

STATE PLANNING COMMISSION

**TASK FORCE ON RURAL DEVELOPMENT
INCLUDING RURAL HOUSING**

**THE ECOLOGICAL SITUATION IN TAMIL NADU
AND
THE NEED FOR AMELIORATION**

**REPORT OF THE WORKING GROUP ON
ECOLOGICAL BALANCES**

Chairman :

Dr. V. SHANMUGASUNDARAM
Member, State Planning Commission

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Thiru D. NATARAJAN, M.A., DIP. ANTHRO.

**STATE PLANNING COMMISSION
“ EZHILAGAM ”, CHEPAUK
MADRAS-600005**

6th December 1973

GOVERNMENT OF TAMIL NADU
STATE PLANNING COMMISSION

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STATE PLANNING COMMISSION
"EZHILAGAM", CHEPAUK
MADRAS 600 005
DECEMBER 6, 1973

Letter of Transmittal

DR.V. SHANMUGASUNDARAM
MEMBER

State Planning Commission,
"Ezhilagam", Chepauk,
Madras-600 005.

December 6, 1973.

My dear Chairman,

I have the honour to present to you the Report of the Working Group under the Task Force on Rural Development including Rural Housing, on a subject of current interest, viz., 'Ecological Balances'. The Report gives a general assessment of the ecological situation in Tamil Nadu and recommends a few measures for amelioration.

The subject of Ecology is of growing importance in poor and rich countries alike, each posing serious problems for urgent solution, so as to ensure better utilisation of the human and natural resources.

Prof.B.M. Thirunaranan, an eminent Geographer and Ecologist and Member of the Task Force on Rural Development has placed at the disposal of the Working Group his expert knowledge on the subject and the Working Group places on record its deep appreciation of his services. Thiru D.Natarajan, Secretary of the Task Force on Rural Development (including Rural Housing) has done an excellent work in the preparation of this Report. The Working Group also expresses its deep appreciation of his services.

The Report calls for policy-oriented research on rural and urban ecological problems of Tamil Nadu. I remain at your service and will be happy to provide any further information that you may need in this connection.

With kind regards,

Yours sincerely,

V. SHANMUGASUNDARAM

To
Dr. Kalaignar M.Karunanidhi,
Chairman, State Planning Commission and
Hon'ble Chief Minister of Tamil Nadu,
Fort St. George, Madras-600009.

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STATE PLANNING COMMISSION
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THE ECOLOGICAL SITUATION IN TAMIL NADU
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REPORT OF THE WORKING GROUP ON
ECOLOGICAL BALANCES

1.0 GROWING ENVIRONMENTAL DEGRADATION:

Nearly everywhere in Tamil Nadu, we are dealing with an environment which has been greatly affected by man's activities, including under this, the damage caused by his livestock. The natural resources have been exploited for centuries with little thought either of the

future, or of their recuperative capacity.

There is ample evidence of environmental degradation all around us.

1.1 LOW YIELDS OF CROPS:

The yields of almost all crops in India are among the lowest in the world. Continuous cultivation for centuries, without either ~~manuring~~ or crop rotation, has brought the soils to the verge of exhaustion. Studies of crop yields in some parts of North India have brought out that the yields have gone down further during the last few decades.

1.2 BARREN PORAMBOKE LANDS:

Around most of our villages, the poramboke lands are almost barren due to overgrazing and trampling by the village cattle; the continuous lopping and fuel collection by the villagers, effectively removes the few surviving shrubs and bushes. On sloping ground, overgrazing and indiscriminate removal of the trees and shrubs completely expose the soil, which erodes rapidly, leaving almost barren, boulder-covered hill masses that

are so conspicuous everywhere in the landscape of Tamil Nadu. The damage thus caused is quite serious because the good red soils and dense forest cover were developed under the more rainy conditions that prevailed during Pleistocene times, and are unlikely to be restored, under the drier conditions now prevailing. These rocky ridges represent the final stage to which the land has been reduced by destructive natural agencies let loose by thoughtless human actions.

1.3 FORESTS:

Historical and official records show that forests and productive fields had existed where there are only huge expanses of bare rock and scrub. The advent of railways created an enormous demand for wood for construction purposes and ^{for use} as fuel. With the wasteful methods of extraction and utilisation followed then, extensive stretches of some of the best forests in South India totally disappeared. Deprived of their protective forest cover, the hill-sides were bared to the full force of the monsoons, and it did not take long for the soil to be eroded and carried into

the rivers, making their channels unnavigable and choking their mouths. Many of the small harbours near the mouths of the rivers of Peninsular India, have silted up during the last hundred years.

1.4 PANCHAYAT FORESTS:

Large areas classified as "Panchayat forests" have suffered gross neglect and misuse, for quite a long time, and were hardly more than poor scrub, until they were taken over recently by the Forest Department. In our own generation, too, forests have suffered serious depletion and damage on two occasions. During the 1940s, the widespread use of producer-gas engines for road transport caused great inroads ^{into} the forests ~~potential~~, to supply the fuel needed. Not long after came the abolition of the Zamindari. The landowners did their best to remove and encash every bit of saleable wood and timber on their estates before relinquishing them. Wind erosion and shifting dunes have consequently become a serious menace in ~~some~~ places, e.g. at Thevaram, near Bodinayakanur, and around Palladam in the Coimbatore District.

1.5 IMPROPER USE OF HILL SLOPES:

When the forested slopes of the Nilgiris were cleared for potato cultivation, severe soil erosion ensued, and led to rapid silting of the hydel reservoirs. The damage illustrates how permanent and serious deterioration of the environment, leading to unforeseen consequences like the silting of the hydel reservoirs, may follow improper use of the hill-slopes.

1.6 GROUND WATER CONDITIONS:

The groundwater conditions have been worsening, in all districts in Tamil Nadu, but happily this has lately aroused a measure of public concern, and certain useful steps have been taken. A part of this deterioration is undoubtedly due to the decrease in percolation of rainwater and recharging of the water-table ^{have} which ~~has~~ followed the removal of the natural plant cover and the soil mantle of the upland tracts.

2.0 PLANTING OF EUCALYPTUS AND CASHEW:

Eucalyptus and cashew have been planted over large areas, because they are ^{valuable} species of economic value. When the indigenous species are replaced by the eucalyptus, it suppresses the under-growth, whose richness and variety ~~are~~ outstanding features of our

jungles. Western Science has not yet found much use for many of the species in our local flora, but that is chiefly because no thorough investigation has been made with that aim. We are aware on the other hand, that many of these are much valued in indigenous medicine and in the treatment of animal diseases. The extent to which the area under eucalyptus and other exotic species should be expanded has therefore to be very carefully considered in this context.

2.1 When the existing forest is cleared or replaced by exotic species, the composition and extent of the undergrowth will change, and likewise the plant litter, which will in due course change into humus and get absorbed into the soil. These changes will also modify the fauna, and especially the small creatures and micro-organisms that dwell in the soil. All these changes will certainly influence the extent of percolation and the capacity of the soil to retain and hold moisture. Hence studies of ground-water conditions on a systematic and long term plan in and near such plantations, are very necessary.

3.0 WILD LIFE IN THE COUNTRY:

Over vast areas in India the more conspicuous elements in the fauna are shrinking towards extinction, speeded up by the rifle, pesticides and the growing population. Until the First World War wild life was quite abundant, affected mainly by the dwindling forest acreage, as more land was brought under cultivation. It was chiefly during and after the Second World War that large scale destruction of wild life took place. During the war years, troops stationed in many parts of the Country used the forests for training in jungle warfare and during such occasions they killed the wild animals in large numbers. After the war enormous quantities of guns and ammunition became cheaply available, poaching became rampant and the lower forest officials on the spot could do little to prevent it.

3.1 WILD LIFE IN TAMIL NADU:

At present the wild life of Tamil Nadu is fast approaching extinction. The cheetan has been wiped out of existence from the whole of India. The tiger, the panther, the four-horned

antelope, the Nilgiri langur, the lion-tailed macaque, the sloth bear, the sambhur, the gaur (bison), the tahr (Nilgiri Ibex) have all become extremely rare. Even the spotted deer, the black buck, and the elephant have been greatly reduced in numbers. The introduction of exotic species like eucalyptus and wattle tends to produce habitats unsuitable for our wild life. When grazing inside forest areas is permitted, the villagers become directly interested in killing the wild animals which may prey on their herds. Pesticides like folidol and endrin are often used to poison the wild animals. Infectious diseases like rinderpest have also spread from the domestic herds to the forest animals like the bison and decimated their numbers.

4.0 WASTE OF LAND BY DUMPING WASTES, QUARRYING, ETC.

Around most towns, and more especially around the larger urban centres, where the land tends to become more valuable, extensive areas are made unusable by dumping urban and industrial wastes, or by quarrying and digging stone, earth and gravel for building and road making. These areas tend to

become ill-drained and insanitary; the water accumulating in the depressions facilitates the breeding of mosquitoes and flies. Thus even a rapid review of the ecological situation shows that there is urgent need for remedial measures.

5.0 EXAMPLES OF ENVIRONMENTAL IMPROVEMENT IN TAMIL NADU:

There is on the other hand good evidence of the scope for adopting effective methods capable of yielding fairly quick results. We have had for several decades an outstanding example of environmental improvement right in the middle of Tamil Nadu near Madurai City. The transformation of Pasumalai into a truly and refreshingly green landmark by the effective protection which the Harveys arranged there, has made it for years a striking contrast to the nearly barren neighbouring hillocks. Legris, Blasco and Meher-Homji have reported that the denuded hill slopes of Trombay hill near Bombay could regain a good tree cover within twelve years when protected effectively against the destructive activities of the local population and their livestock. This was possible under the heavy monsoon rainfall

of the Konkan; but under the much drier conditions prevailing in Tamil Nadu, the regeneration of natural forest will need a longer period. The Forest Department allows a period of 30 years for the regeneration of the fuel forests in the drier tracts. In areas where teak and other timber species are predominant, the felling interval may become even longer. The rate at which the soil, especially the top-soil which sustains plant life, develops is very much slower; it has been stated that it takes 800 years to form an inch-thick layer of top-soil. The slow rate at which many of the natural processes take place is one of the important aspects of the physical environment which is often overlooked.

5.1 The remarkable ecological transformation that has taken place in the campus of the Madras Christian College at Tambaram, wholly as a result of the effective protection provided by fencing the area and keeping trespassers and village cattle out, is an excellent example of what can be achieved even by such simple measures in 30 years,

provided they are effectively carried out. The increase in the plant cover is most striking to any one who goes round the campus, and the composition of the vegetation is also much richer and more varied when compared with that on adjacent areas like the Tambaram Sanatorium hill on the west, or Vandalur hill further south. From the observations reported from time to time by the staff of the College, the enrichment of the fauna of the campus is also quite evident, Even the local climate has been altered. From December to July, nobody entering the College Campus by its main gate facing the Railway Station will fail to notice the distinctly cooler air temperatures within the campus. These examples show how the poramboke areas lie unutilised and unproductive, mainly due to the absence of any policy or programme for their effective utilisation.

5.2 There is however very little active interest or concern - for that matter, there is very little "awareness" of the position - among the leaders of public opinion, or even among the intellectual elite of the population. The inadequacy

of our education at all levels leaves us incapable of appreciating the significance of what we see in our surroundings. Soil conservation is now accepted as desirable, but water conservation, and conservation of areas to preserve plant species to ensure their survival and future availability, are hardly even mentioned in discussions and deliberations on our environmental problems. There is urgent need to arouse public awareness and public interest in the environmental damage going on all around.

6.0 OTHER FALLOW LAND:

More than 6,00,000 hectares of land in Tamil Nadu are classified as "other fallows". This means that 1/5 of this area relapses into uncultivated land every year, and is probably being reclassified under cultivable waste. In other words, this area is actually being rendered use-less every year by cultivators who temporarily occupy and try to cultivate such marginal land. Most probably it is made even less cultivable by the soil erosion following the attempts to plough

it. This is continuing, because the suitable uses to which such land may be put is not the guiding consideration.

POLICY REGARDING PATTERN OF LAND USE:

7.0 The absence of any definite policy regarding the pattern of land use would appear to require amendment, to help and accelerate the proper use of all the land. A stage has been reached where attention will have to be diverted from the idea of finding more land for cultivation to that of more intensive and integrated utilisation of the land. The future will have to be based on the selective use of the land available according to its quality.

7.1. Very little has been done to remedy the situation and improve conditions under the several Five Year Plans, most probably because definite "results" and "achievements" could not be indicated within the Plan periods. Even other remedial measures suggested under the Plans, like soil conservation and flood control, have been only

partially executed. The temptation to concentrate on what is spectacular seems to have been irresistible.

THE PHYSICAL ENVIRONMENT:

8.0 The physical environment which surrounds us is not a mere mass of inert materials which can be manipulated according to our desires, but a delicately balanced system which tends to attain, under natural conditions, a state of equilibrium in which various interacting components reach a state of adjustment to the various factors in operation, such as the climatic conditions, the plant and the animal organisms and the soils. Broadly, each one of these exerts an influence on each of the other sets of factors, directly as well as indirectly. Even the apparently inert soil layers exert an influence not only on the plants which grow in it, but on the atmosphere, too, by the radiation of heat from the soil surface to the air layer above it. Interfering with the soil surface will inevitably cause changes in the

radiation from it, in its capacity to sustain plant life, and in several other aspects, including the subsoil conditions and the ground water levels. Tampering with nature has its hazards. Man is intimately bound up with many of these complex ecological interactions. He has to recognise his dependence on the simpler creatures in the ecosystems with which he is associated, for in damaging them ⁱⁿ irreparably, he irreparably damages himself. Insect pests will develop immunity to pesticides, and then only their natural predators will come to our aid.

HUMAN ACTIVITIES AND THE ENVIRONMENT:

9.0 Human activities, including the effects produced by man's livestock, tend to interrupt and at times greatly accelerate the natural processes taking place in the environment, and in certain circumstances give rise to a whole series of irreversible changes. Man's activities constitute a perpetual source of disturbance of the environment, which would otherwise tend to reach a natural state

of equilibrium. Modern technology and present-day human organisation enable men to interfere with the physical environment on a vastly larger scale than in the past, and there is therefore great danger of causing immense harm by the misuse of these means. Actions taken without due consideration of the interent dangers may start a series of irreversible changes or trends in the environment, culminating in a serious or even permanent impairment of its productive potential. It is one of the main purposes of this note to draw attention to this danger.

URGENT
THE/NEED FOR SYSTEMATIC AND RAPID DEVELOPMENT OF
ECOLOGICAL STUDIES:

10.0 The urgent necessity for the systematic and rapid development of ecological studies needs no emphasis in these circumstances; they will help to provide the administrative authorities with the badly needed basic knowledge and experts in the field, which are both quite essential for sound policies and safe decisions that will not bring about deleterious changes in the environment. The

slow rates of ecological changes under natural conditions inevitably require long-term programmes if they are to be studied and understood properly. Environmental improvement and restoration will also have to be planned on a long-term basis. The aim in all this must be the attainment of a state of natural equilibrium in the environment, with a minimum of human interference to maintain it.

THE NEED FOR SYSTEMATIC REVIEW AND REPLANNING:

11.0 At present, there seems to be no provision for reviewing and systematically replanning the uncultivated land in our State. Apart from the programmes for (a) bringing uncultivated areas into cultivation wherever possible and (b) the programmes for the extension of forest plantations, there seems to be no plan or proposal for utilising the rest of the available area, e.g. the uncultivable wastelands, in any other fashion. A large proportion of the uncultivable lands lies on the sloping uneven upland areas, which are also the gathering grounds for the streamlets which feed the main drainage channels that traverse the adjacent cultivated tracts.

11.1 These upland areas play an important role as zones of percolation for the rain which they receive, and thereby contribute a part of the underground water supply which is tapped and used at lower levels. Indiscriminate use and unregulated activities in these uncultivated areas will not only affect the local vegetation cover but even the surface drainage and subsoil water conditions there and in the neighbouring cultivated areas. Soil erosion may thus be accelerated and greatly increase the risk of floods and of damage through sand-casting of cultivated fields in the foot-hill zones.

11.2 Since soil erosion and serious damage to the land can happen very quickly, and restoration is a much slower process, it will be best and also most essential in the long run to anticipate them by adopting preventive measures. This can be done by planning the use of all land in terms of the natural units of which the different land categories form related components. Integrated planning for each natural unit should not only

provide for the specific use of each of the components but also allocate appropriate uses to each category so that the ecological equilibrium is not upset, and wherever possible they should try to increase the potential productivity of the area.

11.3. Wherever programmes for 'development' are undertaken which involve land and water utilisation, it is advisable to plan them as carefully integrated projects, in which the proposed activities will be selected and located, and their effects on the environment will be regulated to eliminate environmental deterioration.

THE NEED FOR A RATIONAL LAND USE PATTERN:

12.0 There is need to have a rational land use pattern, distinguishing (a) land for intensive cropping; (b) nature reserves; (c) multiple use areas, with cultivation as well as other economic enterprises, ensuring survival of many elements of the natural land scape, and the cost of conservation may be at least partly met by the sale of

products. It is also necessary to secure the release of less productive land from cultivation, to be diverted to other long-term uses like regulated grazing, or cutting of grass in enclosed pastures, afforestation and tree crops. It will be more effective to concentrate on high productivity in selected areas than on low productivity spread over the entire land. It is equally important to maintain and secure environmental variety, in the plant and animal species and even in landscape characteristics, when 'development' is undertaken in any area. Planning and management should be so arranged that nothing irreplaceable is destroyed.

12.1 THE NEED FOR UTILISATION OF LABOUR MOST INTENSIVELY:

The growth of population has transformed the economic situation by making labour the most abundantly available factor of production, and land and water have become much scarcer, comparatively. In this situation, schemes have to be devised which will utilise labour most intensively, land in less measure, and water even more economically. Comprehensive and continuous collaboration with agriculturists, foresters, engineers, and economists

is needed for formulation of land use planning on an emergency footing.

13.0 EDUCATION AND PUBLICITY:

There is however very little active interest or concern -- for that matter, there is very little 'awareness' of the position --, among the leaders of public opinion, or even among the intellectual *élite* of the population. The inadequacy of our education at all levels leaves us incapable of appreciating the significance of what we see in our surroundings. There is urgent need to arouse public awareness of and public concern over the environmental damage going on all round. The absence of any definite policy regarding the pattern of land use would appear to require amendment to help and accelerate the proper use of all the land. A stage has been reached where attention will have to be diverted from the idea of finding more land for cultivation to that of more intensive and integrated utilisation of the land. The future will have to be based on the selective use of the land available according to its quality.

13.1 A good deal of the damage to the environment results from the widespread lack of understanding of the very influential role of the environment in nearly all human activities. It is therefore of the utmost importance to develop a sound understanding of the environment and the importance of ensuring its quality and improving its productivity. This is a most urgent need in order to ensure that a conducive atmosphere may also develop in which various programmes for environmental amelioration may be undertaken. The awakening of public interest in the environment is very much needed to counteract and put an end to the various activities which result in environmental deterioration.

13.2 A programme of publicity suited to the different social and intellectual levels has to be organised and sustained over a period long enough to ensure that its impact on the public has a lasting effect. The rural areas will need a largely different programme both on account of the difference in the educational level of the rural masses and also because the environmental problems in the rural areas will be different from those of the urban and industrial regions.

13.3 Environmental education must also be incorporated as an integral part of the school curriculum and related to already existing subjects like nature study, geography and civics. This must be supplemented by an intensive programme of adult education through all the mass media. Systematic publicity will have to be organized and maintained at a high level of efficiency to bring about speedy results and good public co-operation in the programmes of environmental preservation and improvement wherever they are undertaken.

RECOMMENDATIONS:

14.0 Programme for Research:

I. (a) Establishing an ecological classification of Tamil Nadu, and delimiting the ecological zones of Tamil Nadu, according to the climate and soil conditions and vegetational features. The areas thus defined will be more or less homologous, as regards soil-climate-vegetation features, and hence, when remedial measures are needed, the same treatment can be adopted through out each zone.

b) In each ecological region, at least two sites may be selected (i) a cultivable fallow, and (ii) an uncultivated area, little affected by human

impact; and the latter given priority in study, as it will provide a standard for comparison. From these latter sites, a certain number could be chosen early, to be retained permanently as Nature Reserves, with adequate enclosure, greater protection and watch or supervision. Preference should be given to sites showing greater diversity. These are likely to be inside or near areas under the control of the Forest Department and may therefore be placed in their charge. Exceptionally they could be elsewhere, e.g., within the large campuses of Colleges, Universities and other academic institutions. These Nature Reserves should be permanently preserved and protected, - completely prohibiting entry and movement within them -- for the preservation of species, for research and education, and for their potential value.

c) Inventories of these areas will be made, which will include (i) floristic composition, (ii) regional meteorological and micro-meteorological conditions of the sites, (iii) physical and chemical analyses of the soils, (iv) run-off as a measure of erosion, (v) plant cover degradation and (vi) evaluation of the type and intensity of the biotic factors.

II Similar inventories will have to be made for each of the degraded areas, after they are located.

III. Studies of the degree of degradation, to compare 'affected' with adjacent 'unaffected' areas in (a) cultivable areas now degraded; (b) former forest areas given to landless for cultivation; (c) fallows and cultivable waste areas subject to overgrazing; (d) comparative studies of portions fenced or planted with suitable trees.

p.t.o.

14.0.1 Items I (a), (b), (c) will become part of the permanent scientific research set-up of the State to provide comprehensive basic data about soils, vegetation and ecology, which will be essential for planning properly the protective and ameliorative measures.

THE NEED FOR AN INSTITUTE OF ECOLOGICAL STUDIES:

14.02 Ecological studies are essentially inter-disciplinary, and need to be developed as a cooperative endeavour in which botanists, zoologists, soil scientists, geographers and statisticians work together and with agronomists and experts in forestry and animal husbandry, to understand the several local environments and how to raise them to the maximum level of productivity. A permanent coordinating committee consisting of experienced scientists from all these fields may be constituted to work out the details of a programme for developing ecological studies and ecological research in the State on a long-term basis. The establishment of a full-fledged Institute of Ecological Studies, for this purpose, with the help of international experts in the initial stages, may also be considered.

14.0.3 Ecological studies are essentially multi-disciplinary in scope, and at present facilities for training are very inadequate in Tamil Nadu State. Hence item I will also add to the existing facilities especially in promoting practical and field training. Items II and III will be short-term diagnostic studies. They will start as sample or pilot studies, and will have to be reviewed at intervals, and modified if necessary before they are extended to other areas needing attention.

PROGRAMMES FOR ACTION:

14.1 (a) Protection of areas likely to be eroded and (b) strict protection of areas which should not be deprived of natural vegetation in any circumstances, will have to be undertaken, according to a scheme of priorities. (c) Long-term improvement of vegetation by judicious seeding and planting of selected species will also have to be undertaken. These programmes, will have to be carried out by the Departments concerned (Forests, Agriculture, etc.)

14.2 Near every settlement, more particularly on the fringes of the larger towns and cities, extensive areas are rendered unproductive and unusable by quarrying and dumping of waste materials,, specially near factories. The dumped waste material often tends to occupy the ground permanently to the detriment of the natural vegetation, and at times even of the surface drainage and water supply. In certain places, liquid wastes discharged from factories affect the neighbourhood and pollute nearby channels and streams. The pollution may at times contaminate the ground water supplies too.

14.2.1 High priority may be given to the reclamation and restoration of areas of both these categories. In the neighbourhood of towns and cities, this filling and levelling of quarries and gravel pits may well be taken up as social service projects, by various student and voluntary organizations. Apart from the small economies that may be secured in this way, the chief gain will be the awakening of the social conscience of a larger number among the younger generation and this will be a very significant and permanent achievement.

14.3 These projects could therefore be organised as parts of a systematic scheme of education and training in all schools and colleges regarding the preservation of the quality and productivity of the environment, as an essential contribution to the improvement of the quality of life of the community as a whole.

14.3.1 Existing organisations like the Youth Corps and the Prosperity Brigade, which are concerned with training and developing discipline among youth, could also undertake some of the pilot projects for the reclamation of quarried ground and dumping areas in selected localities. At the outset a small grant may be earmarked for use in this way. The experience gained thereby would provide data from which the cost of wider extension of these activities may be more accurately estimated than is possible at present. In more difficult areas it may be necessary to carry out the reclamation partly or wholly by utilising full-time labour.

14.32 The areas for reclamation will have to be chosen with reference to (a) the scope for immediate utilisation of the reclaimed ground and (b) the availability of voluntary labour of youth organisations. In the first instance the educational value of these projects, for making youth service-minded, and for arousing public awareness must be kept prominently in view. As the work develops and the value of environmental protection and amelioration is seen in actual practice, it will gain wider recognition and larger amounts may then be allocated for the purpose, (a) for undertaking reclamation and protective works and (b) for continuing the educational and publicity programme.

14.3.3 In this matter publicity is of the utmost importance and should be started immediately. Leaders of public opinion and those responsible for the planning and administration of these and related matters, will have to be convinced. On the other hand the education of the public at large, more particularly the rural masses, and the systematic.

instruction of the younger generation should also be undertaken immediately. A comprehensive scheme of public education and publicity aimed at the development of environmental consciousness is urgently needed.

14.4 The filling and levelling of areas scarred by quarrying earth and stone should be followed by systematic planting of trees and the protection and care of these areas. This will provide further opportunities for the social worker. Most of the areas involved in quarrying and dumping consist of public land (Poramboke) usually close to already developed areas. The future use of these areas must also be carefully planned, so as to add to the amenities and facilities enjoyed by the adjacent settlement and the community.

SYSTEMATIC REGULATION OF QUARRYING AND DUMPING:

14.5 It is also necessary to consider and devise in this context suitable measures for the systematic regulation of quarrying and dumping so as to prevent the recurrence of similar damage to good land.

UTILISATION OF PUBLIC LAND:

14.6 The policy to be followed in the utilisation of public land, particularly in the neighbourhood of villages has to be carefully examined and formulated keeping in view as the main aim the necessity to maintain, and wherever possible, improve the quality and productivity of the land. There is good scope for using substantial areas that now lie waste as fodder-producing land by systematic and effective fencing and enclosure. Securing the understanding and cooperation of the communities involved is no less important than the provision of physical fences. Ultimately the increased production of fodder and fuel and the improvement of soil quality and ground water supplies in and around the area will benefit the community more than anything else.

14.6.1 This may have to be undertaken, in the first instance, as experimental or pilot projects, in carefully selected areas. Side by side with these practical measures of amelioration, the regular periodical recording and analysis of the changes

brought about-both physical and social-would be valuable and must be undertaken as research projects. Such studies would furnish definite data on the rate of change and the cost. It would be possible to work out from such data the benefit-cost evaluation of such schemes. †

INTEGRATED PROJECTS:

14.7 Not far from Madras, and near Madurai, Salem and smaller towns like Vellore, there are numerous hilly areas, some of which are of considerable extent. These are at present largely unused except for grazing the village livestock, and fuel-gathering by the villagers themselves. In much drier parts of the Deccan, in the Telengana tract, it has been found that by enclosing and fencing such areas, the fodder yield can be increased five-fold in a few years. It should be equally possible to enclose and fence some of these poramboke areas into compact blocks of a few hundred acres, and develop them as fodder reserves from which plentiful supplies of fodder for cattle can be obtained by periodical cutting and storage. These supplies will

add, in quantity and quality to the paddy straw on which the cattle in villages are now largely fed. The stored fodder will also help during periods of shortage, and if arrangements could be made to convert some of the fodder into silage, the chronic shortage of green fodder during the dry months can also be largely overcome. The proximity to large urban markets for fresh milk can thus be exploited to sustain dairying in the villages which adjoin these fodder reserves. In these fodder blocks, strict control, insisting on the fodder being utilised only by cutting and removal, will ensure the steady improvement of the natural vegetation cover of the area as well as the soil characteristics, especially its water absorbing capacity. The presence of a protecting plant cover will reduce run-off and increase percolation and thereby help to improve groundwater conditions also steadily. The utilisation of these boulder-covered hill tracts for fodder production will not only make them productive to that extent, but also ensure their ecological amelioration.

14.7.1 It will also be possible to undertake in these tracts various soil and water conservation measures, like check dams, soil traps, and gully-plugging which will all help (a) to reduce run-off and check soil erosion, (b) to increase percolation and the underground water supply and (c) to improve the soil conditions and provide thereby areas suitable for tree planting and capable of sustaining a denser plant cover, in due course.

14.7.2 Projects of this nature may be carefully considered and given high priority in all the hilly interior of Tamil Nadu, e.g., Dharmapuri, Salem and North Arcot Districts, where the rocky terrain and the handicap of poor and shallow soils is further aggravated by low and not very reliable rainfall. All these districts are near to the large and ready urban markets for fresh milk, at Madras and Bangalore. Even otherwise it will be possible to utilise the milk output by establishing plants for producing milk powder. At present these areas are handicapped by very limited water supplies. But these can be conserved and used for providing drink-

ing water to the herds in the area, and as far as possible, to grow green fodder for use in the dry months. The introduction and adoption of some of the imported drought resistant varieties of grasses will also help to increase the yield and the nutritive value of the fodder grown in these areas.

SUMMARY OF THE REPORT:

15.0 Environmental deterioration is quite widespread, and seriously affects forests, soils, groundwater, fauna, navigability of river channels, reservoirs, etc. Remedial measures are urgently needed; the success achieved in certain localities shows that there is good scope for effective and substantial improvement. The lack of "awareness" of the importance of proper use of the environment is a great handicap. This must be set right by effective and sustained publicity and education, and by including the systematic study of the environment and its proper use, as a regular part of the school curricula.

15.1 There is need for a comprehensive policy regarding the use of all available land, in an integrated manner, ensuring selective use of the land according to its quality.

15.2 The development of systematic ecological research and of ecological studies is essential to provide the basic knowledge. Studies of different methods of ecological improvement are also urgently needed. The early establishment of a full-fledged Institute of Ecological Studies is also necessary.

15.3 A land policy has to be carefully evolved to utilise all land, to use the land according to its quality, to optimise productivity and to secure ecological equilibrium and amelioration.

15.4 Programmes of research, to define the ecological types and ~~delimit~~ the ecological zones of Tamil Nadu, coupled with studies of the degraded areas, and experiments for improving them, have to be undertaken. At the same time, measures are needed to protect vital areas from soil erosion, and preserve

other areas to ensure survival of the floral and faunal wealth for future use. Restoration and improvement of affected areas have to be carried out, and some of these may be planned and executed as Youth Projects, to develop environmental consciousness among the youth.

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APPENDIX I

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ON ECOLOGICAL STUDIES

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APPENDIX II

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