ற உயிரினங்கள் சீவிக்கமுடியாமல் இறந்து விடு கின்றன. இறுதியில் இறந்த உயிரினங்களிலிருந்து சகிக் கமுடியாத துர்நாற்றம் எழுந்து பவனத்தைப் பாழாக் கிறது.

இலங்கையிலுள்ள, காசில்ரீக் (Castlereagh) குளம், மஸ்கலியா (Mousakelle) குளம் என்பவைகள் ஏற் கனவே மேலே கூறிய வாறு மோசமான அசுத்த நிலைமையை அடைந்துவிட்டன. இத்துடன் கொழும்பு பேரா (Beira) குளம், கண்டிக்குளம், கிரகரிக் குளம் (Lake Gregory) என்பனவும் பலகழிவு நீருடன் மனித மலசலக் கழிவையும் பெறுவதால் மிக்க கெடுதியான நீர் அசுத்தத்தைக் கொண்டுள்ளது.

கிருமிநாசினிகள்

அதிக கிருமிநாசினிகளை சிலதரவு முறைகளில் கையாண்டு பாவிப்பதிலும் சில கெடுதியைக் கொடுக் கும் மாற்றங்கள் காணப்படுகின்றன. கட்டுப்பாடுக் கமைய, பாதுகாப்புடன் கிருமிநாசினிகளைப் பாவிப்பதி னுல் காய்கறிவகைகளும் கிருமிநாசனியின் நச்சுத்தன் மையைப் பெறுகின்றன. சாதாரண தோட்டக்காரர் கிருமிநாசனியைப் பாவிக்காமல் வளர்க்கும் காய்கறிக ளுடன் ஒப்பிட்டுப்பார்த்தால் இது தெளிவாகும். உதா ரணத்திற்கு, இலங்கையர் ஒருவர் சர்வதேச பயிற்சி நிலையத்தில் பரிசோதனைக் கூடத்தில் கிருமிநாசனிகளில் பயிற்சிபெறச் சென்றிருந்தார். அவரின் இரத்தத்தைப் பயிற்சி முடிந்தவுடன் பரிசோதித்ததில் மற்றவர்களின் இரத்தத்திலும் பார்க்க இவர் இரத்தத்தில் டி. டி. ரி அளவு மிகக் கூடுதலாக இருந்ததாக அறிவிக்கப்பட்டுள் ளது. எனவே இதைப்பற்றியும் நாம் சிந்திக்கவேண்டி யிருக்கிறது. கிருமி நாசினியைப் பாவிக்காமல் தாவர நுண்கிருமி இயல்பின் சாதனையினுல் தென்னைமரத்தினை அழித்துவந்த "பிரமிக்கோதிகா குமிங்கி" (Promecotheca Cumingii) என்ற கிருமி வர்க்கத்தை அகற்றியவர்களைப் பார்க்கும் பொழுது அவர்களின் சாதனைக்கு நாம் நெஞ்சார வாழ்த்துக்கள் தெரிவிக்கவேண்டியவர்களாகி றோம்.

தொழில்கூடக் கழிவு நீரும், கழிவுப் பொருட்களும்

திறந்த நீர் பரப்பையும் கடலையும் பலகாலமாக, கழிவுநீரைக் கடத்துவதற்கும், கழிவுப் பொருட்களை அகற்றுவதற்கும் குப்பைத் தொட்டியைப் போல் பாவிக் கப்பட்டு வருகின்றோம். இதனை பிரத்தியட்சகமாக கொழும்பு மாநகர் வெள்ளவத்தை கழிவுநீர் செல்லும் வாய்காலில் காண்கிறோம். இக்கால்வாயில் சிறு குடிசை

கல் வசிப்போரின் கழிவுகளும், மாநகரின் கழிவுநீர்க ளும், சேதனப்பொருள் நிறைந்த (பால், பழம், நெசவு ஆலைகளிலிருந்து அகற்றப்படும்) கழிவுநீர்களும் சங்கமப் பட்டு கடலில் விழுகிறது, இக்கால்வாயில் சங்கமப்படும் சகல கழிவுநீர்கள், நுண்கிருமிகளை வளரச் செய்கிறது. இதனால் நீரிலுள்ள முழுப் பிராணவாயுவும் உறிஞ்சப் படுகின்றது. இத்துடன் கடல் தண்ணீர் வாய்க்கால் நீருள் புகுகின்றது. கடற்தண்ணீரில் உள்ள சல்பேற் உப்புக்கள் நுண்கிருமிகளின் தாக்கத்தினால் பாதிக்கப் பட்டு மிகவும் சகிக்கமுடியாத ஐதரசன் சல்பைட்'' என்ற துர்நாற்றத்தைக் கொடுத்து அதன் பக்கலில் வசிக்கும் மக்களுக்கு துன்பதையும், நோயையும் பவன அசுத்தத்தையும் கொடுக்கின்றது.

களனி ஆற்றில் ஓடும் தண்ணீரைப்பற்றி படித்ததில் இறுதிச் சில மைல் களுக்கப்பால் தூரத்திலிருந்தே தண் ணீர் கழிவு நீர்கள் கலப்பதினால் அசுத்தமடையப் பெற் றிருக்கின்றது. பல தொழில்நிலையக் கழிவுநீர்களும், பட்டின மலசலக் கழிவுகளும் இந்த ஆற்றில் சங்கமப் படுகின்றன. இந்த ஆற்றுநீர் பகுதியில் அடிக்கடி மீன் கள் அழுகிப்போவதும், அசுத்தநிலை கூடுவதும் (முக்கிய மாக தொழிற்சாலைக் கழிவுநீரினாலும், பெற்ரோலிய எண்ணெய்க் கழிவுகளினாலும்) ஏற்படுவது சரித்திர உண் மைகள்

பரிசோதனைக் குறிப்புகளைச் சேகரித்துப்பார்த்ததில், இப்பொழுது அசுத்தடைந்து வரும் நிலை நீடிக்குமாகில், களனி ஆற்றுநீர், ஒரு சில வருடங்களுள் இந்நாட்டில் இந்த நீரைவிட மிகவும் அசுத்தமடைந்த நீர் வேறெறன் றுமில்லை என்ற கெடுதியாக நிலைக்குவந்துவிடும் என்கி ரூர்கள். இத்தோடு, தற்சமையம் கொழும்பு மாநகரின் குழாய் நீர், களனி நீரிலிருந்தும் பெறப்படுகின்றது. அடிக்கடி கொழும்பு குழாய்நீரைப்பரிசோதித்ததில், பேதி வியாபதி, நெருப்புக் காச்சல், கெப்பரைட்டிஸ் வைரஸ், போன்ற கிருமிகளும், கூடாத பக்ரீரியா கிருமி களும் காணப்படுகின்றன.

இதைவிட மிகவும் மனத்தாங்கலான விஷயம் என்ன வென்றால், தொழில் சாலைகள் நிறுவும்பொழுது கழிவு நீரைச் சுத்தகரிக்கும் சாதனப் பகுதி இயந்திரங்கள் தருவித்தலுண்டு. அங்ஙனம் தருவித்த சாதன இயந்தி ரங்கள் பலகாலமாகத் அத்தொழிற்சாலைகள் தொடங்கி நடந்தும் தொழிற்சாலைக் கழிவு நீரைச் சுத்தி கரிக்கப் பாவிக்கப்படாமல், நிறுவப்படாமல் வெளியிலும் மழை யிலும் கிடைந்து பாழடைகின்றன. இதே நேரத்தில் தொழிற்சாலைப் பக்கலில் வாழும் மக்கள், துர்நாற்றம் கொடுக்கும் கழிவுநீரினால், தாங்கள் பாவிக்கும் குடிநீரை அசுத்தத்துடன் குடித்தும், தங்கள் பயிர்வர்க்கங்கள் பலன் கொடுக்காமல் மடிவதையும் பார்த்துத் துன்பப் படுவதை யார் கவனிக்கிறார்கள்.!

இன்னும் இலங்கையில் சில இடங்களில் பல வித மான அசுத்த நிலைகளும் சுற்றுடலும் இருக்கின்றன. அவைகளைப் பற்றிய தகவல்கள் அறியப்பட இருக்கின் றன. தற்பொழுது அசுத்த நிலை காரணமாக வரும் கால தீங்குகளை அறிந்து ஆவன செய்ய சிறு பிரயத்த னம் தான் சுற்றுடலசுத்தபடிப்புகளில் காட்டப்பட்டிருக் கின்றது. சுற்றுடல் அசுத்த நிலையைப்பற்றி நன்கு கற்று அதனை அறிந்து இந்த நாட்டு மக்களுக்குக் கூறக் கூடியவர்கள் விஞ்ஞானிகள் தாம். அவர்கள் ஆற்ற லால்த்தான் அசுத்தநிலைகளின் தீங்குகளையும், நிவார ணங்களையும் அவர்கள் மக்கள் முன்னிலையில் சமர்ப் பிக்க முடியும். இதனால் மக்கள் வேண்டிய நடவடிக் கைகளை எடுத்து சுற்றுடலை நல்ல சுத்தமாக வைத்து வாழ்வார்கள். இயற்கையையும் தங்களுக்கு நன்மை பயக்க வழிவகுப்பார்கள். இதனால் வரும் சந்ததியும் நன்கு வாழும்.

A Conservationist's Lament

The world is finite, resources are scarce,
Things are bad and will be worse.
Coal is burned and gas exploded,
Forests cut and soils eroded.
Wells are dry and air's polluted,
Dust is blowing, trees uprooted.
Oil is going, ores depleted,
Drains receive what is excreted.
Land is sinking, seas are rising,
Man is far too enterprising,
Fire will rage with Men to fan it,
Soon we'll have a plundered planet.
People breed like fertile rabbits,
People have disgusting habits.

Moral :

The evolutionary plan,
Went astray by evolving Man.

The Technologist's Reply

Man's potential is quite terrific,
You can't go back to Neolithic.
The cream is there for us to skim it,
Knowledge is power, and the sky's the limit.
Every mouth has hands to feed it,
Food is found when people need it.
All we need is found in granite,
Once we have the men to plan it.
Yeast and algae give us meat,
Soil is almost obsolete.
Men can go to pastures greener,
Till all the earth is Pasadena.

Moral :

Man's a nuisance, Man's a crackpot,
But only Man can hit the jackpot.

(*from Vidya*)

VIDU 1-3-18

news

Awards

- **Honours for Scientists who serve their Communities**

Scientists from Sri Lanka, Ghana and Tanzania were honoured with Guinness Awards for Scientific Achievement in recognition of their work in applying science to the service of the community.

These new awards are in recognition of individual or institutional achievement in the application of science and technology in the service of the community, in a developing country, for example, for a demonstrated achievement with great potentialities such as in satisfying basic human needs of food, health, shelter, education or work. The awards are given also for work done whose importance lies in its potential application by other developing countries.

Nominations for awards are accepted only from developing countries in the Commonwealth i.e. from all Commonwealth countries, excluding Australia, Canada, New Zealand and the United Kingdom. The awards scheme is administered in close collaboration with the Commonwealth Science Council and its national member organisations.

The awards, to be made every two years for up to three achievements, are from a special trust fund set up by Guinness Overseas Ltd; and replace the Guinness Science Awards last made in 1975. Each award winner i.e. up to three biennially, will receive £1000 and a medal and will be consulted on making a tour, normally to be undertaken within six months of receiving the award. The cost of the tour will be separate from the award. The aim is to ensure that the achievement receives the necessary dissemination.

This year's award winners are:

Dr. F. I. D. Konotey-Ahulu, of Ghana, for research into sickle-cell disease, a hereditary ailment which is a public health problem in West Africa. Dr. Konotey-Ahulu's work, combining the treatment of patients with an extensive programme of clinical and social research, has been widely documented, and has contributed to a much increased understanding of the disease and its containment.

Dr. R. O. B. Wijesekera of Sri Lanka, working within the Ceylon Institute of Scientific and Industrial Research, has over the past ten years built up a unit to study and develop the extraction of essential oils and aromas from plants—notably cardamom, citronella and cinnamon, of which Sri Lanka is the world's leading producer. The results have contributed to international scientific knowledge, built up an indigenous technology, and upgraded the techniques available to spice producers at village level, who are already finding firmer markets for their improved products.

The East African Community's Tropical Pesticides Research Institute, in Arusha, Tanzania, has over many years built up a range of techniques for controlling tsetse fly, mosquitoes and snails, all of which in East Africa are carriers of diseases that do incalculable damage both to humans and to livestock. The Institute has also made discoveries and developments in the control of weeds, birds and fungal diseases of plants. The work ranges from basic scientific study of organisms to the development of new spray nozzles, and is directly relevant to improving living standards in rural Africa.

- **Royal Society ESSO Award for the Conservation of Energy, 1977**

The Commonwealth Science Council has been directed by the Council of the Royal Society to invite nominations for the 1977 Royal Society ESSO Award for the Conservation of Energy.

The Award was instituted in 1974 for outstanding contributions to the advance of science or technology leading to the more efficient conversion or use of any form of energy, and consists of a gold medal and a prize of £1000. It is normally made annually, the selection being made by the Council of the Royal Society which will receive advice from a specially appointed Committee.

The 1976 award was given to Mr. T. B. Jackson, National Sales Manager of the Commercial Division of Honeywell Limited, England, for his contribution in the development of a building heating control system which has achieved notable fuel savings in applications to industrial, commercial and similar large buildings' thermal characteristics and calculates the heating time necessary to achieve the desired level of warmth; it also computes optimum shut-down time to accommodate the building's characteristics in the night time and week-end cooling situations.

The National Science Council of Sri Lanka has been invited to send nominations of suitable candidates so as to reach the Commonwealth Science Council, London by 31 January 1977 at the latest. More information on the above Award is available at the National Science Council.

VIDA 1-3-19

Symposia and Conferences

● SYMPOSIUM ON THE HUMAN HABITAT OF SOUTH ASIA 11-14 February, 1976

A symposium on the human habitat of South Asia was held in February 1976 in Chandigarh, the capital of Punjab State. The conclusions contained some pointers for the UN Conference on human settlements held in Vancouver.

The rural habitat of the countries of South Asia like the Indo-Pakistan sub-continent, **Sri Lanka**, Indonesia, Burma and Afghanistan are very similar. There is widespread poverty and a lack of hygiene in the villages, with a paucity of basic services such as clean water supply and sanitation. The pollution caused by squalor is starkly revealed; that caused by growth—e.g. noise and air pollution—is also starting to make inroads.

It was a multi-disciplinary meeting. 85 specialists in pollution, architecture, social sciences, administration and politics participated in the three day seminar. The participants were taken to various villages to study problems on site.

The symposium identified the following priority areas:

- ground-water development
- public health and sanitation
- low-cost housing
- land development and soil erosion
- deforestation
- rural employment
- a good communications network

A series of long and short term measures were proposed for India.

—The setting up of a Habitat Conference of Punjab to tackle the problem of habitat at all levels, rural and urban in an integrated fashion.
—Each state should ensure safe drinking water in every village within five years.
—Prototypes are necessary for physical development of the entire hierarachy of settlements from farm houses to metropolitan centres.
—The Indian Government should form a Ministry of Environment and Human Settlements. There should also be habitat forums at the district levels to solve those local problems not involving high level technology.

● HABITAT: UNITED NATIONS CONFERENCE ON HUMAN SETTLEMENTS, VANCOUVER, CANADA, 31 May—11 June 1976.

Habitat was the largest of the international conferences convened under the auspices of the United Nations to awaken world attention to the gravity of the problems concerning human settlements.

It is now much clearer after Habitat, that human settlement issues are not really about housing and technology, but politics and social change. They are basically issues of the organisation and structure of societies, and can only be solved by reforms and new initiatives within each society at the local and national, level. Policies for human settlements must be integrated at every level with all other aspects of national development planning. If national societies are to stop the chaotic growth of cities, and if people are to recapture control over their environment, proper land-use planning for community needs will be absolutely essential.

A group of world experts including Maurice Strong, Barbara Ward, Margaret Mead and Buckminister Fuller issued a special statement that "certain priorities must be met" among them:

- Clean water,
- Community control of land and unearned increments,
- a moratorium on nuclear-power generation,
- respect for man's environmental endowment,
- the monitoring and preservation of the life support systems of the biosphere.

Urbanists, the most numerous and vociferous at both the government conference and the forum, accepted the growth of Third World cities as inevitable, and concentrated on arguing for the creation of the necessary infrastructure to cope with rural-urban migration. On the other hand, ruralists like **Chandra Soysa,** Director of the Marga Institute in Sri Lanka, argued that globally most households (561 million out of 916 million) are rural, and no fewer than 410 million of these are in developing countries. The task before us, he said, is to raise the minimum standards of life and labour in rural areas to make them sufficiently attractive to stem migration to the cities.

Some of the important recommendations of the conference were:

—An international agency must be established to deal with human settlement problems, and there should be an international fund for housing the world's people and improving the basic services and quality of life in human settlements.

—Efforts should be made to bring all building materials into commodity arrangements similar to those in existence under UNCTAD agreements.

—Political action by communities is ultimately the the best way of securing the skills of citizenship and self determination necessary to improve human settlements on a long-term basis and to ensure access to the resource delivery system.

Commonwealth Science Council

The ninth biennial meeting of the Commonwealth Science Council hosted by the Sri Lanka Government and organized by the National Science Council was held in Colombo from the 29th November to 10th December 1976. The Secretary-General of the National Science Council, **Dr. G. C. N. Jayasuriya,** was the Chairman of the C.S.C. The Secretary to the CSC is Mr. D. G. Thomas, an Agricultural Botanist from Australia's CSIRO. Thirty six delegates from seventeen countries participated at this meeting: Australia, Bangladesh, Britain, Canada, Cyprus, Fiji, Guyana, India, Kenya, Malawi, Malaysia, New Zealand, Nigeria, Sri Lanka, Tanzania, Trinidad and Tobago and Zambia.

Mr. T. B. Subasinghe, Minister of Industries and Scientific Affairs who inaugurated the meeting said that Science by its very nature, is and must be an international activity.....while we struggle to better the human conditions of our own people, we are aware of and convinced of the necessity for international co-operation, particularly in the field of scientific research and the interchange of technical know-how not only in our own interest but in the interest of science itself and the future of humankind.

The Chairman, **Dr. G. C. N. Jayasuriya,** in his Report said "We are now at the stage when the ground work has been done and are ready to launch a programme of collaborative projects from which each member country can benefit in some measure or another. But the onus lies on members to define the areas in which their respective countries can and wish to participate. There is obviously some distance to go before we can confidently state that the approach adopted is successful, as we must first prove this by pursuing and undertaking the operational phases of our first few projects....."

"It would be unrealistic of CSC to work under the assumption that the Council can operate entirely independently and free from normal inter-governmental linkages without losing some substantial benefits. Unless we work closely with the recognized channels of governments, we shall not be able to comply with our wish to ensure that scientific and technological considerations are taken full account of in all areas of national development. We must maintain our position as the leading Commonwealth body that can offer the only collective expert view in this vast and all pervading field....

"The need to encourage the development, under certain circumstances, of simple technologies based on long-established rural crafts and on labour intensive methods is real and urgent. Under other circumstances, it may be necessary to make use of more sophisticated technologies to ensure that an industry can be viable and reach the essential standards of product and production.....

"The CSC, very conscious of the various situations and the alternatives required to be selected for any given situation, considers that the essential element is to build up the national capability in science and technology so that the appropriate choice of technology can be made, and that there is a full awareness of industry's technological and managerial requirements. The programme now being developed by the Council is a reflection of this viewpoint....."

Three seminars were held on subjects of current concern to members.

(1) The Role of Infrastructure in Rural Community Development.
(2) International Activities in Science and Technology
(3) Alternative Energy Resources and their potential in Rural Development.

George H. Franklin, Physical (Land-Use) Planning Adviser, Ministry of Overseas Development, U.K. gave the keynote address at the Seminar on the Role of Infrastructure in Rural Community Development. He said that rural development cannot be discussed realistically apart from urban development. The problems resulting from unplanned and too-rapid urban growth could be reduced if greater attention was paid to the needs and potential of rural areas where, in spite of large-scale rural-urban migration, rural populations continue to increase.....Successful rural development must be based on increased agricultural production of all kinds, but other action is needed if the sense of neglect and isolation experienced by rural populations is to be eliminated.

"The Needs and Priorities for International Co-operation in Science and Technology" was the subject of the lead paper by **Maurice Goldsmith,** Director of the Science Policy Foundation, London at the second seminar. He said that "to assess the effectiveness and coverage of S & T aid presents great problems because the Commonwealth is a group of countries diverse geographically and non-homogeneous politically socially and culturally each country asks different questions about effectiveness of S & T aid..... If the developing countries are to become technologically independent, they, too must develop their own source of innovations, including an indigenous R & D system which is linked to the productive system. It can serve a second purpose, that is the adaptation of existing, technologies to make them more appropriate"

Norman L. Brown, of the office of International Affairs, Energy Research and Development Administration, Washington speaking on "Alternative Energy Resources and their Potential in Rural Development" said that "The energy situation in the developing countries is desperate—and not growing any easier....The LDC's have two distinct energy needs. On the one hand, industrial growth is dependent on conventional urban energy systems that use commercial energy sources and technologies that are already in use or are being developed in the industrialized countries....

On the other hand, the majority of the population in most LDC's living in the rural areas, is isolated from central power distribution. They would therefore particularly benefit from development of technologies to exploit renewable energy resources of the sun, wind and and flowing water. . . . "

A special session was devoted to the future of CSC, and particularly to its relationship with the Commonwealth Secretariat. The Council approved a draft memorandum of understanding as a first step towards closer integration with the Commonwealth Secretariat. Collaborative projects in food preservation and storage, the exchange of information between member countries and the communication gap between research institutions and users are also matters to which Council will continue to direct its attention.

The tenth meeting is to be held in Georgetown, Guyana in August or September in 1978. The new Chairman of the CSC is Dr. Patrick Munroe, Secretary-General of the National Science Council of Guyana.

- **32nd ANNUAL SESSIONS OF THE SRI LANKA ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE: 7th—11th December.**

The thirty second annual session of the Sri Lanka Association for the Advancement of Science was opened by Mr. Pieter Kennemann, Minister of Housing and Construction at the Arts Theatre, University of Sri Lanka, Colombo Campus.

The General President, Mr. Justin Samarasekera delivered his presidential address on the theme of this year's session:- Physical Planning.

The Chief Guest was **Professor O. H. Koenigsberger,** Emeritus Professor of Development Planning of the University College, London School of Environmental Studies. Prof. Koenigsberger addressed the SLAAS on the "UN Habitat Conference at Vancouver—its significance for Sri Lanka".

Some of the decisions taken at the conference would help a developing country like Sri Lanka, he said. Environmental pollution had become a big problem to the rich industrialized countries and this should not happen to the developing countries. It was to prevent environmental pollution that development in developing countries should be planned on ecological lines.

The Vancouver conference laid down lines for city planning and traffic control. It was to the advantage of Sri Lanka to plan the development of cities bearing in mind the future control of traffic.

Another highlight of this year's programme was the opening of the new SLAAS headquarters at Wijerama Mawatha.

Attending the sessions this year were delegates representing sister Associations in Britain, Japan, USA, USSR, Nigeria, India and the People's Republic of China.

Forthcoming symposia & Training courses

- **6th to 12th February 1977**
  Third Asian Symposium on Medical Plants and Spices —ASYMPS-3
  Venue: Sri Lanka Foundation Institute, Colombo.

This International Seminar is being organized with the joint collaboration of the National Science Council, UNESCO and the Sri Lanka Foundation Institute. The seminar will be followed by a Workshop and an Exhibition. The Workshop will be held in the University laboratories at Peradeniya and the Symposium is to be held at the Sri Lanka Foundation Institute in Colombo. An exhibition of Medicinal Plants and Spices will be organized at the Bandaranaike Memorial Ayurvedic Research Institute, Nawinna.

The purpose of the Symposium is to give an over-all picture of the research carried out in Asia on Medicinal Plants and Spices from the botanical, Phytochemical and pharmacological points of view.

A limited number of research workers are invited after application to participate in a training course on methods for phyto chemical, microbiological and pharmacological screening of plant material. This training course which will be led by Prof. Finn Sandberg University of Uppsala, Sweden-will take place immediately before the Symposium, from 31 January to 5 February 1977.

- **1 — 29 March 1977**
  AN INTERREGIONAL TRAINING COURSE ON NUCLEAR TECHNIQUES FOR CHEMICAL RESIDIUES AND POLLUTION PROBLEMS, SRI LANKA.

12 qualified graduates from countries in this region of the world and about 10 from Sri Lanka will be selected to attend this course which will be conducted by Prof. K. Buchtela of Vienna, Prof. F. P. W. Winteringham of the IAEA and FAO, Prof. E. P. Lichtenstein of the USA, Prof. A. Benakis of Geneva and Dr. Granville Dharmawardena of the Radio Isotope Centre.

Nuclear techniques provide powerful, often unique and extensively used tools in all advanced laboratories

concerned with chemical residue (especially pesticide residue) and pollution problems. There are many serious food and environmental quality and resource protection problems of the Far East Region and agro-climatically similar countries in which nuclear techniques would be of considerable value in their identification, study and eventual control. For example, pesticides are very extensively used for the control of pests of vital rice crops and there are many associated pesticide residue problems which effect the quality of the rice and its acceptability in international trade. Intensive agricultural practices can also result in the undesirable loss of vital soil organic nitrogen reservoirs leading to increasing dependence upon artificial fertilizers and potential problems of water pollution and eutrophication.

Three similar courses held earlier in Vienna, Sao Paulo and Cairo, have been very successful and drew the interests of the developing countries. The proposed course in Sri Lanka will complement geographically to these three courses.

Apart from training, the course is designed to strengthen the facilities available at the Radioisotope Centre, so that it can provide further training, advisory and research services.

● SCIENTISTS IN THE NEWS

Dr. A. A. Leslie Gunatilaka of the Department of Chemistry, Peradeniya Campus attended the 10th I.U.P.A.C. (International Union of Pure and Applied Chemistry) Symposium on the Chemistry of Natural Products held at the University of Otago, New Zealand on an invitation extended by the Royal Society of New Zealand. During this tour he was also invited to attend a Workshop on the Biosynthesis of Natural Products held at the Australia National University under the auspices of the Australian Government and the South East Asian UNESCO. He was also a Guest Lecturer at the 'Regional Training Programme in Synthetic Chemistry' organised by the Mahidol University, Bangkok, Thailand in collaboration with UNESCO.

● INAUGURATION OF THE NATIONAL ACADEMY OF SCIENCES

The National Academy of Sciences was formally inaugurated by the Minister of Housing and Construction, Mr. Pieter Keuneman at the New Arts Theatre.

Mr. Keuneman in his address said that the SLAAS had done a great deal of work during its 30 year existence. The establishment of the Academy of Sciences was a natural development of a process which began three decades ago. Of course it would take time for this new Academy to reach the standards of those in other countries but he was sure that much could be achieved because he was aware of the capabilities of our scientists. Mr. Keuneman said he was happy that the Academy was an independent body, which he hoped would apply science and technology to solve the many problems which the country faced today.

Mr. Justin Samarasekera, President of the SLAAS, said that the Academy of Sciences would be composed of distinguished and eminent scientists who would be available to address their minds to the wider problems affecting the nation's development.

The President-elect of the National Academy of Sciences, Dr. W. R. N. Nathaniel proposed the vote of thanks.

Unesco's Man and the Biosphere programme (MAB)

Man and the Biosphere, the name itself evokes the complex web of interacting elements contained in the thin layer of soil, water and air surrounding our planet to which life is confined. The total extent of these interactions and interrelationships has only recently begun to be understood and was largely ignored by the traditional, specialized approach to scientific research. The vital problem, today, is to prevent the pressure of the ever-increasing population from causing irreversible damage to the environment and destroying irreplaceable resources on which mankind depends.

Unesco's Man and Biosphere Programme (MAB) represents a new integrated approach to research, training and action aimed at improving man's partnership with the environment. MAB seeks to break down the obsolete barriers between natural scientists, human and social scientists and decision makers and offers instead an interdisciplinary, problem-orientated approach to the management of natural and man-modified ecosystems. Regional and global solutions must be found for problems formerly tackled only within the national context. MAB proposes a systems approach based on the co-operative efforts of countries sharing problems under comparable ecological conditions.

The general objective of Unesco's Man and the Biosphere Programme is:

".....to develop within the natural and social sciences a basis for the rational use and conservation of the resources of the biosphere and for the improvement of the relationships between man and the environment; to predict the consequences of today's actions on tomorrow's world and thereby to increase man's ability to manage efficiently the national resources of the biosphere."

The MAB Programme consists of a number of projects with global or regional impact. The objectives of these projects are:

- To identify and assess the changes in the biosphere resulting from man's activities and the effects of these changes on man,

- To study and compare the structure, functioning and dynamics of natural, modified and managed ecosystems,
- To study and compare the dynamic interrelationships between 'Natural' ecosystems and socio-economic processes and especially the impact of changes in human populations, settlement patterns and technology on the future viability of these systems,
- To establish scientific criteria to serve as a basis for rational management of natural resources,
- To establish standard methods for acquiring and processing environmental data,
- To promote the development of simulation and other techniques of prediction as tools for environmental management,
- To promote environmental education in its broadest sense and encourage the idea of man's responsibility for and personal fulfilment in partnership with nature.

MAB was officially launched in 1970 at the 16th session of the General Conference of UNESCO and the broad outlines of the programme were established in November 1971 at the first session of the MAB International Coordinating Council which proposed 13 project areas for co-operative research. A 14th project, on environmental pollution was added at the 18th session of the General Conference in 1974.

The Way MAB Works

The MAB International Co-ordinating Council ... consists of scientific representatives from 25 nations, selected every two years by the UNESCO General Conference, along with representatives from appropriate UN and non-governmental organizations. Unesco provides the Secretariat.

In each country a National Committee defines and organizes research activities on particular national problems which relate to the international programme. Special working groups and expert panels are set up by the Council to co-ordinate national contributions and to define international core programmes ensuring that compatible methodology is used for the various projects. Thus, countries work together on a series of problems of common concern so as to provide comparable results capable of generalization and synthesis.

Some of the Major MAB Project Areas.

—Ecological effects of increasing human activities on tropical and sub-tropical forest ecosystems.

—Ecological effects of human activities on the value and resources of lakes, marshes, rivers, deltas, estuaries and coastal zones.

—Ecology and rational use of island ecosystems.

—Conservation of natural areas and of the genetic material they contain.

—Ecological assessment of pest management and fertilizer use on terrestial and aquatic ecosystems.

—Effects on man and his environment of major engineering works.

—Research on environmental pollution and its effect on the biosphere.

The activities of the MAB Programme in Sri Lanka are administered by a National Committee with **Professor B. A. Abeywickrema** as Chairman. The five sub-committees under it are in charge of the following different aspects:-

(1) Forestry and Forest Ecology

(2) Environmental Pollution and Pollution Control

(3) Education and Training in Environmental Studies

(4) Grassland Ecosystems.

(5) Impact of Human Activities on Natural Ecosystems.

The Sub-Committee on Forestry and Forest Ecology headed by **Mr. W. R. H. Perera,** Conservator of Forests and Chairman State Timber Corporation has been working on the demarcation of biosphere reserves in various parts of the island and these areas have been classified as strict reserves.

Mr. E. E. Jeyaraj, Head, Department of Microbiology CISIR is head of the sub-committee on Environmental Pollution and Pollution Control. This sub-committee is studying the pollution of water in the city of Colombo, especially in the Kelani River.

The Sub-Committee on Education and Training in Environmental Studies headed by **Professor B. A. Abeywickrema** is preparing background literature for a proposed course at degree level on Environmental studies.

The Grass-lands Ecosystems sub-committee headed by **Professor R. R. Appadurai** is preparing a checklist of Fauna and Flora in the island. The sub-committee has also been engaged in studies on Montane Grasslands.

The Sub-Committee on the Impact of Human Activities on Natural Ecosystems is headed by **Professor K. N. Seneviratne.**

The ultimate human goal implied by the concept of rational use of the biosphere is a high standard of living coupled with retention of the maximal variety of natural and manmade environments, the protection of animal and plant species, and the safeguarding of the world's genetic stock. Before such a goal can be achieved a vast amount of research will have to be undertaken to overcome our present ecological ignorance and provide the basic tools for future planning. With MAB we are making a beginning.

United Nations Environment programme

The purpose of the UNEP is to facilitate co-ordination particularly within the UN system in identifying significant environmental issues and developing a concerted approach to such action by the UN system, other inter-governmental organisations, national institutions and non-governmental organisations.

The UNEP approaches its role on the premise that environment is not an issue or discipline separate and apart from others, but a new dimension which must be brought to bear on the whole range of activities which relate to its protection and enhancement.

The General Assembly of the United Nations Environment Programme is now located in Nairobi, Kenya. It has:

(1) A Governing Council composed of 58 member countries elected by the General Assembly.

(2) A small secretariat to serve as a focal point for environmental action and co-ordination within the United Nations system headed by an Executive Director elected by the General Assembly on the nomination of the Secretary-General.

(3) An Environment Fund to provide additional financing for environmental programmes.

(4) An Environment Co-ordination Board under the chairmanship of the Executive Director.

A field team comprising of 3 scientists: **Dr. P. V. R. Subramahamyam Mr. V. L. Pampattiwar** and **Mr. Bhatt** from the National Environmental Engineering Research Institute, Nagpur (India) visited Sri Lanka from 17th—25th September, in connection with a project of the UNEP to collect information regarding **Air/Water Pollution**. Visits were arranged for them by the National Science Council to some of the highly polluted areas in Colombo and the outstations.

Within the City and its environs they visited—

1. Steel Corporation — Oruwala
2. Tannery (effiluent — chromium)
3. Lake systems within city — Wellawatte, Grandpass, Beira Lake.
4. Brown's Battery Factory, Ratmalana (lead fumes)
5. Government Press (lead fumes)

In the outstantions:-,

1. Paranthan Chemicals Corporation.
2. Paper Corporation, Valachchenai (effluents affecting fisheries).

Any information concerning scientific activities, projects and current research as well as comments and viewpoints will be received with the greatest interest. As the publication is mainly for information purposes, the National Science Council takes no responsibility for the views adopted by the authors, the facts presented or the interpretation of these facts.

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